Using Big Data to Measure Quality of Work Life in Public Sector Organisations: Opportunities & Concerns

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Abstract- Public sector organisations across the world are undergoing rapid digital transformation, characterised by the adoption of biometric systems, human resource management platforms, algorithmic scheduling tools, and data analytics dashboards. These technologies generate vast quantities of employee-related data that are increasingly used to inform administrative decisions, performance evaluations, and workforce planning. In recent years, such data-driven systems have also been proposed as tools to assess and monitor the Quality of Work Life (QWL) of employees. This paper critically examines the use of big data to measure QWL in public sector organisations, with particular reference to the Indian context. Drawing on interdisciplinary literature from human resource management, sociology of work, and critical data studies, the paper analyses how digital traces such as attendance logs, workflow metrics, sentiment analysis, and surveillance data are interpreted as indicators of well-being, engagement, and job satisfaction. While big data offers opportunities for enhanced transparency, evidence-based policy formulation, and predictive identification of workplace stress, it also raises serious concerns related to surveillance, privacy, algorithmic bias, consent, and the reduction of complex human experiences to quantifiable metrics. Using a sociotechnical lens, the paper argues that data-driven approaches to QWL risk reinforcing power asymmetries and overlooking the subjective and relational dimensions of work life. The study concludes by proposing a responsible and participatory framework for integrating big data into QWL assessment that balances organisational efficiency with employee dignity, autonomy, and rights.

Keywords: Big data, Quality of Work Life, public sector organisations, algorithmic governance, HR analytics, surveillance

I. INTRODUCTION

Public sector organisations worldwide are increasingly embedded within data-intensive systems of governance and management. Digital attendance registers, biometric identification, electronic workflow platforms, artificial intelligence (AI)-driven scheduling tools, and centralised human resource management systems have become integral to the functioning of government institutions. These technologies produce continuous streams of data about employees' movements, time usage, productivity, and interactions, enabling unprecedented levels of organisational visibility and control.

This transformation reflects a broader shift towards the datafication of work, wherein everyday activities are translated into quantifiable digital traces that can be monitored, analysed, and acted upon. While datafication is often justified in terms of efficiency, transparency, and accountability, it also fundamentally reshapes how work is experienced, evaluated, and governed. Within this context, public sector organisations are increasingly exploring the use of big data not only for administrative efficiency but also for assessing less tangible aspects of employment, such as employee motivation, engagement, well-being, and Quality of Work Life (QWL).

QWL is a multidimensional concept encompassing physical working conditions, psychological well-being, job security, work–life balance, autonomy, interpersonal relationships, opportunities for growth, and perceptions of fairness and dignity at work. Traditionally, QWL has been assessed through surveys, interviews, and participatory methods that foreground employees' subjective experiences. The growing reliance on digital metrics and algorithmic analytics to infer QWL therefore raises critical questions about what aspects of work life are captured, what remains invisible, and how power is redistributed through data-driven systems.

These questions are particularly salient in public sector organisations in India, such as railways, municipal bodies, healthcare institutions, and

transport authorities, where large workforces operate within hierarchical bureaucratic structures and under intense public accountability pressures. In such settings, the use of big data to measure QWL sits at the intersection of efficiency-oriented governance and welfare-oriented public service, making it a deeply sociotechnical issue rather than a purely technical or managerial one. This paper critically examines the opportunities and concerns associated with using big data to measure QWL in public sector organisations, with the aim of contributing to debates within Big Data & Society on the limits and implications of data-driven governance.

II. LITERATURE REVIEW

2.1 Quality of Work Life in Public Sector Organisations

The concept of Quality of Work Life emerged from efforts to humanise work and improve employee well-being alongside organisational performance. Early studies focused on physical working conditions and job satisfaction, while later research expanded the concept to include autonomy, participation in decision-making, work–life balance, psychological safety, and organisational justice. In the public sector, QWL is shaped by distinctive institutional characteristics, including bureaucratic rules, standardised procedures, hierarchical authority, and limited flexibility in job design.

Public sector employees often experience constrained career mobility, formalised performance evaluation systems, and strong monitoring mechanisms. At the same time, their work frequently involves emotional labour, public accountability, and service delivery under resource constraints. As a result, QWL in public organisations is closely linked to perceptions of fairness, respect, dignity, and trust in institutions. These dimensions are inherently subjective and relational, making them difficult to capture through purely quantitative indicators.

2.2 Datafication and Algorithmic Governance

Datafication refers to the transformation of social processes into data that can be quantified and analysed. In organisational contexts, datafication enables algorithmic governance, where computational systems increasingly shape decisions related to scheduling, performance evaluation, promotion, and discipline. Proponents argue that algorithmic systems enhance objectivity and efficiency by reducing human bias and discretion. However, critical scholars highlight that algorithms are embedded within social contexts and often reproduce existing power relations and inequalities.

Algorithmic governance can introduce opacity, as decision-making processes become difficult for employees to understand or contest. Moreover, the normalisation of data-driven monitoring can shift organisational cultures towards constant surveillance, altering how employees perceive autonomy and trust at work. These concerns are central to debates within Big Data & Society, which emphasise the need to examine the social and ethical implications of data-driven systems rather than treating them as neutral tools.

2.3 Big Data in Human Resource Management

The use of big data in human resource management has expanded rapidly, encompassing attendance tracking, performance dashboards, sentiment analysis, and predictive analytics. Such systems promise evidence-based decision-making, early identification of stress or burnout, and improved workforce planning. In practice, however, HR analytics often rely on proxies for complex human states, such as equating long working hours with commitment or high task completion rates with engagement.

Critics argue that data-driven HRM risks reducing employees to data points, neglecting contextual factors such as job complexity, emotional labour, and informal contributions. There is also concern that continuous monitoring may undermine intrinsic motivation and exacerbate stress, thereby negatively affecting QWL rather than enhancing it.

2.4 Digital Workforce Management in the Indian Public Sector

In India, public sector organisations have rapidly adopted digital workforce management systems, including Aadhaar-linked biometric attendance, centralised HRMS platforms, CCTV-based monitoring, and GPS tracking for field staff. While these systems are often justified in terms of

transparency and accountability, regulatory frameworks for data protection, employee consent, and algorithmic accountability remain uneven. This creates a situation in which large-scale data collection outpaces ethical safeguards, raising concerns about privacy, misuse, and the erosion of trust between employees and institutions.

III. OBJECTIVES OF THE STUDY

The study is guided by the following objectives:

• To analyse how big data is currently used or proposed for measuring Quality of Work Life in public sector organisations. • To examine the opportunities created by data-driven approaches to QWL assessment for human resource management and organisational development. • To critically evaluate concerns related to surveillance, privacy, algorithmic bias, consent, and reductionism in the measurement of QWL. • To propose a sociotechnical framework for the responsible and ethical use of big data in assessing QWL in public sector contexts.

IV. METHODOLOGY

This paper adopts a conceptual and exploratory research design. It is based on critical qualitative analysis of interdisciplinary literature on QWL, big data, algorithmic governance, and public sector management. In addition, the study draws on document analysis of digital HR systems and workforce management practices in public sector organisations, particularly in India. A sociotechnical framework is employed to situate big data technologies within their organisational, social, and ethical contexts. This approach aligns with the editorial orientation of Big Data & Society, which prioritises theoretically informed and critical engagement with data-driven phenomena.

V. BIG DATA SYSTEMS USED TO MEASURE QUALITY OF WORK LIFE

5.1 Biometric Attendance and Time Tracking

Biometric attendance systems generate precise data on employees' arrival times, departures, and absences. These metrics are often interpreted as indicators of discipline, commitment, or engagement. However, such interpretations oversimplify the realities of work, ignoring factors such as workload intensity, commuting challenges, health conditions, and emotional labour. Over-reliance on attendance data risks conflating presence with productivity and well-being.

5.2 Digital Workflow and Productivity Dashboards

Workflow management platforms track task assignments, completion rates, and response times. While these systems provide visibility into workloads, they may also incentivise speed over quality and contribute to work intensification. When used as proxies for QWL, productivity metrics can obscure experiences of stress, burnout, and job dissatisfaction.

5.3 AI-driven Rostering and Scheduling Systems

Algorithmic scheduling tools allocate shifts, routes, or duties based on optimisation criteria. Although such systems are promoted as enhancing efficiency and work–life balance, their opaque decision-making processes can reduce employee autonomy and limit opportunities for negotiation, particularly in large public sector organisations.

5.4 Employee Feedback and Sentiment Analysis Systems

Digital grievance portals, e-surveys, and sentiment analysis tools are designed to capture employee perceptions in real time. However, concerns about anonymity and data use may discourage honest feedback, leading to partial or distorted representations of QWL.

5.5 CCTV and Geo-tracking Technologies

CCTV analytics and GPS tracking are increasingly used to monitor compliance and accountability, especially for field staff. While these technologies may enhance operational oversight, they also contribute to pervasive surveillance, with significant implications for psychological well-being and trust.

VI. OPPORTUNITIES OF USING BIG DATA IN QWL ASSESSMENT

Big data offers several potential benefits for QWL assessment when used responsibly. It can enhance

transparency by providing objective records of workload distribution and resource allocation. Data analytics can support evidence-based policy formulation by identifying patterns of absenteeism, overtime, or stress across departments. Predictive models may help identify employees or units at risk of burnout, enabling preventive interventions. Additionally, real-time data can facilitate more responsive workforce planning and quicker identification of systemic problems than traditional surveys.

VII. CONCERNS AND ETHICAL CHALLENGES

Despite these opportunities, the use of big data in QWL assessment raises significant ethical concerns. Continuous monitoring can normalise surveillance and erode privacy, leading to stress and reduced trust. Reductionism remains a central challenge, as complex dimensions of QWL such as dignity, autonomy, and interpersonal relationships cannot be fully captured through metrics. Algorithmic bias may disadvantage certain groups or job categories, while limited employee consent and agency exacerbate power asymmetries. Data security risks further compound these issues, particularly in large public sector systems.

VIII. DISCUSSION

The use of big data to measure QWL reflects a broader shift towards data-driven governance in public sector organisations. While such approaches are often framed as modern and objective, they risk conflating quantifiable behaviours with lived experiences of work. This tension underscores the need to critically examine not only how data is collected and analysed, but also how it is interpreted and used in organisational decision-making.

IX. RECOMMENDATIONS

To ensure that the use of big data meaningfully enhances Quality of Work Life (QWL) in public sector organisations, a responsible and human-centred approach is essential. Big data analytics should be adopted as a complementary tool, integrated with qualitative methods such as surveys, interviews, and participatory consultations, so that employees' subjective experiences, emotional well-being, and perceptions of fairness are not reduced to numerical proxies. Public sector organisations must establish robust ethical data governance frameworks that clearly define the purpose, scope, and limits of employee data collection, emphasising data minimisation, transparency, and accountability. Ensuring informed consent and employee agency is critical; employees should be made aware of how their data is used and be provided avenues to access, question, and contest data-driven assessments that affect their work life. Furthermore, algorithmic transparency and explainability should be prioritised, particularly where digital systems influence decisions related to scheduling, performance evaluation, or career progression, in order to strengthen perceptions of fairness and trust in management. Regular bias and impact audits are necessary to prevent algorithmic systems from reproducing structural inequalities or disproportionately disadvantaging certain groups or job categories. Importantly, organisations should shift from a control-oriented use of data towards a well-being-oriented approach, employing analytics to identify workload imbalances, stress, and burnout rather than to intensify surveillance or disciplinary control. The participatory design of digital HR systems, involving employees, staff associations, and unions, can further enhance legitimacy, trust, and organisational commitment. Strong data security and privacy safeguards are essential to protect psychological safety and prevent misuse of sensitive employee information. In parallel, organisations should invest in digital and data literacy initiatives to enable employees and managers to understand the capabilities, limitations, and ethical implications of big data systems. Finally, all data-driven QWL practices must be aligned with labour laws, constitutional values, and principles of dignity and fairness, supported by continuous review mechanisms that allow organisations to reflect on unintended consequences and adapt systems in response to changing work realities. Collectively, these measures can help ensure that big data functions as a tool for enhancing employee well-being rather than as an instrument of surveillance and control.

X. CONCLUSION

The integration of big data into QWL assessment represents a significant transformation in public sector management. While data-driven systems offer valuable insights and efficiencies, they also pose

serious risks to employee privacy, autonomy, and dignity. This paper argues that Quality of Work Life cannot be fully understood through data alone. Meaningful assessment requires a sociotechnical approach that recognises the limits of quantification and foregrounds ethical, participatory, and human-centred practices. Public sector organisations must adopt cautious and responsible strategies to ensure that big data enhances, rather than diminishes, the quality of work life.

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