A study on human resource dynamics of survey project management: from fieldwork to team coordination

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Abstract:

As survey projects grow in scale, complexity, and geographic dispersion, the dynamics of human resource management (HRM) have become increasingly critical to project success. This study examines the HR challenges, coordination models, and behavioural factors influencing team performance in survey project management—focusing on the transition from fieldwork operations to multi-team coordination. Drawing from a desk-based qualitative methodology, the research synthesizes insights from peer-reviewed literature on competence management, virtual collaboration, emotional engagement, and workforce planning under uncertainty.

The study identifies several key issues affecting survey project execution: misalignment between personnel and task requirements, communication breakdowns in virtual teams, and resistance to technological change. To address these, the paper reviews strategic frameworks such as the 4Ps model (Person, Performance, Position, Period) for aligning individual competencies with project needs, and stochastic optimization techniques for adaptive staffing and scheduling. The emotional and cognitive dimensions of team performance are also explored, emphasizing how perceptions of usefulness, motivation, and leadership affect innovation adoption and collaboration.

Through thematic analysis and comparative case references, the study finds that rigid organizational structures and deterministic planning are insufficient in dynamic survey environments. Instead, successful outcomes rely on integrated HR strategies that blend technical expertise with behavioural insight and agile coordination. The research concludes that HRM must be repositioned as a central driver of efficiency, resilience, and innovation in survey projects.

This study contributes to the growing body of knowledge in geomatics and project-based HRM by offering a conceptual foundation and practical recommendations for improving team coordination, competence deployment, and adaptive planning in field-intensive survey operations.

Introduction:

Human Resource Management (HRM) is the adoption of certain functions and activities for utilizing employees efficiently and effectively in an organization to achieve its goals which include satisfying the key stakeholders to the possible extent and contributing positively to the natural environment. It involves formulation, implementation, and on-going maintenance of

strategies, policies, procedures, rules, practices, and systems of managing employees strategically, participatorily, and sustainably (Opatha, 2021).

The increasing complexity of field-based projects in geospatial, environmental, and infrastructure sectors has magnified the importance of human resource dynamics in project execution. Among these, survey project management stands out as a multidisciplinary task that demands not only technical accuracy but also nuanced human coordination. From planning topographic missions in remote areas to mobilizing GIS experts and enumerators, the quality of outcomes hinges significantly on the human capabilities engaged at each stage. In such settings, effective Human Resource Management (HRM) becomes a pivotal driver of success impacting recruitment, team integration, field safety, knowledge transfer, and inter-team communication (Lindkvist et al., 1998).

Modern survey projects often adopt project-based organizational forms that rely on cross-functional and distributed teams. These teams must be rapidly mobilized, frequently restructured, and managed under uncertainty. The rise of virtual collaboration tools has made it easier to coordinate such dispersed efforts, but also introduced new difficulties. Communication gaps, cultural misalignments, time-zone constraints, and ambiguity in responsibilities are frequent issues faced by survey project teams working in remote environments or across organizational boundaries (Rehman, Ali, & Abbas, 2021). While virtual teams offer benefits such as 24/7 workflow and cost reduction, their failure rates can be high - often due to inadequate leadership, unclear coordination mechanisms, and insufficient emotional support for team members.

Alongside structural issues, competence alignment plays a vital role in survey project efficiency. Survey operations involve a wide range of specialists—such as UAV operators, GIS analysts, hydrologists, and field assistants—each with different skills and work rhythms. Projects often struggle to match available talent with required roles, leading to competence gaps. Addressing this challenge requires systems that assess performance capabilities, predict skill needs, and align staff based on task-critical qualifications. Advanced Competence Management Systems (CMS) can support these processes through automated profiling, 360-degree assessments, and strategic workforce forecasting (Bohlouli et al., 2017).

Moreover, the effectiveness of implementing new methods or technologies—such as remote sensing platforms or AI-based mapping—depends not just on skills, but on behavioural acceptance and emotional readiness of staff. As Choi et al. (2011) argue, innovation success is not merely about rational evaluations like "usefulness" or "ease of use," but also about the emotional reactions of field operators and team members toward change. Field teams may resist unfamiliar tools due to anxiety, cognitive overload, or lack of autonomy, thereby affecting implementation quality. Thus, HRM must integrate emotional intelligence training, change management protocols, and feedback mechanisms to maintain team morale and adaptability.

Another pressing issue is uncertainty in workforce availability and work volume, especially in projects affected by terrain access, political constraints, weather conditions, or community cooperation. Traditional project scheduling models assume predictable work rates and static staffing needs, which is rarely the case in field-heavy survey projects. Stochastic optimization models which simulate different staffing and scheduling scenarios under varying constraints—are now emerging as powerful tools. They enable better resource allocation, cost estimation, and contingency planning (Felberbauer et al., 2019).

The literature also points to the need for organizational flexibility and concurrent engineering, especially when managing large, interdependent survey missions. Projects like Ericsson's Japan case demonstrate that success often depends on interactive problem solving, iterative planning, and continuous knowledge exchange. Such environments demand adaptable HR strategies that allow for cross-learning, milestone-based monitoring, and shared mental models among team members (Lindkvist et al., 1998).

Recent studies also highlight gaps in the use of Human Resource Information Systems (HRIS) and digital decision-support tools in managing such teams. There is growing advocacy for AI-based staffing solutions, knowledge graph-based skill retrieval, and real-time performance dashboards tailored for HR planning in dynamic projects. Such technologies are particularly promising in projects involving frequent re-deployment, temporary contracts, and large-scale multi-agency collaboration.

Objective:

The primary objective of this study is to examine the human resource dynamics influencing team coordination and performance in survey project management.

The secondary objectives of this project are as follows:

i.   To identify key HR challenges related to skill alignment, communication, and role clarity in field and remote teams.
ii. To evaluate the use of competence management and scheduling strategies in optimizing workforce deployment.
iii. To assess the impact of emotional and cognitive factors on innovation adoption and team collaboration.

Methodology:

This study utilizes a qualitative desk-based research approach to explore the human resource dynamics in survey project management, focusing particularly on the intersection of field operations and team coordination. The methodology is informed by a synthesis of peer-reviewed literature and expert research in the fields of HR management, project staffing, competence modelling, and team performance.

Key literature was systematically reviewed to identify dominant themes in human resource and team dynamics, including communication barriers, competence gaps, emotional and cognitive performance, and distributed coordination. The concept of virtual teams and their management was explored in-depth, recognizing that while such structures enable flexibility and cost efficiency, they also risk failure due to poor coordination and leadership, with failure rates estimated as high as 70% (Rehman, Ali, & Abbas, 2021). This has direct implications for distributed survey teams operating under varying logistical constraints.

To ground the study in real-world relevance, comparative insights were drawn from complex project environments. Lindkvist et al. (1998) examined Ericsson's cellular development project, showcasing how knowledge integration and cross-functional coordination are critical

under conditions of complexity and deadline pressure—challenges mirrored in geospatial survey execution. Similarly, Felberbauer et al. (2019) employed hybrid stochastic optimization to tackle uncertainties in scheduling and staffing, offering a methodological analogue for managing unpredictable field conditions in survey work

The research adopts the 4Ps framework—Person, Performance, Position, Period—as proposed in competence management literature, enabling structured evaluation of staff-job alignment(Bohlouli et al., 2017) .This model supports mapping of surveyors' qualifications to role-specific demands and optimizing staff allocation. Furthermore, the application of stochastic models in HR planning underscores the value of predictive labour deployment strategies under uncertain workloads, an insight crucial to managing temporal and geographic variability in survey projects (Felberbauer et al., 2019).

Understanding the behavioural dynamics of remote team collaboration was guided by research emphasizing both cognitive and emotional responses to innovation and work environments (Choi et al., 2011). These findings are particularly relevant when introducing new technologies for field data collection or coordinating cross-site teams, where both acceptance and emotional engagement affect implementation success.

Discussion

With the increasing shift toward geographically dispersed and hybrid teams in modern project environments, survey operations now frequently rely on virtual collaboration. While this approach improves flexibility and access to skilled personnel, it also introduces challenges in communication flow, leadership clarity, and accountability. As Rehman, Ali, & Abbas, (2021) observe, up to 70% of virtual teams may fail due to inadequate project management and poor coordination strategies. These failure points are often driven by HR limitations in establishing clear communication protocols and performance tracking mechanisms in virtual settings.
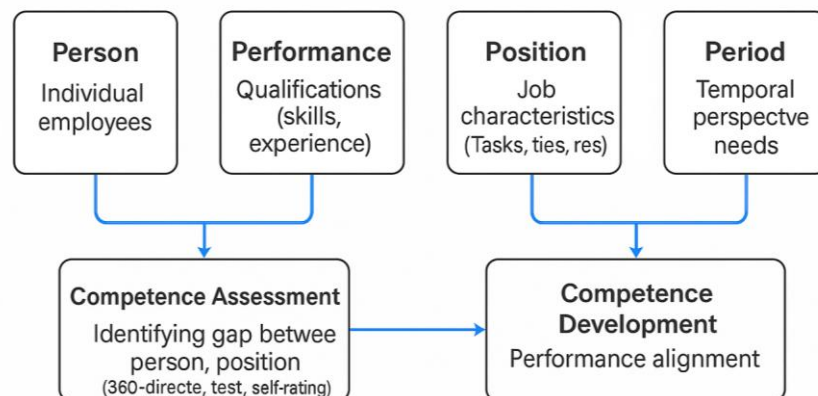
Virtual Team Failure Model
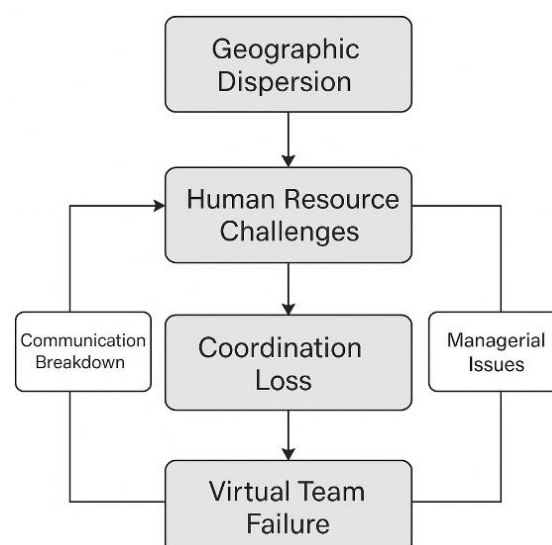
This flowchart illustrates how geographic dispersion, when coupled with insufficient HR support and managerial clarity, leads to coordination breakdown and ultimately project failure.

Effective field execution in survey projects depends heavily on aligning personnel with precise task requirements. Bohlouli et al. (2017) propose the 4Ps model—Person, Performance, Position, Period—as a structured method to assess and allocate human capital. This model facilitates systematic evaluation of individual competencies against job demands, using tools like 360-degree feedback and self-assessment to identify competence gaps and recommend targeted development strategies.

Competence Management and Person-Job Fit (4Ps Model)

Person	Performance	Position	Period
Individual employees	Qualifications (skills, experience)	Job characteristics (Tasks, ties, res)	Temporal perspectve needs

Competence Assessment
Identifying gap betwee person, position
(360-directe, test, self-rating)

Competence Development
Performance alignment

This diagram presents the 4Ps framework in an HR planning context, emphasizing performance alignment across survey team roles.

Survey projects are subject to a range of unpredictable factors—terrain difficulty, climatic disruption, or equipment delays—that affect staff availability and task completion timelines. To address this, (Felberbauer et al., 2019) advocate for stochastic optimization models that simulate workforce demand scenarios and suggest optimal staffing solutions. Their research shows that these models outperform deterministic scheduling in volatile conditions by accounting for skill variability and resource flexibility, making them particularly suitable for fieldwork-heavy survey operations.

Deterministic Approach

Deterministic model

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Fixed resource plan

Stochastic Approach

Stochastic model

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Flexible resource plan
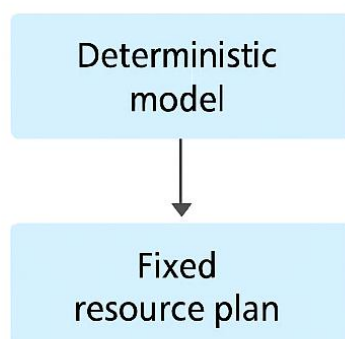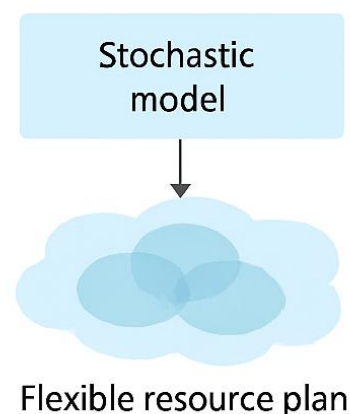
The diagram compares deterministic and stochastic approaches, highlighting the adaptability of probabilistic models in survey resource planning.

Field teams increasingly interact with emerging tools—GPS loggers, mobile GIS, real-time dashboards yet their adoption is often hindered by resistance or anxiety Choi et al. (2011) argue that innovation implementation is not just a rational process; it is also shaped by emotional responses. Drawing on Affective Events Theory and Appraisal Theory, their model links organizational climate to cognitive appraisals and emotional reactions, both of which influence team readiness to embrace change.

Survey projects, especially large-scale or cross-disciplinary ones, require seamless collaboration between diverse teams—ranging from GIS analysts to equipment operators. Lindkvist et al. (1998) emphasize that in such environments, successful coordination depends on continuous interaction between knowledge systems. Their "fountain" model of project logic suggests that concurrent tasking, rather than sequential execution, enables more responsive and integrated project outcomes.

Conclusion:
This study examined the human resource dynamics shaping coordination and performance in survey project management, with a focus on the challenges and strategies required in both field-based and virtual team environments. The findings emphasize that effective management of survey teams hinges not only on technical expertise but also on the strategic alignment of skills, clear communication structures, and contextual adaptability.
Key human resource challenges identified include misalignment between competencies and assigned roles, gaps in communication across distributed teams, and ambiguity in task responsibilities. Addressing these challenges requires deliberate planning around role clarity, recruitment strategies, and leadership support mechanisms tailored to the unique demands of survey operations.
The research also underscores the value of structured competence management systems, such as the 4Ps framework, in enhancing staff-role alignment. By integrating predictive models like stochastic scheduling, organizations can better manage uncertainties inherent in fieldwork, including fluctuating workloads and variable access conditions. These tools contribute to more resilient and responsive workforce planning.
In parallel, the study highlights the importance of emotional and cognitive factors in shaping team behaviour and innovation adoption. Successful implementation of new tools or workflows depends not only on technical training but also on the emotional readiness and engagement of team members. Incorporating behavioural insight into HRM practices—through feedback loops, change management protocols, and motivational support—can significantly enhance team cohesion and adaptability.
Overall, the research concludes that human resource management in survey projects must evolve into a proactive, strategic function—one that integrates skill planning, emotional intelligence, and adaptive coordination to ensure sustained performance across complex, multidisciplinary, and often uncertain operational contexts.

References

Bohlouli, M., Mittas, N., Kakarontzas, G., Theodosiou, T., Angelis, L., & Fathi, M. (2017). Competence assessment as an expert system for human resource management: A mathematical approach. *Expert Systems with Applications*, *70*. https://doi.org/10.1016/j.eswa.2016.10.046

Choi, J. N., Sung, S. Y., Lee, K., & Cho, D. S. (2011). Balancing cognition and emotion: Innovation implementation as a function of cognitive appraisal and emotional reactions toward innovation. *Journal of Organizational Behavior*, *32*(1). https://doi.org/10.1002/job.684

Felberbauer, T., Gutjahr, W. J., & Doerner, K. F. (2019). Stochastic project management: multiple projects with multi-skilled human resources. *Journal of Scheduling*, *22*(3). https://doi.org/10.1007/s10951-018-0592-y

Lindkvist, L., Soderlund, J., & Tell, F. (1998). Managing Product Development Projects: On the Significance of Fountains and Deadlines. *Organization Studies*, *19*(6). https://doi.org/10.1177/017084069801900602

Opatha, H. (2021). A Simplified Study of Definitions of Human Resource Management. *Sri Lankan Journal of Human Resource Management, 11*.

Rehman, A. U., Ali, T. M., & Abbas, M. (2021). Role of Project Management in Virtual Teams' Success. *iKSP Journal of Computer Science and Engineering*, 12.