

INNOVATIVE TECHNOLOGIES FOR OPTIMIZING HUMAN FACTOR MANAGEMENT AT DEUTSCHE BAHN AG

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Abstract: The Deutsche Bahn AG faces the challenge of efficiently managing its human resources in a rapidly evolving mobility sector. Innovative technologies offer new opportunities to handle the complexity of Human Factor Management and enhance the company's performance¹. Human Factor Management plays a crucial role in the successful execution of infrastructure projects at Deutsche Bahn AG. Technological innovations improve the efficiency and safety of these projects by optimizing work processes and enhancing employee collaboration. This article presents various technologies and their applications in detail for optimizing Human Factor Management at Deutsche Bahn AG².

Keywords: Human Factor, innovative technologies, management, Deutsche Bahn.

Introduction

Innovative technologies play a central role in improving human resource management³ and enhancing company performance. This study analyzes various technologies and their applications for optimizing Human Factor Management at Deutsche Bahn AG. The analysis draws on qualitative and quantitative research methods, including internal documents, case studies, expert interviews, and data analysis.

The Human Factor is of central importance in human resource management, as employees represent the most valuable asset of a company⁴. Management must focus on maximizing the potential of employees, nurturing their skills, and creating a productive work environment. Challenges include balancing automation and human work, the need for continuous training, and ensuring employee satisfaction and motivation.

Innovative technologies encompass a variety of tools and platforms aimed at optimizing processes and increasing efficiency⁵. These have been neglected in the realm of the Human Factor and have not been considered in infrastructure projects. Effective management in HR requires a strategic focus on integrating and utilizing these technologies and adopting agile methods that enable flexibility and rapid adaptation to changes.

The results demonstrate that the utilization of innovative technologies such as Big Data, artificial intelligence, digital platforms, wearables, virtual training programs, and blockchain has significantly enhanced the efficiency, safety, and quality of infrastructure projects at Deutsche Bahn AG. A strategic focus on

digital solutions and agile methods is crucial for successfully tackling future challenges and strengthening the company's competitiveness.

Despite the positive results and potentials of the examined technologies, there are some limitations in the research. The state of research on the Human Factor and its interactions with technological systems is not yet fully developed. There are limited studies that comprehensively address the psychological and social impacts of introducing new technologies on employees. The rapid evolution of new technologies complicates the prediction and comprehensive analysis of long-term impacts. Additionally, results can vary significantly depending on how technologies are implemented in the specific context of a company. Lastly, the use of technologies such as Big Data and wearables raises issues regarding data privacy and the ethical utilization of employee data, which are often inadequately addressed in research.

The research indicates that innovative technologies have the potential to significantly improve human resource management and company performance. However, it is crucial to carefully consider the human aspects and ethical implications to achieve sustainable and positive outcomes.

Research methodology

This analysis employs a mixed-methods design combining qualitative and quantitative approaches. The following methods were utilized, briefly explained and contextualized.

Qualitative Methods

– Interviews: This study involved interviewing various employees holding different roles, including 20 – 30 individuals from various departments such as infrastructure, technical equipment, construction, commercial sectors, contract departments, and management. Interviewees ranged from technicians, project engineers, administrative staff, and team leaders to senior executives, directors, and chairpersons. Semi-structured interviews were conducted with experts and executives of Deutsche Bahn AG⁶. Each interview lasted approximately one hour, focusing on challenges and successes in implementing new technologies in Human Factor Management. This paragraph is intended for scholarly publication.

– Case Studies: Various infrastructure projects within Deutsche Bahn AG are examined, including railway stations, platforms, railway equipment projects, track renewals, new railway lines, as well as the construction of signal boxes and control locations. These case studies analyze specific implementations of innovative technologies regarding their processes, outcomes, and challenges.

Quantitative Methods

– Data Analysis: Internal documents and databases of Deutsche Bahn AG were statistically analyzed. Methods such as regression analysis and analysis of variance were employed to measure the effects of technological innovations on personnel management (see Fig. 1).

– Surveys: A comprehensive survey was conducted among all employees of Deutsche Bahn AG, regardless of their department. Participation in the survey was anonymous and voluntary. The survey included questions on usability, efficiency, and safety of the new technologies.

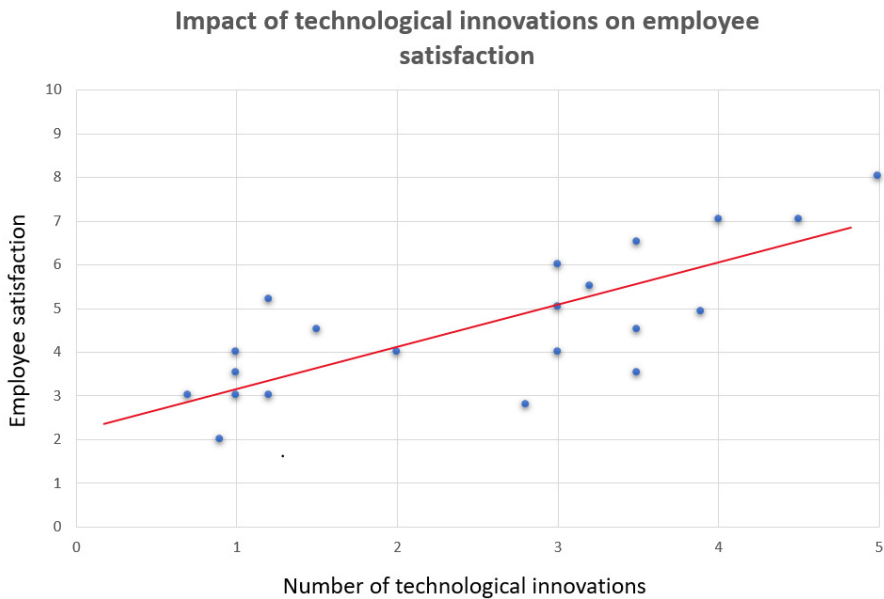


Fig. 1. Diagram: the relationship between the number of technological innovations and employee satisfaction

The blue dots represent the hypothetical data points, and the red line is the regression line depicting the overall trend: Increased technological innovations appear to be associated with higher employee satisfaction.

Results

The following section will present in detail the results obtained with the methods described above.

Digitalization of personnel management:

Deutsche Bahn AG has initiated a comprehensive modernization of its personnel management by digitizing a large portion of its HR processes and transitioning to the Oracle Fusion Cloud Human Capital Management (HCM) platform⁸. This cloud-based software allows employees to manage their HR matters more easily and remotely.

Utilization of Big Data and Data Analytics:

Big Data and Data Analytics enable Deutsche Bahn AG to collect, analyze, and utilize large volumes of employee data. By analyzing work hours, break patterns, and other relevant data, trends in employee behavior can be identified⁹. These insights can be used to proactively detect staffing shortages, optimize workforce planning, and enhance employee satisfaction. This has facilitated strategic workforce planning with an 18-month rolling forecast. Another tool is the Career Network for succession planning, aimed at optimizing and streamlining the succession process.

Digital platforms and tools:

The implementation of digital platforms and tools facilitates communication and collaboration among employees at Deutsche Bahn AG¹⁰. Furthermore, they enable quick and easy access to relevant information, enhancing the efficiency of work processes. However, there are challenges in utilizing these platforms, especially when they are not seamlessly integrated. For instance, within the corporation and in Project Control and Monitoring (PSU), Jira, Confluence, and Microsoft Teams are used as communication tools¹¹, but they are not fully integrated for unified use.

Jira is primarily used for project management and task tracking. It allows teams to monitor project progress, assign tasks, and document issues. However, integration with other tools like Microsoft Teams is often limited, which can lead to information silos. For example, employees frequently need to switch between Jira and Teams to update project statuses and coordinate meetings, potentially reducing efficiency.

Confluence serves as a wiki and documentation platform used for creating and sharing project documentation, knowledge bases, and internal manuals. However, the lack of seamless integration with Jira and Microsoft Teams can lead to fragmentation. For instance, while meeting notes and project documentation can be generated in Confluence, linking this information to tasks and discussions in Jira and Teams often requires manual steps, potentially resulting in information loss and duplicated effort.

Microsoft Teams serves as the primary communication tool for chats, meetings, and collaboration. Despite offering a variety of features, its integration with Jira and Confluence is not always seamless. For example, discussions held and files shared in Teams cannot automatically link to tasks in Jira or be embedded in Confluence documentation, complicating the traceability of decisions and information.

This fragmentation across platforms often requires employees to switch between different tools to complete their work, thereby affecting efficiency and information consistency. One potential solution could involve implementing middleware or integration solutions to enhance communication between these platforms, or opting for a unified platform that integrates most needed functionalities.

Wearables and IoT Devices:

The use of wearables and IoT devices enables Deutsche Bahn AG to monitor and enhance the health, safety, and performance of its employees [1]. Continuous collection of health data allows early detection of potential risks and implementation of preventive measures. While Deutsche Bahn AG has taken initial steps in this direction, there are companies that are more advanced in this area.

Examples at Deutschen Bahn:

1. Pilot projects for monitoring occupational safety:

In several pilot projects, wearables have been used to monitor employees' physical strain. These devices measure parameters such as heart rate, temperature, and physical activity to ensure that employees are working within safe limits and are promptly alerted to any health risks.

2. Sensor technology in trains and stations:

IoT devices have been installed in trains and stations to monitor the environment and collect data on air quality, temperature, and noise levels. This data aids in optimizing the working environment for personnel and enhancing safety.

Diese Beispiele zeigen, dass der Einsatz von Wearables und IoT-Geräten erhebliches Potenzial bietet, die Gesundheit und Sicherheit der Mitarbeiter zu verbessern und Arbeitsprozesse effizienter zu gestalten. Während die Deutsche Bahn AG bereits erste Schritte in diese Richtung unternimmt, gibt es Unternehmen, die hier bereits weiter fortgeschritten sind und als Vorbilder dienen können.

Virtual training programs and simulations:

These examples illustrate that the use of wearables and IoT devices holds significant potential to enhance employee health and safety, as well as streamline work processes. While Deutsche Bahn AG has taken initial steps in this direction, there are companies that are more advanced and can serve as role models.

The Human Factor in infrastructure projects

In construction and infrastructure projects, the Human Factor is often considered in various aspects [2]. However, there are specific areas where this factor tends to receive less attention:

In very large projects such as airports, bridges, and highways, the focus is often on technical, financial, and temporal aspects, while social and human factors are less emphasized. Sometimes, the needs of residents and users are overlooked. With increasing automation and advanced technology in planning and construction, the Human Factor may be less prioritized [3]. The efficiency and precision of technology are given higher priority than human experience and intuition. In projects under high cost pressures or strict deadlines, safety aspects and ergonomic considerations may be deferred in favor of cost savings or timely completion. In areas where construction is highly standardized and regulated by strict norms, consideration of individual human needs may be inadequate [4]. These standards often aim to maximize efficiency and uniformity, limiting flexibility for human aspects. While these aspects are crucial, the focus on environmental and safety regulations can lead to less attention given to other human needs such as comfort and accessibility.

Conclusions/discussion

The implementation of innovative technologies in Human Factor Management has significantly contributed to the efficiency and adaptability of Deutsche Bahn AG. A strategic focus on digital solutions and agile methods is crucial for successfully addressing future challenges. However, critical examination of the Human Factor and optimization of deployed technologies remain paramount. There is a challenging necessity to comprehensively explore the role of Human Factor Management in corporate strategy and the implementation of new technologies to achieve holistic and sustainable optimization of corporate performance [5]. In particular, the limited research dynamics in this field present a significant challenge, as they constrain the development of effective strategies for integrating human factors into technological innovations.

Notes

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About the Author

Zrinka Lorch holds a degree in Civil Engineering from Josip Juraj Strossmayer University in Osijek. She has experience in construction management in both building and infrastructure sectors, as well as in the application of Building Information Modelling (BIM) methods and processes. As a Senior Project Manager at Deutsche Bahn AG, she is responsible for various processes in the management of infrastructure projects.

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