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# A Phenomenological Exploration of Agile Human Resource Architecture Through the Lens of Soft Capabilities for Digital Transformation: A Qualitative Study in the Rail Transportation Industry

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## ABSTRACT

The present study aims to design and explain a comprehensive model of agile human resources based on soft capabilities for digital transformation in the Islamic Republic of Iran Railways. Moving beyond technically reductionist approaches, the study seeks to propose an integrated framework for aligning digital technologies with human cognitive and behavioral competencies. In terms of its objective, this study is developmental and exploratory, while its methodological orientation is qualitative. The research strategy was based on thematic analysis using the systematic approach developed by Attride-Stirling (2001). The study population comprised academic experts and senior human resource managers with lived experience in rail transportation and digital transformation. Participants were recruited through purposive and snowball sampling, and theoretical saturation was achieved after interviews with 14 experts. Data were collected through in-depth, semi-structured interviews. The credibility and trustworthiness of the findings were established through triangulation, member checking, and the calculation of inter-coder reliability, which yielded an agreement coefficient of 91%. An in-depth analysis of the literature and qualitative data indicates that the transition toward agile human resources requires transformation across three fundamental layers: the cognitive layer, encompassing neuro-organizational flexibility and anticipatory learning; the structural layer, comprising fluid organizational architecture and agile talent ecosystems; and the behavioral layer, including digital agile leadership and digital emotional intelligence. The findings demonstrate that soft capabilities provide the biological and organizational infrastructure required to transform digital technologies into a sustainable competitive advantage. Furthermore, drawing on dynamic human capital theory and complex adaptive systems theory, the proposed model explains the mechanisms through which organizations can transition from traditional hierarchical structures to intelligent, self-regulating networks. The originality of this study lies in its unprecedented integration of organizational neuroscience, complexity theory, and human resource management within a unified framework. In contrast to existing models that adopt an instrumental perspective toward digital transformation, this study introduces the concept of digital–human resilience as the central core of agility. The findings provide strategic guidance for project-based and infrastructure-intensive organizations, enabling them to manage digital transformation not merely as a technological imperative but as an opportunity to reinvent and regenerate human capital.

**Keywords:** agile human resources, soft capabilities for digital transformation, thematic analysis, rail industry, complex adaptive systems.

## Introduction

The acceleration of digitalization has fundamentally altered the way organizations compete, coordinate work, deploy human capital, and respond to environmental turbulence. Contemporary organizations increasingly operate in contexts characterized by technological discontinuity, rapid shifts in stakeholder expectations, data-intensive decision-making, workforce diversification, and persistent uncertainty. Under these conditions, traditional human resource management systems, which are often based on stable job descriptions, centralized authority, rigid hierarchies, and long planning cycles, are progressively losing their effectiveness. Organizational survival increasingly depends on the capacity to sense change, rapidly reconfigure resources, mobilize employees across functional boundaries, and translate emerging technologies into operational and strategic value [1-3]. Accordingly, agility has become a central concern in both management theory and organizational practice, particularly in infrastructure-intensive and public-sector organizations where structural inertia, bureaucratic procedures, and legacy systems may substantially constrain adaptation.

Organizational agility is commonly understood as the capacity to recognize environmental changes and respond to them rapidly, intelligently, and effectively. However, agility is not merely a structural attribute or a set of operational techniques. It is a multidimensional capability that emerges from the interaction of leadership, workforce competencies, organizational culture, knowledge flows, technological infrastructure, and adaptive work processes. The agile way of working depends on clearly defined but revisable goals, iterative learning, rapid feedback, and the ability of teams to adjust their behavior as conditions change. Evidence suggests that agile work arrangements can enhance team adaptive performance when goal-setting processes support responsiveness, shared understanding, and continuous adjustment rather than rigid compliance with predefined plans [4]. Therefore, agility should be conceptualized as a dynamic organizational capability that is sustained through coordinated human and technological mechanisms rather than as a temporary response to disruption.

Within this broader framework, human resource agility has emerged as a critical foundation of organizational agility. Human resource agility refers to the capacity of employees, teams, and human resource systems to anticipate change, learn rapidly, move across roles and projects, and sustain effective performance under uncertain conditions. Previous research has identified multiple drivers of human resource agility, including flexible competencies, decentralized decision-making, employee empowerment, learning orientation, effective communication, and adaptive leadership [5]. These drivers indicate that agile human resources are not created solely through structural redesign. Instead, they require an integrated architecture in which employee capabilities, work systems, leadership practices, and organizational processes are deliberately aligned with the need for rapid and intelligent adaptation.

The strategic importance of human resource agility is particularly evident in public organizations. Public-sector institutions are expected to respond to complex social and economic demands while operating under legal, political, and administrative constraints. In these organizations, digital human resource management can provide mechanisms for accelerating information flows, improving workforce planning, integrating human resource processes, and supporting faster decision-making. Research conducted in Iran's state-owned banking network has shown that digital human resource management can contribute to organizational agility in the public sector by connecting digital systems with more flexible and responsive human resource practices [6]. Nevertheless, digitalization does not automatically generate agility. The introduction of digital platforms into bureaucratic systems may reproduce existing inefficiencies if employees lack the competencies, autonomy, trust, and psychological readiness required to use them effectively.

The relationship between human resource strategy and organizational agility is also mediated by the manner in which work is organized. Agile human resource strategies require job systems that facilitate role flexibility, collaboration, rapid redeployment, and employee participation. When jobs remain narrowly defined and authority is concentrated at higher organizational levels, human resource agility is difficult to achieve. Empirical evidence indicates that job organization can play a mediating role in the relationship between agility strategy and human resource strategy, demonstrating that strategic intent must be translated into practical arrangements for work design, coordination, and responsibility allocation [7]. This finding highlights the architectural nature of agility: agile outcomes arise when the design of jobs, teams, talent systems, and decision processes supports rapid recombination of human resources.

Talent management constitutes another essential component of agile human resource architecture. Conventional talent systems often treat employees as holders of fixed positions and define career development through predictable vertical advancement. By contrast, an agile talent ecosystem emphasizes skill visibility, internal mobility, project-based deployment, cross-functional collaboration, and continuous capability development. A talent management framework based on human resource agility enables organizations to identify emerging skill requirements, rapidly assign individuals to priority tasks, and use workforce capabilities beyond the boundaries of formal job titles [8]. Such an approach is especially relevant in complex organizations, where valuable expertise may remain underutilized because it is confined within departmental silos.

Despite the growing emphasis on agile structures and digital systems, an important conceptual gap remains between digital transformation and organizational agility. Digital transformation is frequently presented as a technological process involving automation, artificial intelligence, integrated platforms, advanced analytics, cloud infrastructure, and data connectivity. However, the success of digital transformation depends not only on technological adoption but also on the organization's capacity to change routines, reinterpret roles, modify mental models, and develop new forms of collaboration. A systematic review of digital transformation has shown that technological change must be integrated with organizational strategy, capabilities, structures, and managerial processes to produce meaningful transformation [9]. This integrative perspective challenges technologically deterministic models and demonstrates that digital transformation is fundamentally organizational and human in nature.

Technology adoption is itself shaped by environmental, managerial, and behavioral factors. Organizations may possess access to advanced technologies but fail to realize their potential because of resistance, capability deficits, weak leadership, fragmented processes, or inadequate alignment with operational needs. Effective technology adoption therefore requires attention to organizational readiness, user acceptance, strategic alignment, continuous support, and the management of implementation challenges [3]. These conditions are particularly important in large public and infrastructure organizations, where legacy systems, centralized structures, occupational diversity, and high operational risk make technological change more difficult. Consequently, the transition from technology acquisition to digital value creation depends on a range of nontechnical capabilities that enable employees and managers to adapt, collaborate, learn, and act under changing conditions.

These nontechnical capabilities may be described as the soft capabilities of digital transformation. Soft capabilities include cognitive flexibility, systems thinking, emotional intelligence, psychological resilience, trust, communication, collaborative problem-solving, learning agility, tolerance of ambiguity, and adaptive leadership. Although such capabilities are often treated as supplementary to technological competence, they may constitute the essential mechanism through which digital

tools become embedded in organizational practice. Digital transformation changes not only the instruments used by employees but also the speed, intensity, and social structure of work. Employees are increasingly expected to interact with algorithms, interpret complex data, participate in virtual teams, learn new platforms, and make decisions under conditions of information overload. Without the necessary soft capabilities, digital systems may increase stress, resistance, fragmentation, and disengagement rather than agility.

Cognitive adaptability is particularly important in this context. Digital environments require employees to revise assumptions, abandon obsolete routines, and continuously reconstruct their understanding of work. Organizational members must be able to learn new knowledge while unlearning practices that were effective under previous technological and institutional conditions. This process resembles organizational neuroplasticity, in which individuals and systems develop the capacity to reorganize cognitive patterns in response to new stimuli. Research on digital transformation emphasizes that organizations must develop flexible internal capabilities and learning mechanisms to respond to the disruptive effects of technology [9]. Therefore, cognitive flexibility is not simply an individual trait; it is an organizational capability that can be supported through leadership, learning systems, psychological safety, and work design.

Data-driven decision-making represents another critical component of digitally enabled agility. Human resource analytics can improve the speed and quality of decisions concerning workforce planning, talent allocation, performance, retention, and capability development. The use of data analytics in human resource management enables organizations to move from reactive decision-making toward predictive and evidence-based action [10]. However, the value of analytics depends on whether managers and employees can interpret data critically, integrate quantitative evidence with contextual judgment, and act on insights without becoming excessively dependent on automated outputs. Data literacy, analytical judgment, ethical awareness, and human–machine collaboration are therefore essential soft capabilities within agile human resource systems.

The concept of human–machine symbiosis further illustrates the need to integrate technological and human capabilities. Artificial intelligence and automation can increase processing capacity, improve forecasting, reduce repetitive work, and support rapid decisions. Nevertheless, human judgment remains indispensable in situations requiring empathy, contextual interpretation, ethical reasoning, creativity, and the management of ambiguity. The optimal model is not the replacement of employees by technology but the augmentation of human capabilities through intelligent systems. The quality of organizational outcomes depends on the proficiency of human resources and their ability to combine technical systems with managerial and policy competencies [11]. Accordingly, agile human resource architecture should allocate analytical and repetitive tasks to machines while strengthening employees' capacity for strategic, relational, and innovative work.

Team-based work also plays a central role in agile organizations. Agility increasingly depends on temporary, cross-functional, and self-managing teams that can mobilize resources quickly around emerging problems. Sustained team effectiveness requires the availability and continuous mobilization of cognitive, emotional, social, and structural resources. A systematic review of agile team effectiveness emphasizes that team performance is sustained when members can access, coordinate, and replenish resources over time [12]. This perspective suggests that agile human resource management must extend beyond individual competence and focus on team-level processes such as shared leadership, psychological safety, mutual support, knowledge exchange, and adaptive coordination.

The social and emotional dimensions of agility are particularly significant in digitally mediated work environments. Virtual and hybrid work reduce the visibility of emotional cues and make trust more difficult to establish. Leaders must be able to recognize stress, fatigue, disengagement, and conflict through digital communication channels, while employees need the interpersonal capacity to collaborate effectively without continuous face-to-face interaction. Green and socially responsible human resource practices have also demonstrated that employee attitudes and discretionary behaviors are important mechanisms linking human resource systems to organizational sustainability [13]. This evidence reinforces the view that organizational transformation depends not only on formal systems but also on trust, citizenship behavior, shared values, and the quality of employee relationships.

Psychological resilience is another indispensable capability in turbulent digital environments. Continuous technological change can create technostress, job insecurity, role ambiguity, and concerns about skills obsolescence. Agile employees must be able to maintain performance, recover from setbacks, and adapt positively to unfamiliar conditions. At the organizational level, resilience is supported by access to resources, supportive leadership, learning opportunities, and a culture that treats error as a source of improvement rather than punishment. Research on organizational agility and sustainability indicates that adaptive capacity enhances the ability of organizations to convert intellectual and social resources into long-term value [1]. Thus, resilience should be regarded as both an individual psychological capability and an organizationally produced condition.

Leadership is the mechanism through which cognitive, structural, emotional, and technological resources are aligned. Digital agile leadership differs from traditional command-and-control leadership because it emphasizes facilitation, empowerment, experimentation, and distributed decision-making. Leaders must articulate a coherent digital vision while allowing teams sufficient autonomy to respond to operational realities. They must also create psychological safety, encourage intelligent risk-taking, and support the rapid circulation of information. Data-driven culture transformation requires leaders to use evidence not merely for control but for collective learning and adaptive improvement [14]. Therefore, digital agile leadership involves a combination of strategic intelligence, technological understanding, emotional competence, and the ability to mobilize resources across organizational boundaries.

The development of agile service systems also requires the integration of multiple managerial approaches rather than isolated interventions. Contemporary service organizations increasingly seek to combine sustainability, lean management, quality improvement, and agility within integrated systems. The adoption of such systems depends on organizational readiness, leadership commitment, employee involvement, process integration, technological support, and a culture of continuous improvement [2]. These drivers are directly relevant to the rail transportation industry, where safety, efficiency, sustainability, service quality, and operational responsiveness must be pursued simultaneously.

Human resource agility is also shaped by institutional and sector-specific conditions. Models developed in private technology firms may not transfer directly to state-owned, heavily regulated, and infrastructure-dependent organizations. Research in the Iranian Tax Affairs Organization has shown that human resource agility in public institutions must be designed in accordance with governmental agility policies and the specific administrative environment [15]. This context-sensitive perspective is critical because public organizations must balance agility with accountability, legal compliance, operational continuity, and public value. The architecture of agile human resources in the railway sector must therefore reflect the technical complexity, safety requirements, geographic dispersion, occupational diversity, and public-service obligations of the industry.

The rail transportation industry provides a particularly important context for examining the intersection of digital transformation, agility, and soft capabilities. Rail organizations operate as complex adaptive systems composed of interdependent technological, human, logistical, and regulatory subsystems. A change in one component, such as signaling technology, scheduling software, maintenance analytics, or workforce allocation, may produce nonlinear effects across safety, employee workload, service reliability, and customer experience. The sector also involves geographically dispersed workforces, specialized occupations, high levels of operational interdependence, and a strong legacy of hierarchical coordination. These characteristics make fluid communication, systems thinking, distributed leadership, predictive learning, and data-driven decision-making especially important.

Although prior studies have examined human resource agility, digital human resource management, technology adoption, talent management, agile teamwork, and data analytics, these streams of research remain fragmented. Existing models often address either technological infrastructure or organizational capabilities without sufficiently explaining how cognitive, emotional, social, structural, and leadership capabilities interact within a unified human resource architecture. Moreover, the concept of soft capabilities is frequently discussed in general terms and is rarely positioned as the central mechanism linking digital transformation to agile organizational outcomes. There is therefore a need for an ecosystem-based model that explains how human and technological dimensions combine to create adaptive capacity in complex infrastructure organizations.

The current study addresses this gap by adopting a qualitative and phenomenological perspective centered on the lived experiences of academic experts and senior practitioners. Such an approach is appropriate because agile transformation involves tacit knowledge, contextual judgment, and relational dynamics that cannot be fully captured through predetermined quantitative measures. By examining expert accounts, the study seeks to identify the cognitive enablers, leadership mechanisms, fluid structural arrangements, emotional and social capabilities, technological foundations, and value-creating outcomes that collectively shape agile human resource architecture. The resulting model is expected to provide both theoretical integration and practical guidance for organizations seeking to move beyond technology-centered transformation toward human-centered digital agility.

Accordingly, the aim of this study was to design and explain a comprehensive model of agile human resource architecture through the lens of soft capabilities for digital transformation in the Islamic Republic of Iran Railways.

## Methodology

This study employed an exploratory qualitative design to develop a comprehensive model of agile human resources through the lens of soft capabilities for digital transformation in the Islamic Republic of Iran Railways. The qualitative approach was selected because the phenomenon under investigation involves complex cognitive, behavioral, structural, and technological processes that cannot be adequately understood through predetermined variables or purely quantitative indicators. The study was therefore designed to explore the lived experiences, interpretations, and professional judgments of experts who had direct involvement in organizational agility, human resource management, digital transformation, or strategic change within the rail transportation industry and other large public-sector organizations. The analytical strategy was grounded in thematic analysis and followed the systematic thematic-network approach proposed by Attride-Stirling (2001). This approach was considered appropriate because it extends beyond the descriptive coding of interview data and

enables the systematic organization of basic, organizing, and global themes. It also facilitates the interpretive integration of latent patterns within participants' accounts and supports the development of a dynamic conceptual model explaining agile human resource architecture in a digital context.

The study population consisted of academic experts and senior executives possessing substantial theoretical knowledge and lived professional experience in human resource management, organizational agility, digital transformation, and rail transportation. A rigorous purposive selection protocol was developed to ensure the relevance, richness, and credibility of the qualitative data. To be eligible for participation, academic experts were required to hold a doctoral degree in human resource management, public administration, or industrial engineering with a specialization in macro-level systems or a closely related field. Executive participants were required to have at least 10 years of managerial, operational, or strategic consulting experience in the rail transportation industry or in a large public-sector organization undergoing organizational or digital transformation. Participants were also expected to demonstrate theoretical and practical familiarity with organizational agility, digital transformation, and soft capabilities, as evidenced by their research publications, managerial responsibilities, consulting activities, or participation in transformation projects. In addition, eligible individuals had to be available for an in-depth interview lasting approximately 60 to 90 minutes and willing to participate in subsequent procedures for validating the interpretations and findings.

Individuals were excluded when they had fewer than 10 years of relevant professional experience, lacked experience at senior or macro-level managerial positions, or possessed an exclusively technical or engineering-oriented background without sufficient familiarity with human capital and behavioral issues. Potential participants were also excluded when they were unwilling to permit audio recording, could not participate fully in the interview, or were unavailable for the subsequent member-checking process. These criteria were intended to ensure that participants could address not only the technological dimensions of digital transformation but also its cognitive, emotional, behavioral, and organizational implications.

Participants were recruited through a combination of purposive and snowball sampling. The initial pool of candidates was identified through academic databases, professional networking platforms, organizational recommendations, and professional records within the Islamic Republic of Iran Railways. Thirty-five individuals were initially identified as potentially eligible. Following a review of their academic and professional résumés, 11 candidates were excluded because they did not meet the minimum requirements concerning academic specialization or lived professional experience, leaving 24 individuals for further assessment. Initial contact and screening interviews were subsequently conducted with these candidates. Six additional individuals were excluded because of limited availability, unwillingness to participate, or insufficient familiarity with the concept of soft capabilities. Eighteen candidates proceeded to the final assessment stage, from whom 14 experts were selected for participation. The final sample included six university professors representing the theoretical and academic perspective and eight senior executives from the rail transportation industry representing the managerial and practitioner perspective.

Sampling continued concurrently with data collection and preliminary analysis. Recruitment was terminated when theoretical saturation was achieved, meaning that the final interviews did not produce substantively new codes, relationships, or thematic categories relevant to the emerging model. Saturation was reached after interviews with 14 participants. This sample size was considered adequate because the participants had highly specialized expertise, the interviews generated extensive and information-rich data, and the analysis demonstrated sufficient conceptual depth and

thematic recurrence. Ethical principles governing qualitative research were observed throughout the study. Before each interview, participants received information about the purpose of the research, the voluntary nature of participation, the intended use of the data, confidentiality procedures, and their right to withdraw from the study. Informed consent was obtained before audio recording began. Identifying information was removed during transcription and analysis, and numerical identifiers were assigned to the interviews to protect participants' anonymity.

Data were collected primarily through in-depth, semi-structured interviews. This method was selected because it provided sufficient structure to ensure coverage of the central research domains while allowing participants to describe their experiences, interpretations, and professional observations in detail. The interview guide was developed based on the study objectives, the conceptual literature on agile human resource management, organizational agility, digital transformation, soft capabilities, organizational neuroscience, dynamic human capital, and complex adaptive systems. The questions were designed to elicit participants' perceptions of the cognitive, structural, behavioral, emotional, technological, and outcome-related conditions required for the development of agile human resources in the rail transportation industry.

The interview protocol included broad, open-ended questions concerning participants' understanding of agile human resources, the limitations of traditional human resource structures, the human and organizational challenges associated with digital transformation, and the soft capabilities required to translate digital technologies into sustainable organizational value. Participants were invited to explain how cognitive flexibility, anticipatory learning, unlearning, distributed leadership, emotional intelligence, psychological resilience, human–machine interaction, data-driven decision-making, and fluid organizational structures affected organizational agility. Additional questions examined the role of open talent ecosystems, cross-functional teams, information sharing, the removal of organizational silos, employee experience, continuous innovation, and operational responsiveness within the rail transportation context. Probing questions were used when necessary to clarify meanings, obtain concrete examples, explore causal relationships, and identify the contextual conditions under which particular capabilities became effective.

Each interview lasted approximately 60 to 90 minutes and was conducted at a time and location agreed upon with the participant. Interviews were audio-recorded with participants' permission and subsequently transcribed verbatim. More than 800 minutes of interview material were collected. Each transcript comprised approximately 12 pages on average, creating a substantial qualitative dataset for interpretation. The researchers reviewed the recordings and transcripts to ensure transcription accuracy and to retain relevant contextual features of the participants' accounts. Field notes were also recorded during and immediately after the interviews to document nonverbal observations, contextual information, preliminary analytical insights, and issues requiring further exploration in subsequent interviews.

In addition to interview data, relevant organizational and strategic documents from the rail transportation sector were examined to support data triangulation. These materials were used to compare participants' accounts with the formal organizational context, strategic priorities, human resource policies, and digital transformation initiatives of the railway organization. The documentary evidence was not treated as a substitute for lived experience but as a supplementary source that helped the researchers evaluate the consistency of the emerging interpretations. The integration of interview data, organizational documents, and the theoretical literature strengthened the contextual grounding of the analysis and reduced the likelihood that the final model would reflect only individual opinions.

The quality and trustworthiness of the data were evaluated according to the criteria proposed by Lincoln and Guba (1985), including credibility, transferability, dependability, and confirmability. Credibility was enhanced through data triangulation and member checking. Interview findings and emerging interpretations were compared with relevant organizational documents and theoretical evidence. Preliminary codes and interpretations were also returned to eight participants, who were asked to evaluate whether the findings accurately represented their experiences and intended meanings. Their comments were incorporated into the refinement of code labels, thematic boundaries, and conceptual relationships.

Transferability was supported through thick description of the research context, the characteristics of the rail transportation industry, the participant selection criteria, and the professional composition of the expert panel. These details were provided to enable readers to judge the applicability of the findings to other project-based, infrastructure-intensive, or public-sector organizations. Dependability and confirmability were strengthened by maintaining a comprehensive audit trail covering participant recruitment, interview scheduling, audio recording, transcription, coding decisions, code revisions, thematic clustering, and the development of the final conceptual model. Raw transcripts, coding files, analytical notes, and records of methodological decisions were retained systematically.

The accuracy of the data collection and interpretation processes was also assessed by two independent researchers. Each interview transcript and the corresponding extracted codes were reviewed using qualitative appraisal checklists. Where disagreements arose, the researchers discussed their interpretations, and unresolved cases were referred to a third reviewer. This procedure ensured that the emerging concepts were supported by the data rather than being determined exclusively by the assumptions of a single analyst. Reflexive notes were maintained throughout the study to document the researchers' prior assumptions, interpretive decisions, and potential sources of bias.

Data analysis was conducted concurrently with data collection using the systematic thematic-network approach developed by Attride-Stirling (2001). The analytical process involved repeated engagement with the transcripts, progressive abstraction, constant comparison, and the construction of relationships among codes and themes. The purpose of the analysis was not merely to summarize frequently mentioned concepts but to identify the latent mechanisms through which cognitive and behavioral soft capabilities interacted with organizational structures and digital technologies to produce human resource agility. The analysis proceeded through three interrelated levels consisting of basic themes, organizing themes, and global themes.

During the initial coding stage, each interview transcript was read several times to achieve immersion in the data. The transcripts were then examined line by line, and meaningful statements were assigned descriptive and interpretive codes. Codes were formulated as concisely as possible while preserving the contextual meaning of the original statements. Each basic code was assigned a unique identifier. To facilitate analytical organization, the initial codes were classified broadly as cognitive, structural, or behavioral, although these preliminary classifications remained open to revision throughout the analysis. Cognitive codes addressed employees' and managers' mindsets, learning processes, cognitive flexibility, anticipatory thinking, and the ability to abandon obsolete knowledge. Structural codes concerned organizational architecture, workflows, talent systems, decision-making arrangements, information flows, and the replacement of rigid hierarchies with flexible networks. Behavioral codes addressed leadership, interpersonal interaction, emotional and social capabilities, resilience, collaboration, and digitally mediated relationships.

The open coding process generated 140 basic codes. Examples included neurocognitive flexibility in responding to change, the ability to unlearn obsolete knowledge, anticipatory learning and environmental scanning, the replacement of hierarchy with networks of teams, open and fluid talent ecosystems, unrestricted information flow, the removal of organizational silos, distributed leadership, digital emotional intelligence, virtual empathy, psychological resilience in conditions of ambiguity, human–machine collaboration, real-time data-driven decision-making, operational responsiveness, continuous innovation in rail services, and the enhancement of employee experience. The frequency of references was considered as a supplementary indicator of emphasis but was not used as the sole criterion for determining the conceptual importance of a code. Codes with lower frequencies were retained when they offered substantial explanatory value or represented a distinctive aspect of the phenomenon.

In the next stage, semantically and conceptually related basic codes were compared and clustered into organizing themes. The researchers used inductive reasoning to determine the relationships among codes, while also considering differences in meaning, context, causal direction, and level of abstraction. Codes were repeatedly merged, separated, renamed, or repositioned until each organizing theme demonstrated adequate internal coherence and clear external distinction from the other themes. This process resulted in 21 organizing themes. These themes included cognitive agility and learning, fluid organizational architecture, digital agile leadership, emotional and social capabilities, intelligent analytical infrastructure, agile talent ecosystems, psychological resilience, distributed decision-making, human–machine collaboration, information transparency, cross-functional interaction, and value-creating outcomes.

At the highest level of abstraction, the organizing themes were integrated into global themes representing the principal domains of the proposed model. The global themes captured mental and cognitive enablers, structural and behavioral drivers, and technological and outcome-related foundations. These overarching thematic domains were subsequently refined into six main dimensions of the final agile human resource model. The analytical structure reflected a progression from underlying cognitive capacities to organizational and behavioral transformation and, ultimately, to technology-enabled and value-creating outcomes. The central theme emerging from this process was defined as the dynamic convergence of cognitive–behavioral soft capabilities, fluid organizational architecture, and intelligent infrastructure, resulting in the formation of a responsive, innovative, and resilient rail organization.

The relationships among the principal themes were further examined through analytical interaction matrices. These matrices were used to determine whether relationships functioned as prerequisites, facilitators, reinforcing mechanisms, implementation triggers, enabling conditions, consequences, or feedback loops. The analysis indicated that cognitive and mental capabilities served as prerequisites for structural transformation and the meaningful adoption of digital technologies. Structural and behavioral mechanisms, in turn, reinforced cognitive agility by creating an organizational culture that encouraged experimentation, learning, collaboration, and adaptation. Technological capabilities provided real-time information and analytical feedback that modified organizational learning and improved decision-making. Digital tools also enabled more flexible structural arrangements, while fluid structures facilitated the effective implementation of intelligent technologies. The model therefore represented agility as a reciprocal and self-reinforcing process rather than a linear sequence of isolated interventions.

Theoretical saturation was evaluated throughout the coding process by comparing the contribution of each new interview with the existing coding framework. Saturation was considered achieved when additional interviews no longer generated

new basic codes, organizing themes, global themes, or meaningful relationships among the principal dimensions. The final interviews mainly confirmed and elaborated previously identified patterns rather than altering the conceptual structure of the model. This process supported the adequacy of the 14-participant sample and indicated that the thematic framework had reached sufficient conceptual completeness.

Several procedures were used to assess the reliability and credibility of the coding process. A second researcher independently coded 20% of the interview data. The coding outputs of the two researchers were then compared at the level of code assignment and conceptual interpretation. Across 140 coding decisions reviewed in the reliability assessment, 64 agreements and 12 disagreements were identified. Inter-coder agreement, calculated using Holsti's coefficient, was 91.43%, indicating a high level of consistency between the two coders. Disagreements were discussed until consensus was reached, and the definitions of ambiguous codes were revised to improve conceptual clarity. When consensus could not initially be reached, a third reviewer examined the relevant transcript segment and made the final determination.

Member checking provided an additional level of analytical validation. Preliminary codes, thematic interpretations, and selected conceptual relationships were presented to eight participants. They were asked to determine whether the findings accurately reflected their experiences and whether any major concepts had been misunderstood or omitted. Their feedback led to refinements in the terminology and boundaries of several themes but did not result in fundamental changes to the model. Triangulation with strategic and organizational documents and relevant theoretical literature was also used to assess whether the emerging framework was compatible with the institutional realities of the railway industry.

The final analysis transformed more than 800 minutes of in-depth interview data into 140 basic codes, 21 organizing themes, six main model dimensions, and an integrated central concept. The interpretive findings suggested that agility in the rail transportation industry should not be conceptualized as a purely technical adjustment or the simple deployment of digital tools. Rather, it represents a cognitive, behavioral, structural, and technological transformation that begins with the mindsets and learning capacities of organizational members, progresses through fluid architecture and agile leadership, and culminates in responsive decision-making, continuous innovation, employee value creation, and resilient rail services.

## Findings and Results

This section presents and provides an in-depth analysis of the findings obtained through the thematic analysis of the qualitative data. As explained in the methodology section, the data collected through 14 in-depth interviews with academic and executive experts were examined using a systematic three-stage coding procedure comprising open, axial, and selective coding. This process resulted in the identification of 140 initial open codes, which were subsequently refined and categorized into 21 organizing themes and ultimately integrated into six global themes representing the principal dimensions of the model.

The final structure of the model is first presented in the form of a thematic table to provide an overall representation of the study architecture. Each of the six global themes is then discussed and analyzed in detail. The analyses are not merely descriptive; rather, they adopt an interpretive approach to explain the internal relationships among the concepts and reveal latent patterns within the data. Mathematical notation was used as a conceptual device to represent the complex and synergistic relationships among the dimensions and to facilitate a deeper understanding of the dynamics of the model.

The final analyses indicated that the model of agile human resources based on soft capabilities for digital transformation constitutes a multilayered and ecosystem-based structure composed of six principal dimensions. Through their dynamic interactions, these dimensions shape the organization's capacity to respond to environmental changes. Table 1 presents the final structure of the model in terms of its global, organizing, and basic themes.

**Table 1**

*Final Thematic Network of the Study*

| Global Theme: Principal Model Dimension | Organizing Themes: Axial Categories | Basic Themes: Examples of Key Concepts |
|---|---|---|
| GC-A: Cognitive and Mental Enablers | OC-01: Neuro-organizational flexibility | Rapid modification of mental models through neuroplasticity |
| | OC-02: Anticipatory and deep learning | Unlearning obsolete knowledge |
| | OC-03: Systems and holistic thinking | Tolerance of ambiguity and uncertainty |
| | | Monitoring weak environmental signals |
| | | Understanding nonlinear relationships within the ecosystem |
| GC-B: Digital Agile Leadership | OC-04: Strategic leadership intelligence | Aligning the digital vision with human objectives |
| | OC-05: Distributed and shared leadership | Transitioning from command-and-control management to coaching and facilitation |
| | OC-06: Development of an innovation- and risk-taking-oriented culture | Intelligent delegation of authority to operational teams |
| | | Creating psychological safety for experimentation and failure |
| GC-C: Fluid Organizational Architecture | OC-07: Network- and team-based structures | Replacing hierarchy with self-managing teams |
| | OC-08: Free flow of knowledge and information | Breaking down information silos and ensuring data transparency |
| | OC-09: Dynamic talent ecosystem | Dynamic allocation of talent according to skills |
| | OC-10: Adaptive and agile processes | Agile reengineering of procedures and elimination of bureaucracy |
| GC-D: Emotional and Social Soft Capabilities | OC-11: Digital emotional intelligence | Virtual empathy and recognition of nonverbal emotions |
| | OC-12: Social capital and network-based trust | Management of technostress and digital mental health |
| | OC-13: Psychological resilience | Building trust in geographically dispersed and remote teams |
| | | Positive adaptation to continuous change and crises |
| GC-E: Technology and Data Intelligence | OC-14: Human–machine symbiosis | Constructive interaction with artificial intelligence algorithms |
| | OC-15: Data-driven and predictive analytics | Augmentation of human capabilities through digital tools |
| | OC-16: Integrated digital infrastructure and platforms | Decision-making based on big data analytics |
| | | Integration of human resource information systems |
| GC-F: Value-Creating Outcomes | OC-17: Productivity and operational efficiency | Increasing the speed of railway operations and reducing delays |
| | OC-18: Innovation in value creation | Creating new services and enhancing the customer experience |
| | OC-19: Excellence in employee and stakeholder experience | Increasing employee satisfaction, engagement, and digital well-being |
| | | Strengthening the employer brand and attracting high-quality talent |

Each of the six global themes is examined in detail below. The analyses are based on the interview data and are discussed with reference to the supporting theoretical literature.

**First Dimension (GC-A): Cognitive and Mental Enablers**

As the most fundamental layer of the model, this dimension concerns the mental, intellectual, and learning capabilities of employees and managers. The findings strongly indicate that digital transformation is primarily a cognitive metamorphosis rather than merely a technological change. As one academic expert stated, "Our organizations are filled with modern hardware and up-to-date software, but the brainware of our employees remains embedded in the industrial paradigm. Unless this brainware is updated, every technological investment will be ineffective." This dimension constitutes an essential prerequisite for the acceptance and effective utilization of the other dimensions of the model.

**OC-01: Neuro-Organizational Flexibility**

Borrowed from the literature on organizational neuroscience, this concept refers to employees' ability to rapidly reorganize their mental models and neural pathways when confronted with ambiguity and emerging technologies (Ben Slimane et al., 2022). One senior railway executive described the phenomenon as follows: "In the past, a single procedure could remain effective for 10 years. Today, a new platform emerges every six months. A successful employee is one who can

rapidly restart their mind and adapt to the new environment rather than resist it." This finding extends the concept of neuroplasticity from the individual level to the organizational level and identifies it as a necessary condition for agility.

**OC-02: Anticipatory and Deep Learning**

The interview analysis revealed that the traditional classroom- and workshop-based training paradigm has lost much of its effectiveness in the digital era. Agility requires a transition toward three new learning patterns.

Rapid and on-the-job learning refers to learning through direct experience and within short developmental cycles.

Unlearning was also identified as a critical capability. As one expert explained, "Our main problem is not learning new things, but forgetting what we have already learned when that knowledge has become old and obsolete." The capacity to actively abandon ineffective knowledge constitutes a key soft capability.

Anticipatory learning refers to the capacity to monitor weak environmental signals and predict future skill requirements before a crisis emerges. This process is facilitated by big data analytics and artificial intelligence (Hamidin et al., 2024).

**OC-03: Systems and Holistic Thinking**

The experts emphasized that in a complex network such as the railway system, isolated and function-specific decisions can have disastrous consequences. Systems thinking refers to understanding the nonlinear and complex relationships among the different components of the ecosystem, including locomotives, railway lines, human resources, customers, and technology. As one manager stated, "We must understand how a minor change in the signaling system can affect a train driver's job satisfaction and, ultimately, the customer experience." This holistic perspective constitutes the essence of agile management.

**Second Dimension (GC-B): Digital Agile Leadership**

This dimension concerns the central role of managers in directing and governing the transformation process. The findings indicated that the traditional command-and-control leadership style represents the greatest barrier to agility. Digital agile leadership embodies a managerial paradox: creating stability through the acceptance of instability. This leadership style combines strategic intelligence, empowerment, and culture building.

**OC-04: Strategic Leadership Intelligence**

This concept extends beyond technical knowledge and refers to a leader's ability to align the digital vision with the organization's human and strategic objectives. An intelligent leader regards technology not as an end in itself but as an instrument for achieving a broader purpose. Such a leader is capable of balancing short-term technological investments with long-term organizational sustainability (Ali & Al-Ahmad, 2025).

**OC-05: Distributed and Shared Leadership**

All experts emphasized the need to transition from the "heroic leader" model to an understanding of leadership as a team-level capacity. This transition involves intelligent delegation of authority and the empowerment of self-managing teams. As one experienced manager stated, "The era of the manager who knows the answer to every question is over. Today's leader is someone who asks the best questions and creates the space for the team to find the answers." This finding is consistent with the theory of team resource mobilization (Junker et al., 2024).

**OC-06: Development of an Innovation- and Risk-Taking-Oriented Culture**

One of the most frequently recurring themes in the interviews concerned the role of leaders in creating psychological safety. In an agile culture, failure is regarded as an opportunity for learning rather than as grounds for punishment. An agile

leader encourages experimentation and intelligent risk-taking. As one expert stated, “Employees will never innovate if they are afraid of making mistakes. My primary responsibility as a manager is to assure them that failure in the pursuit of innovation is part of the process.”

**Third Dimension (GC-C): Fluid Organizational Architecture**

This dimension concerns the structural and process-related aspects of the organization. The findings indicate that rigid, hierarchical, and bureaucratic structures are the primary enemies of agility. Fluid organizational architecture refers to an organizational design that operates like a living organism: adaptive, networked, and responsive.

**OC-07: Network- and Team-Based Structures**

The transition from functional structures to team- and project-based structures lies at the core of this theme. This transition entails the formation of small, cross-functional, and self-managing teams that are established to accomplish a specific mission and dissolved once that mission has been completed (Kudryashov et al., 2025). Such structures substantially increase the speed of decision-making and organizational responsiveness.

**OC-08: Free Flow of Knowledge and Information**

The experts identified information silos as a major organizational weakness within the railway system. In a fluid architecture, information does not remain under the exclusive control of particular departments or managers but flows transparently and democratically throughout the organization. Achieving such transparency requires integrated digital platforms and a culture that actively promotes knowledge sharing.

**OC-09: Dynamic Talent Ecosystem**

This concept transforms talent management from a static process into a dynamic internal marketplace. Within this model, employees are not confined to fixed jobs but participate in various projects and teams according to their skills and interests. This approach not only increases employee motivation but also enables the organization to utilize the full range of latent capabilities embedded within its workforce.

**Fourth Dimension (GC-D): Emotional and Social Soft Capabilities**

This dimension constitutes the core of the soft-capability approach and concerns the human, psychological, and communicative aspects of the digital workplace. The findings demonstrated that although technology creates opportunities, it can also generate threats, and managing these threats requires advanced soft capabilities.

**OC-11: Digital Emotional Intelligence**

This concept refers to the ability to understand and manage one’s own emotions and those of others in virtual interactions. As one expert stated, “Empathy from behind a monitor is much more difficult than face-to-face communication. A manager who cannot recognize an employee’s stress, fatigue, or lack of motivation through email or online chat will fail to lead a virtual team.” The management of technostress, defined as psychological pressure resulting from continuous interaction with technology, was also identified as a key competency for all employees.

**OC-12: Social Capital and Network-Based Trust**

Within network structures and geographically dispersed teams, trust functions as the adhesive that connects individuals. Establishing and maintaining trust in the absence of physical interaction represents a major challenge. This process requires high levels of transparency, continuous communication, and clearly defined responsibilities.

**OC-13: Psychological Resilience**

The digital environment is characterized by uncertainty and continuous change. Resilience refers to individuals' psychological capacity to adapt positively to adversity, recover from failure, and maintain performance under conditions of pressure. Resilience is not an exclusively innate characteristic; rather, it is a developable capability in which organizations must invest.

**Fifth Dimension (GC-E): Technology and Data Intelligence**

This dimension concerns the technological tools, platforms, and infrastructure that make agility possible. Nevertheless, the findings emphasize that technology is not a solution in itself but an enabler. The appropriate approach is one of human-centered technological orientation.

**OC-14: Human–Machine Symbiosis**

The experts' perspectives on artificial intelligence were mature and realistic. They viewed artificial intelligence not as a substitute for human beings but as an intelligent colleague or cognitive assistant. The preferred model assigns repetitive and analytical tasks to machines so that human employees can concentrate on creative, strategic, and empathy-based activities. This concept is consistent with the augmented human resource model.

**OC-15: Data-Driven and Predictive Analytics**

The transition from intuitive decision-making to data-driven decision-making constitutes one of the pillars of agility. This process includes the use of predictive analytics to forecast employee turnover, identify future training needs, and optimize the allocation of talent.

**Sixth Dimension (GC-F): Value-Creating Outcomes**

This dimension concerns the tangible results and outputs generated through the implementation of the other five dimensions. Agility is not an abstract objective; it must result in the creation of identifiable value for the organization, its employees, and its customers.

**OC-17: Productivity and Operational Efficiency**

The first and most tangible consequence of agility is improvement in performance indicators. In the railway industry, this improvement involves increasing operational speed, reducing train delays, optimizing fuel consumption, and decreasing costs associated with human error.

**OC-18: Innovation in Value Creation**

Agile organizations function as engines of innovation. In the railway context, this involves creating new passenger services, such as intelligent reservation systems and personalized on-board services, and improving the customer experience across all service touchpoints.

**OC-19: Excellence in Employee and Stakeholder Experience**

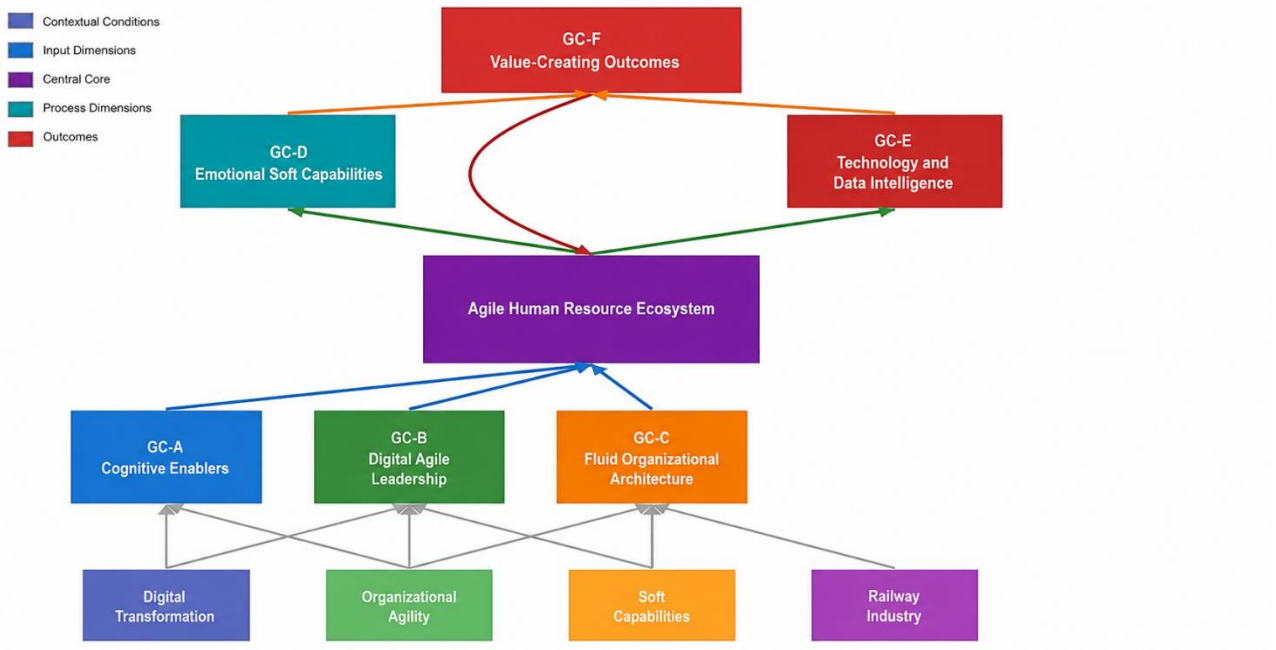
Agility contributes to the creation of a more human-centered, dynamic, and meaningful working environment. In turn, this enhances employees' job satisfaction, engagement, and digital well-being. Consequently, the organization's employer brand is strengthened, and its capacity to attract and retain high-quality talent is increased.

The in-depth analysis of the qualitative data revealed an integrated six-dimensional model of agile human resources. The findings indicate that agility is not a unidimensional phenomenon but a complex ecosystem in which cognitive enablers (GC-A) function as the underlying foundation and prerequisite. Agile leadership (GC-B) and fluid architecture (GC-C) serve as driving forces that activate this cognitive potential. Emotional and social soft capabilities (GC-D) function as the lubricant of

the system, reducing human friction and facilitating interactions. Intelligent technology (GC-E) operates as an accelerator that increases the speed and accuracy of the system. Ultimately, through their mutual interactions, all of these components generate value-creating outcomes (GC-F) for the entire ecosystem. This comprehensive model provides a holistic representation of the requirements for transforming traditional organizations into agile and future-oriented institutions.

**Figure 1**

*Comprehensive Conceptual Model of Agile Human Resources Through the Lens of Soft Capabilities for Digital Transformation*




## Discussion and Conclusion

The present study developed an integrated six-dimensional model of agile human resources through the lens of soft capabilities for digital transformation in the rail transportation industry. The findings showed that agile human resource architecture is not limited to the implementation of digital technologies or the redesign of formal human resource processes. Rather, it emerges from the dynamic interaction of cognitive and mental enablers, digital agile leadership, fluid organizational architecture, emotional and social soft capabilities, technology and data intelligence, and value-creating outcomes. The resulting model therefore conceptualizes agility as a multilayered organizational ecosystem in which human, structural, behavioral, and technological elements continuously reinforce one another. This interpretation is consistent with the broader view that organizational agility is a systemic capability rather than an isolated managerial technique and that its development requires the coordinated transformation of people, processes, structures, and technologies [5, 6].

The first major finding concerned the foundational role of cognitive and mental enablers. The participants emphasized that digital transformation begins with changes in employees' and managers' mental models rather than with the acquisition of new technologies. Neuro-organizational flexibility, unlearning, anticipatory learning, tolerance of ambiguity, and systems thinking were identified as prerequisites for the effective adoption of digital tools and agile work practices. This finding suggests that organizations may invest extensively in hardware, software, and digital platforms while remaining behaviorally and cognitively embedded in traditional industrial paradigms. Such a mismatch reduces the likelihood that technological

investments will produce meaningful transformation. This result aligns with studies indicating that digital transformation depends on organizational readiness, dynamic capabilities, and the capacity to revise established routines and assumptions in response to technological disruption [3, 9].

The importance of anticipatory learning further indicates that conventional training systems are insufficient for organizations operating in rapidly changing environments. The findings showed that agile human resources require continuous, experience-based, and forward-looking learning mechanisms. Employees must be able not only to acquire new knowledge but also to unlearn obsolete practices and predict future capability requirements. This interpretation is consistent with the emphasis placed on data-supported decision-making and predictive human resource analytics in agile organizations. Human resource analytics can assist organizations in identifying emerging skill gaps, anticipating turnover, and aligning workforce capabilities with future strategic priorities [10]. However, the present findings extend this argument by showing that analytical technologies are valuable only when organizational members possess the cognitive flexibility and interpretive capacity required to use them effectively.

Systems thinking also emerged as a central cognitive capability because railway organizations function through tightly interconnected technical and human subsystems. Participants stressed that isolated decisions in areas such as signaling, scheduling, maintenance, or staffing may create unintended consequences elsewhere in the system. This finding supports the view that agility requires an understanding of nonlinear relationships and interdependencies rather than narrow functional optimization. Integrated agile service systems similarly depend on the coordination of multiple organizational objectives, including efficiency, quality, sustainability, employee involvement, and technological integration [2]. Thus, systems thinking allows managers to evaluate the wider organizational effects of local interventions and reduces the risk of fragmented transformation initiatives.

The second major finding concerned the central role of digital agile leadership. Participants described traditional command-and-control leadership as one of the most significant obstacles to agility. In contrast, agile leadership was characterized by strategic intelligence, distributed authority, team empowerment, coaching, facilitation, and the creation of psychological safety. The findings indicate that leaders must simultaneously provide strategic direction and permit sufficient decentralization for operational teams to respond rapidly to emerging conditions. This dual responsibility reflects the paradoxical nature of agile leadership: leaders create coherence not through excessive control but through shared purpose, trust, and adaptive coordination.

The emphasis on distributed and shared leadership is supported by prior research on sustained agile team effectiveness. Agile teams require the continuous mobilization of individual, social, cognitive, and structural resources, and such mobilization cannot depend exclusively on a single formal leader [12]. Leadership must instead function as a collective capacity through which team members share expertise, identify emerging problems, and coordinate responses. The findings of the present study similarly showed that the effective leader is not necessarily the person who provides every answer but the person who creates conditions in which teams can generate appropriate answers. This interpretation also corresponds with evidence that agile ways of working improve adaptive team performance when goals are clear, revisable, and collectively understood [4].

The development of psychological safety was another critical leadership-related finding. Participants emphasized that innovation is unlikely when employees fear blame or punishment for mistakes. Agile leadership therefore requires a culture

in which intelligent experimentation and learning from failure are encouraged. This result is compatible with the idea that data-driven agile transformation should support organizational learning rather than merely strengthen surveillance and managerial control [14]. When data are used punitively, employees may conceal problems and avoid risk. When data are used as a basis for shared reflection and improvement, they can enhance agility, transparency, and collective learning.

The third dimension, fluid organizational architecture, demonstrated that agility requires structural transformation alongside cognitive and leadership development. The participants identified rigid hierarchies, departmental silos, static job definitions, and bureaucratic procedures as major barriers to rapid adaptation. They emphasized network-based structures, self-managing teams, open information flows, dynamic talent allocation, and adaptive processes. This finding is consistent with research showing that human resource agility depends on flexible job organization and that job design mediates the relationship between agility strategies and human resource strategies [7]. Strategic commitment to agility is therefore insufficient unless formal work arrangements permit role flexibility, cross-functional collaboration, and decentralized decision-making.

The dynamic talent ecosystem identified in the study also reinforces earlier research on agile talent management. A conventional talent system allocates individuals to fixed jobs and often limits the visibility and use of their broader capabilities. By contrast, an agile talent ecosystem allows employees to move across projects and teams based on their skills, interests, and the organization's changing priorities. This approach is consistent with a human resource agility framework in which talent management supports internal mobility, skill-based deployment, and rapid reconfiguration of the workforce [8]. It also offers a practical response to capability shortages because organizations can mobilize internal expertise more effectively rather than relying exclusively on external recruitment.

The emphasis on information transparency further illustrates the interdependence of structure and technology. Participants regarded information silos as a serious impediment to coordination within the railway system. Integrated digital platforms can improve information accessibility, but their effectiveness depends on organizational norms that support knowledge sharing. This finding corresponds with research on digital human resource management in public-sector organizations, which shows that integrated digital systems can enhance organizational agility by accelerating information flows and supporting more responsive human resource processes [6]. Nevertheless, the current study demonstrates that technological integration alone cannot eliminate information monopolies when cultural and power-related barriers remain unchanged.

The fourth major finding concerned emotional and social soft capabilities. Digital emotional intelligence, network-based trust, social capital, technostress management, and psychological resilience were identified as the human core of agile transformation. These findings indicate that digitalization may create new vulnerabilities even as it improves operational capabilities. Virtual communication reduces access to nonverbal cues, remote work complicates trust formation, and constant technological change may produce anxiety, fatigue, and perceptions of skill obsolescence. Agile organizations must therefore develop employees' ability to understand emotions, manage digital strain, maintain effective relationships, and adapt positively to uncertainty.

The role of trust and social capital is especially important in networked and geographically dispersed organizations. When work is organized through temporary teams and digital platforms, formal supervision becomes less effective as a mechanism of coordination. Trust, transparency, and shared responsibility become essential for maintaining cohesion. This interpretation

is compatible with research showing that human resource systems generate sustainable organizational outcomes partly through employee attitudes, organizational citizenship behavior, and socially responsible relationships [13]. The present findings expand this perspective by showing that these relational capabilities also contribute directly to agility by reducing coordination costs and enabling faster collaboration.

Psychological resilience was similarly identified as a developable organizational capability rather than an exclusively personal trait. Participants argued that employees must be able to recover from failures, tolerate ambiguity, and sustain performance under conditions of rapid change. This finding aligns with studies demonstrating that organizational agility helps convert intellectual and social resources into sustainable value [1]. Resilience provides continuity during disruption, whereas agility enables adaptation. The interaction of the two allows organizations to respond rapidly without losing psychological stability or operational reliability.

The fifth dimension, technology and data intelligence, confirmed that digital infrastructure is an essential enabler of agility, but not its sole determinant. The participants emphasized integrated platforms, predictive analytics, human–machine collaboration, and artificial intelligence-assisted decision-making. Technology was viewed as a means of augmenting human capability rather than replacing employees. Routine and analytical tasks could be assigned to intelligent systems, while employees focused on creativity, empathy, strategic judgment, and complex problem-solving. This interpretation is consistent with the view that organizational quality depends on the synergy between human resource proficiency and effective managerial and technological systems [11].

The importance of predictive analytics also supports existing research on agile human resource decision-making. Data analytics allows organizations to make faster and more evidence-based decisions concerning staffing, training, performance, and talent allocation [10]. The present study, however, shows that analytics must be embedded within broader cognitive, ethical, and relational capabilities. Without data literacy, critical judgment, and trust in the system, employees may reject analytical recommendations or use them mechanically. Thus, data intelligence should be understood as a sociotechnical capability produced through the interaction of technological infrastructure and human interpretation.

The sixth dimension concerned value-creating outcomes. The participants emphasized that agility should ultimately improve operational efficiency, innovation, customer experience, employee experience, and organizational sustainability. In the railway industry, these outcomes include faster operations, fewer delays, better resource utilization, improved passenger services, increased employee engagement, and stronger employer branding. This result is consistent with studies showing that human resource agility improves organizational responsiveness and performance in complex public institutions [15]. It also aligns with the identification of key human resource agility drivers in other highly structured organizations, where flexible competencies, rapid communication, and adaptive human resource systems contribute to effectiveness under changing conditions [5].

The value-creation dimension also demonstrates that agile transformation should not be evaluated solely through the speed of implementation or the number of digital systems adopted. Effective transformation must generate meaningful benefits for multiple stakeholders. The adoption of new technology is successful when it addresses organizational needs, supports employees, and improves service outcomes [3]. Similarly, integrated agile service systems are sustainable only when they simultaneously improve efficiency, quality, adaptability, and stakeholder value [2]. Therefore, the outcomes of agile

human resource architecture should be assessed through a balanced set of operational, human, innovative, and service-related indicators.

Taken together, the findings reveal a reciprocal rather than linear model. Cognitive enablers prepare individuals to engage with change; agile leaders activate and direct these capabilities; fluid structures create opportunities for rapid coordination; emotional and social capabilities sustain trust and resilience; technology accelerates information processing and decision-making; and value-creating outcomes provide feedback that reinforces organizational learning. This interpretation is compatible with the concept of data-driven agile culture transformation, in which evidence, behavior, and organizational systems continuously interact [14]. It also corresponds with public-sector research emphasizing that agility must be adapted to institutional policies, administrative constraints, and sector-specific realities [15].

The theoretical contribution of the present study lies in positioning soft capabilities as the connective mechanism between digital transformation and human resource agility. Previous studies have examined digital human resource management, agile teams, analytics, talent management, or technology adoption, but these domains have often remained conceptually separate. The proposed model integrates them into a single ecosystem and shows that digital transformation produces agility only when cognitive, emotional, social, leadership, and structural capabilities are developed concurrently. In this sense, soft capabilities are not peripheral behavioral attributes; they are strategic organizational resources that determine whether technological potential is converted into sustainable value.

The findings also have particular relevance to the railway industry. Railway organizations must reconcile agility with safety, reliability, regulation, and infrastructure continuity. Complete structural fluidity may not be feasible in safety-critical operations, but adaptive teams, transparent information, predictive learning, and decentralized problem-solving can be developed within clearly defined governance boundaries. The model therefore does not imply the elimination of all hierarchy. Rather, it proposes a differentiated architecture in which control is retained where safety and accountability require it, while flexibility is expanded in learning, innovation, talent deployment, and operational coordination.

This study had several limitations. The findings were derived from the perspectives of 14 academic and executive experts and therefore reflect informed interpretations rather than direct observations of all employee groups within the railway organization. Operational employees, technical specialists, union representatives, passengers, and external contractors were not included, although their experiences may reveal additional dimensions of digital agility. The qualitative design also limits statistical generalizability, and the proposed model may be influenced by the institutional, cultural, and regulatory characteristics of the Iranian railway sector. In addition, the data were based mainly on retrospective interview accounts, which may be affected by selective recall, professional interests, or socially desirable responses. Although triangulation, member checking, and inter-coder agreement were used to strengthen trustworthiness, the findings remain interpretive and context-dependent.

Future research should test the proposed model quantitatively by developing valid measurement scales for each dimension and examining the relationships among cognitive enablers, leadership, structural fluidity, soft capabilities, technological intelligence, and value-creating outcomes. Longitudinal studies could determine how these dimensions evolve throughout different stages of digital transformation and whether their relative importance changes over time. Comparative studies across railway systems, public organizations, transportation sectors, and private technology firms would help evaluate the transferability of the model. Future qualitative research should also include frontline employees, technical personnel,

customers, and external partners to provide a broader ecosystem perspective. Experimental or action-research designs could assess the effects of targeted interventions such as digital leadership training, talent marketplaces, psychological resilience programs, and cross-functional agile teams.

Railway managers should treat digital transformation as a human and organizational transformation program rather than as a technology procurement project. Implementation should begin with an assessment of cognitive readiness, leadership capability, trust, learning systems, job flexibility, and data literacy. Managers should create cross-functional teams, reduce unnecessary approval layers, establish integrated knowledge-sharing platforms, and develop skill-based internal talent marketplaces. Leadership development programs should emphasize coaching, distributed decision-making, psychological safety, and evidence-based management. Organizations should also provide structured support for technostress management, digital well-being, resilience, and virtual communication. Finally, performance evaluation should include not only operational efficiency and cost reduction but also employee experience, innovation, learning capacity, service quality, and the organization's ability to respond effectively to emerging disruptions.

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## Authors' Contributions

All authors equally contributed to this study.

## Declaration of Interest

The authors of this article declared no conflict of interest.

## Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

## Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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