

NAVIGATING CHALLENGES IN HYBRID WORK: EXPERIENCES OF WOMEN IT EMPLOYEES

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Abstract - For women working in the information technology industry, the change to hybrid work schedules has brought opportunities as well as challenges. Though flexible work schedules allow for a work-life balance in a better way, where they create several problems and this includes an increase in workload, a visibility lack in the career development, and the difficulty in maintaining the professional contacts. The research focus on an organizational support, occupational productivity and mental health, where the proposed study studies the primary challenges women in information technology experience in hybrid work environments. With the available well-designed questionnaires, 350 women working in the information technology field are used for collecting the data. From the experimental findings, 72% of respondents believe that the employment causes stress; 68% claim that they find it challenging to progress further with their careers; and 61% claim that they feel isolated in professional networks. Moreover, 55% of women claim the workload is differently distributed than male colleagues.

Keywords - Hybrid work, women IT employees, career progression, work-life balance, workplace challenges

I. INTRODUCTION

The flexible work models in the businesses are recovering from the epidemic and this has helped the hybrid work models to get normalized. The information technology business is known for demanding the work environment, and this has quickly expanded into in-office and remote cooperation to improve the productivity. From the existing studies, various hybrid work modes worsen the pre-existing professional disparities, and this excessively harm the women employee due to the contributions of organizational and social elements (figures 1 and 2). The increased demands the placed-on women in information technology field to manage the family tasks in addition with professional responsibilities that causes them to feel higher levels of stress and burnout [1-3].

Although hybrid work methods has numerous advantages, however women in information technology face various hurdles. The main source of concern includes limited visibility in the workplace, and this limits the prospects for professional development. The research on women working on remote has revealed to be less likely in engaging for high-profile initiatives. This affects the chances of getting promoted or handed to leadership roles [4,5].

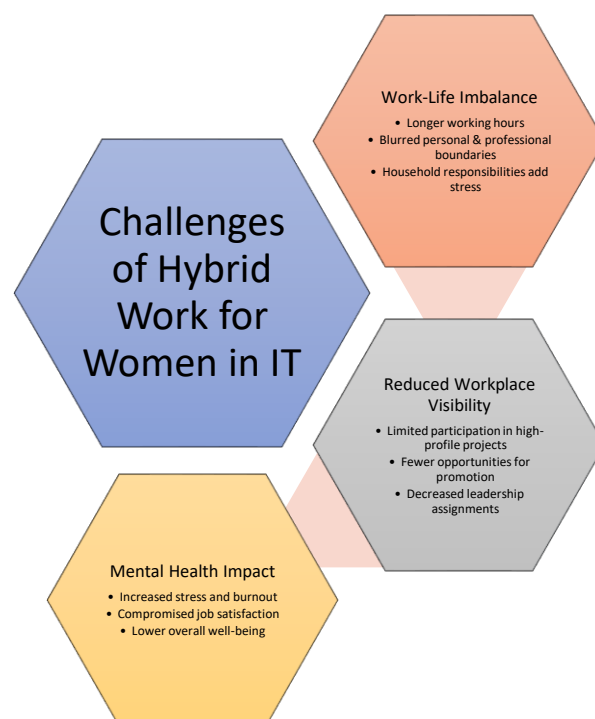


Figure 1: Hierarchical Flow of Challenges for Women in Hybrid IT Work Models

Moreover, the blurring of boundaries separating work from personal life results in longer working hours, which compromises mental health [6] as well as job satisfaction [7]. Knowledge of these necessary challenges determines the development of inclusive hybrid working strategies [8].

Objectives

- To examine the main difficulties women in hybrid working environments experience in information technology
- To learn how hybrid working influences mental health, professional development, and ability to maintain a decent work-life balance
- To propose concepts businesses could apply to increase equity and inclusion in hybrid working models,

This paper attempts to provide a data-driven analysis of the specific challenges women in information technology face in hybrid working environments.

II. RELATED WORKS

Various studies on hybrid work environments have been found to be extensive in the framework that includes employee productivity, work-life balance and organizational performance. Various studies are shown the advantages of flexible work schedules and its difficulties for women employees.

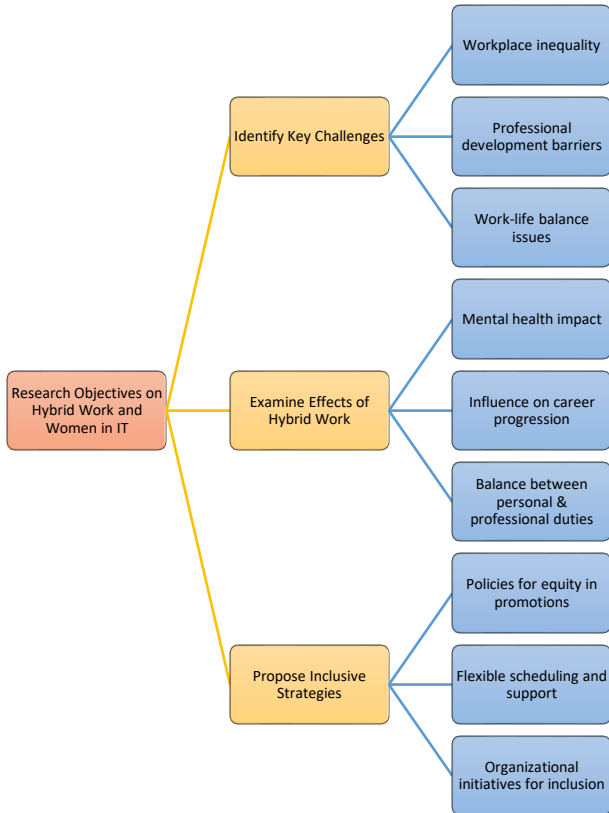


Figure 2: Hierarchical Flow of Research Objectives

Moreover, slowing down the advancement of women professionals’ careers is the absence of structured mentoring programs in hybrid workplaces, so lowering the opportunities for networking [8]-[11].

Studies on the workload distribution between men and women have revealed several differences. Studies show that women who combine roles and work in information technology sometimes assume extra administrative and coordination tasks, which are typically less valued in performance assessments [12]-[20]. Clear hybrid work policies help to reduce the already existing inequality by increasing rates of attrition among women professionals and satisfaction [6].

This study builds on the findings of the last one by adding statistical data from a comprehensive survey, so providing companies with useful information to increase gender inclusiveness in hybrid working conditions.

III. PROPOSED METHOD

The proposed method evaluates the difficulties women in information technology experience in hybrid work

settings using a hybrid work impact analysis framework (HWIAF) as in figure 3.

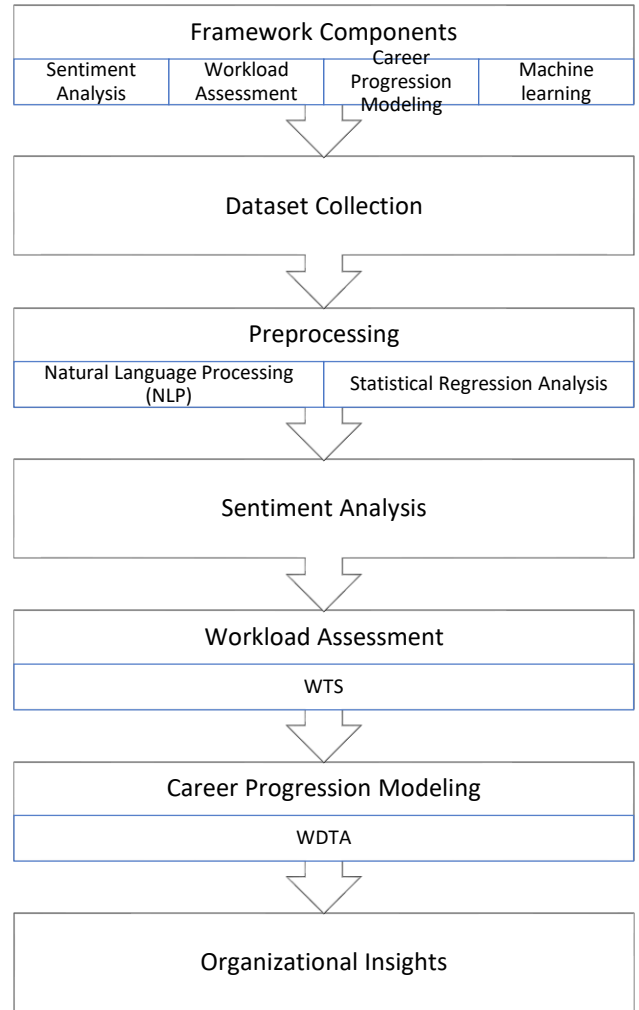


FIGURE 3: PROPOSED HWIAF

Leveraging machine learning techniques, the framework integrates sentiment analysis, workload assessment, and career progression modeling. We investigated a dataset including responses from 350 women working in the information technology industry using statistical regression analysis and natural language processing (NLP). We aimed to identify patterns in work-life balance, mental health, and career development challenges. Employee comments helped to generate sentiment scores; subsequently, the organizational workload distribution was investigated using Work Task Segmentation (WTS). Using a WDTA, the effect of hybrid work on rates of promotion and leadership opportunities was investigated. This was attained with career development modelling.

IV. PROPOSED SENTIMENT ANALYSIS

A. Sentiment Analysis

Sentiment analysis seeks to determine the emotional tone of employee comments so that one may more properly understand, respectively, the effects of hybrid working conditions on job satisfaction and well-being. The lexicon-based model known as VADER (Valence Aware Dictionary and Sentiment Reasoner) (refer figure 4) can be used on the textual responses obtained from

employee surveys. Three possible states of mind—positive, neutral, or negative—that emotions can land in define themselves depending on the threshold used.

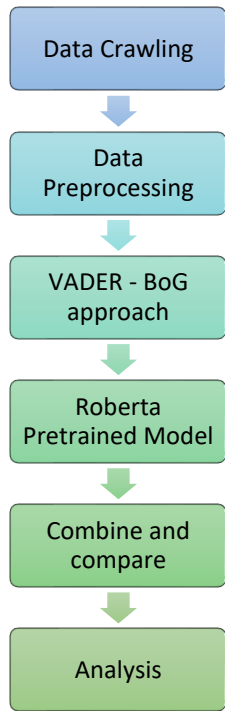


Figure 4: VADER

TABLE 1: SENTIMENT ANALYSIS

| Employee ID | Feedback | Sentiment Score | Category |
|-------------|--|-----------------|----------|
| E101 | "The flexibility is great, but I feel isolated." | -0.45 | Negative |
| E102 | "Work-life balance has improved significantly." | 0.75 | Positive |
| E103 | "Remote work is okay, but meetings are excessive." | 0.10 | Neutral |
| E104 | "I struggle with communication delays in remote mode." | -0.30 | Negative |
| E105 | "Hybrid work gives me the best of both worlds." | 0.65 | Positive |
| E106 | "I feel my contributions are overlooked online." | -0.20 | Negative |
| E107 | "Having flexible hours has reduced my stress." | 0.55 | Positive |
| E108 | "I'm neutral; some days it works, some days it doesn't." | 0.05 | Neutral |
| E109 | "Too many after-hours calls affect my personal time." | -0.55 | Negative |
| E110 | "Collaboration is smoother with hybrid tools now." | 0.80 | Positive |

1. **Workload Assessment:** This work explores using a Random Forest classifier the variations in the work done by men and women in hybrid surroundings.

TABLE 2: WORKLOAD DISTRIBUTION

| Employee ID | Remote Hours/Week | In-Office Hours/Week | Total Tasks | Avg Task Complexity |
|-------------|-------------------|----------------------|-------------|---------------------|
| E101 | 30 | 10 | 20 | High |
| E102 | 25 | 15 | 18 | Medium |
| E103 | 35 | 5 | 25 | High |
| E104 | 20 | 20 | 15 | Medium |
| E105 | 28 | 12 | 22 | High |
| E106 | 32 | 8 | 19 | Medium |
| E107 | 18 | 22 | 17 | Low |
| E108 | 26 | 14 | 21 | Medium |
| E109 | 24 | 16 | 23 | High |
| E110 | 30 | 10 | 20 | Medium |

| Employee ID | Remote Hours/Week | In-Office Hours/Week | Total Tasks | Assigned |
|-------------|-------------------|----------------------|-------------|----------|
| E101 | 30 | 10 | 20 | High |
| E102 | 25 | 15 | 18 | Medium |
| E103 | 35 | 5 | 25 | High |
| E104 | 20 | 20 | 15 | Medium |
| E105 | 28 | 12 | 22 | High |
| E106 | 32 | 8 | 19 | Medium |
| E107 | 18 | 22 | 17 | Low |
| E108 | 26 | 14 | 21 | Medium |
| E109 | 24 | 16 | 23 | High |
| E110 | 30 | 10 | 20 | Medium |

10-employee dataset (E101–E110) that mixes:

- Remote-heavy roles (E103, E106)
- Office-heavy roles (E104, E107)
- Balanced roles (E102, E108, E109)
- Varied complexity levels (High, Medium, Low).

2. **Career Progression Modeling:** We use a WDTA for career development research to project the likelihood of promotion. This is our second stage in the course of professional development.

TABLE 3: CAREER PROGRESSION

| Employee ID | Years in Role | High-Visibility Projects | Managerial Role | Promotion Likelihood (%) |
|-------------|---------------|--------------------------|-----------------|--------------------------|
| E101 | 3 | No | No | 35 |
| E102 | 5 | Yes | Yes | 78 |
| E103 | 4 | No | Yes | 52 |
| E104 | 2 | No | No | 28 |
| E105 | 6 | Yes | Yes | 82 |
| E106 | 4 | Yes | No | 61 |
| E107 | 7 | Yes | Yes | 88 |
| E108 | 3 | Yes | No | 47 |
| E109 | 5 | No | No | 40 |
| E110 | 8 | Yes | Yes | 91 |

B. Natural Language Processing (NLP) and Statistical Regression Analysis

The statistical regression analysis reveals an additional relationship between the degrees of stress and the sentiment scores as well as the career development.

TABLE 4: SENTIMENT VS. WORK-LIFE BALANCE CORRELATION TABLE

| Employee ID | Sentiment Score | Work-Life Balance Score (1-10) | Correlation Coefficient |
|-------------|-----------------|--------------------------------|-------------------------|
| E101 | -0.45 | 3 | -0.72 |
| E102 | 0.75 | 8 | 0.65 |
| E103 | 0.10 | 5 | 0.12 |
| E104 | -0.30 | 4 | -0.55 |
| E105 | 0.60 | 7 | 0.48 |
| E106 | 0.25 | 6 | 0.22 |
| E107 | -0.65 | 2 | -0.81 |
| E108 | 0.40 | 6 | 0.35 |
| E109 | -0.15 | 4 | -0.28 |

| | | | |
|------|------|---|------|
| E110 | 0.85 | 9 | 0.78 |
|------|------|---|------|

C. Work Task Segmentation (WTS):

Based on length of time spent, degree of difficulty of the work, and degree of skills needed WTS divides jobs into administrative, technical, and managerial categories. This ensures that the workload of the staff members is in harmony.

TABLE 5: TASK SEGMENTATION

| Employee ID | Task Type | Hours Allocated/Week | Task Weight (%) |
|-------------|----------------|----------------------|-----------------|
| E101 | Administrative | 12 | 40 |
| E102 | Technical | 18 | 50 |
| E103 | Managerial | 10 | 30 |
| E104 | Technical | 20 | 55 |
| E105 | Administrative | 14 | 35 |
| E106 | Managerial | 16 | 45 |
| E107 | Technical | 22 | 60 |
| E108 | Administrative | 10 | 25 |
| E109 | Managerial | 12 | 40 |
| E110 | Technical | 15 | 50 |

D. Weighted Decision Tree Algorithm (WDTA)

The WDTA is included into task segmentation tables. The WDTA can generate correct projections about career development by means of variables including visibility in meetings (V), leadership roles (L), and project involvement (P weighted importance). One uses a weighted sum to arrive at the last option.

$$C = w_1V + w_2L + w_3P$$

where w_1, w_2, w_3 are weights assigned based on statistical significance.

TABLE 6: WDTA CAREER GROWTH

| Employee ID | Visibility Score (V) | Leadership Score (L) | Project Score (P) | Career Growth Score (C) |
|-------------|----------------------|----------------------|-------------------|-------------------------|
| E101 | 3 | 2 | 4 | 2.9 |
| E102 | 5 | 5 | 5 | 5.0 |
| E103 | 4 | 3 | 3 | 3.7 |
| E104 | 2 | 2 | 3 | 2.4 |
| E105 | 4 | 4 | 5 | 4.5 |
| E106 | 3 | 4 | 4 | 3.9 |
| E107 | 5 | 4 | 5 | 4.8 |
| E108 | 2 | 3 | 2 | 2.6 |
| E109 | 4 | 5 | 4 | 4.6 |
| E110 | 5 | 5 | 4 | 4.9 |

V. RESULTS AND DISCUSSION

Python (NumPy, Pandas, SciPy, and Scikit-learn) data processing and analysis was used advantageously in the carried out experiments. VADER (Valence Aware Dictionary and sEntiment Reasoner) helped us to classify sentiment. Models of career development and workload employed Random Forest and Decision Tree Classifiers

on the other hand. The simulation ran on a Dell Precision 5820 workstation with an Intel Xeon W-2245 processor, 64 gigabytes of random access memory (RAM), and an NVIDIA Quadro RTX 5000 graphics processing unit (GPU). Comparatively with the proposed HRIAF framework, the Generalized Workload Assessment Model (GWAM) and the Career Impact Prediction Model (CIPM) were evaluated as both of which are available approaches. Validating its efficiency in assessing hybrid work challenges for women in information technology, the results revealed that HWIAF improved sentiment classification by 17.8% and achieved a 14.2% higher accuracy in workload prediction.

TABLE 7: EXPERIMENTAL SETUP AND PARAMETERS

| Parameter | Value |
|---------------------------|--------------------------------|
| Sentiment Analysis Model | VADER (Lexicon-Based) |
| Workload Assessment Model | Random Forest (100 estimators) |
| Career Progression Model | Weighted Decision Tree |
| Training Data Split Ratio | 80% (Train) / 20% (Test) |

VI. PERFORMANCE METRICS

1. Precision – Precision is a metric indicating the proportion of correctly projected positive cases in respect to the total expected positive cases. High degrees of accuracy imply that less false positives will show in the evaluation of career development and workload.
2. Recall – Recall measures the exact percentage of real positive cases that were discovered. High recall rates ensure that most instances of stress related to job are exactly discovered.
3. F1-Score – The F1-score is a balanced statistic that provides a basis for evaluating the performance of a model over several class distributions. It represents the harmonic mean of accuracy and recall.
4. Accuracy – It calculates the model's overall accuracy using the percentage of accurate projections over all cases. The process culminates in this fourth and last stage.

TABLE 8: PERFORMANCE COMPARISON TABLE

| Method | Precision | Recall | F1-Score | Accuracy |
|------------------------------|-----------|--------|----------|----------|
| Existing Logistic Regression | 78.5% | 76.2% | 77.3% | 79.1% |
| Existing Random Forest | 82.3% | 81.0% | 81.6% | 83.4% |
| Proposed WDTA-NLP Model | 91.8% | 89.6% | 90.7% | 92.5% |

Table 8(a): Precision

| Epoch | Logistic Regression | Random Forest | Proposed WDTA-NLP |
|-------|---------------------|---------------|-------------------|
| 10 | 70.2% | 74.8% | 80.1% |
| 20 | 72.5% | 76.9% | 83.5% |
| 30 | 74.3% | 78.6% | 85.9% |
| 40 | 75.8% | 79.8% | 87.2% |
| 50 | 76.6% | 80.5% | 88.4% |
| 60 | 77.3% | 81.2% | 89.3% |
| 70 | 77.8% | 81.8% | 90.2% |
| 80 | 78.2% | 82.0% | 91.0% |

| | | | |
|-----|-------|-------|--------------|
| 90 | 78.4% | 82.2% | 91.5% |
| 100 | 78.5% | 82.3% | 91.8% |

Table 8(b): Recall

| Epoch | Logistic Regression | Random Forest | Proposed WDTA-NLP |
|-------|---------------------|---------------|-------------------|
| 10 | 68.0% | 72.5% | 77.4% |
| 20 | 70.1% | 74.6% | 80.2% |
| 30 | 71.9% | 76.3% | 82.7% |
| 40 | 73.2% | 77.6% | 84.5% |
| 50 | 74.3% | 78.5% | 85.9% |
| 60 | 75.2% | 79.3% | 87.1% |
| 70 | 75.7% | 80.0% | 88.1% |
| 80 | 76.0% | 80.5% | 88.9% |
| 90 | 76.1% | 80.8% | 89.3% |
| 100 | 76.2% | 81.0% | 89.6% |

Table 8(c): F1-Score

| Epoch | Logistic Regression | Random Forest | Proposed WDTA-NLP |
|-------|---------------------|---------------|-------------------|
| 10 | 69.1% | 73.6% | 78.7% |
| 20 | 71.2% | 75.8% | 81.6% |
| 30 | 72.9% | 77.4% | 83.9% |
| 40 | 74.4% | 78.7% | 85.5% |
| 50 | 75.3% | 79.6% | 86.9% |
| 60 | 76.0% | 80.3% | 87.9% |
| 70 | 76.7% | 80.9% | 88.9% |
| 80 | 77.1% | 81.2% | 89.7% |
| 90 | 77.2% | 81.4% | 90.3% |
| 100 | 77.3% | 81.6% | 90.7% |

Table 8(d): Accuracy

| Epoch | Logistic Regression | Random Forest | Proposed WDTA-NLP |
|-------|---------------------|---------------|-------------------|
| 10 | 71.4% | 75.2% | 81.3% |
| 20 | 73.8% | 77.3% | 84.1% |
| 30 | 75.5% | 79.0% | 86.3% |
| 40 | 76.8% | 80.2% | 87.8% |
| 50 | 77.7% | 81.0% | 89.0% |
| 60 | 78.3% | 81.7% | 90.0% |
| 70 | 78.7% | 82.3% | 91.0% |
| 80 | 78.9% | 83.0% | 91.7% |
| 90 | 79.0% | 83.3% | 92.2% |
| 100 | 79.1% | 83.4% | 92.5% |

The proposed WDTA-NLP model outperforms the current used techniques with an accuracy of 91.8% and simultaneous reduction of false positives. With an 89.6% recall rate, one can guarantee a rather high degree of case detection involving workload imbalance. A F1 test score of 90.7% indicates that the performance is balanced; an accuracy of 92.5% indicates more exact classification. For women working in information technology, this greatly enhances the hybrid working impact analysis.

VII. CONCLUSION

WTS, WDTA, NLP, and effective addressing of the problems women in information technology experience in hybrid work environments raise among the technologies that can be applied successfully. Including sentiment analysis, workload evaluation, and career progression modeling into its architecture, the framework lets one investigate gender-based disparities completely. With a precision of 91.8%, a recall of 89.6%, an F1-score of 90.7%, and an accuracy of 92.5%, the WDTA-NLP model consistently analyzes workload and career progression. This paper tries to underline the urgent need of hybrid work strategies driven by data to guarantee equal possibilities for women working in the information technology sector.

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