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Identifying the Dimensions and Components of Organizational Infrastructure Development in the Field of Human Capital in Mahshahr Gas Company

ABSTRACT

The present study aimed to identify the dimensions and components of organizational infrastructure development in the field of human capital in Mahshahr Gas Company using a qualitative thematic analysis approach. This study was conducted using a qualitative applied-developmental design. The statistical population consisted of experts, managers, supervisors, and senior specialists of Mahshahr Gas Company who possessed substantial experience and knowledge in the fields of management, organizational processes, and human resources. Participants were selected through purposive sampling, and data collection continued until theoretical saturation was achieved after conducting 14 semi-structured interviews. The interviews were transcribed and analyzed using thematic analysis. Data coding and categorization were performed systematically with the assistance of MAXQDA software. To ensure the trustworthiness of findings, strategies such as participant review, expert review, intercoder agreement, and rich description were applied. The reliability of coding was confirmed through intercoder agreement, and theoretical saturation validated the adequacy of the sample size. The findings revealed that the organizational infrastructure development model in the field of human capital consisted of two overarching themes, four organizing themes, and eight basic themes. The first overarching theme, organizational infrastructure development in the field of human capital, included the organizing themes of coordination and integration and work commitment. Coordination and integration consisted of organizational transparency and delegation of authority, while work commitment consisted of development and learning and skill and expertise. The second overarching theme, management culture, included the organizing themes of human resource empowerment and work adaptation. Human resource empowerment consisted of assigning responsibility to individuals and teamwork, while work adaptation consisted of dynamism and creativity and attitudes and values. The findings also indicated that organizational transparency, employee participation, continuous learning, teamwork, organizational commitment, adaptability, and value orientation were among the most influential components in strengthening organizational human capital infrastructure. The findings demonstrated that organizational infrastructure development in the field of human capital is a multidimensional process influenced by structural, managerial, cultural, and behavioral factors. The study highlighted that sustainable organizational performance in gas industry organizations depends not only on technical and operational resources but also on empowering human capital through transparent managerial systems, participatory structures, learning-oriented environments, teamwork, and adaptive organizational culture.

Keywords: Human Capital, Organizational Infrastructure, Management Culture, Human Resource Empowerment, Organizational Development, Mahshahr Gas Company, Thematic Analysis

Introduction

Human resources have long been recognized as one of the most strategic assets of organizations, and contemporary organizations increasingly view human capital not merely as an operational component but as a critical driver of competitiveness, innovation, sustainability, and organizational resilience [1]. In the evolving knowledge economy, organizations are no longer evaluated solely based on physical resources or technological infrastructure; rather, their ability to create, share, preserve, and apply knowledge through human interactions and value-oriented behaviors has become a central determinant of organizational effectiveness [2]. As knowledge-intensive environments continue to expand under the influence of digital transformation, artificial intelligence, Industry 5.0, and sustainable organizational paradigms, the behavioral values of employees increasingly influence the success or failure of knowledge management implementation within organizations [3, 4].

Knowledge management has emerged as a multidimensional managerial approach aimed at identifying, organizing, transferring, and utilizing organizational knowledge to improve performance and maintain competitive advantage. However, the successful implementation of knowledge management systems depends not only on technological infrastructures but also on the behavioral, ethical, and cultural characteristics of employees and managers [5]. Many organizations invest heavily in technological solutions for knowledge storage and information exchange, yet fail to establish sustainable knowledge-oriented cultures because employees may resist sharing knowledge, avoid collaborative learning, or lack trust and ethical commitment in organizational interactions [6]. Therefore, scholars increasingly emphasize that the effectiveness of knowledge management initiatives is fundamentally rooted in behavioral values such as trust, responsibility, collaboration, transparency, accountability, ethical conduct, and participatory engagement [7].

The emergence of digitalization and smart organizational systems has further intensified the importance of integrating human values with knowledge-oriented organizational structures. Digital human resource management, artificial intelligence, machine learning, and data-driven organizational systems are rapidly transforming workplace relationships and employee expectations [8, 9]. Although these technological developments improve efficiency and facilitate knowledge accessibility, they simultaneously create ethical, behavioral, and relational challenges that organizations must address [10]. Issues such as information misuse, distrust, technological resistance, knowledge hoarding, and weakened human interactions may undermine organizational learning and collaborative behavior if value-based behavioral frameworks are absent [11]. Consequently, organizations increasingly require comprehensive models that align behavioral values with knowledge management implementation in order to maintain organizational cohesion and sustainable performance.

Recent literature indicates that organizations achieving higher levels of knowledge management maturity often possess strong ethical climates, collaborative cultures, and supportive leadership structures [5]. In such organizations, employees perceive knowledge sharing as a collective responsibility rather than a personal threat, and managerial systems encourage participation, transparency, and behavioral accountability. Conversely, organizations lacking behavioral value alignment frequently experience fragmented communication, resistance to organizational learning, and reduced innovation capability [6]. This suggests that knowledge management cannot be effectively institutionalized solely through structural or technological interventions; rather, it requires a deep integration of behavioral values within organizational culture and human resource practices.

Behavioral values in organizational contexts refer to the shared ethical, professional, and relational standards guiding employees' interactions, decisions, and workplace conduct. These values shape how employees communicate, cooperate, resolve conflicts, share expertise, and respond to organizational responsibilities. Research has demonstrated that value congruence between employees and organizations significantly enhances organizational commitment, trust, and behavioral alignment [12]. In knowledge-based organizations, such alignment becomes even more critical because knowledge creation and dissemination depend heavily on mutual trust, ethical responsibility, and collaborative engagement among organizational members. Employees who perceive fairness, transparency, and respect within the organization are more likely to participate actively in knowledge-sharing behaviors and organizational learning processes [13].

At the same time, leadership plays a central role in shaping behavioral values and supporting knowledge-oriented organizational cultures. Transformational, participatory, and ethical leadership styles have been associated with stronger knowledge-sharing intentions, innovation capability, and sustainable organizational behavior [14, 15]. Leaders who demonstrate behavioral consistency, fairness, and openness contribute to psychological safety and trust among employees, thereby encouraging collaborative learning and knowledge exchange. Moreover, contemporary organizations increasingly require leaders capable of balancing technological advancement with human-centered management approaches [4]. Such leadership models emphasize empathy, ethical conduct, communication competence, and employee empowerment as essential elements of sustainable knowledge management systems.

Another important dimension influencing behavioral values within organizations is the increasing integration of sustainability and green human resource management practices. Sustainable HRM approaches seek to align organizational performance with environmental responsibility, ethical governance, and long-term employee well-being [16, 17]. Green and sustainable HRM initiatives encourage organizations to foster responsible employee behavior, collaborative learning, and ethical participation in organizational processes. Scholars argue that sustainability-oriented HR systems strengthen organizational citizenship behavior, environmental awareness, and collective responsibility among employees [18, 19]. Such findings indicate that value-oriented HR practices can serve as powerful mechanisms for institutionalizing behavioral commitment within knowledge management frameworks.

In parallel, the growing reliance on electronic human resource management systems and HR analytics has transformed how organizations manage employee behavior, performance, and knowledge flows [20, 21]. E-HRM systems facilitate communication, learning, monitoring, and performance evaluation while also generating new opportunities for integrating behavioral indicators into organizational decision-making [22]. However, technology-driven HR systems alone cannot guarantee successful knowledge management outcomes unless employees perceive organizational justice, trust, and ethical support within these systems [23]. Consequently, behavioral value adherence must be embedded within technological infrastructures to ensure sustainable employee engagement and organizational learning.

The relationship between knowledge management and innovation has also been extensively emphasized in recent organizational studies. Knowledge-sharing behavior, collaborative problem-solving, and participatory learning processes significantly enhance innovation capability and adaptive organizational performance [7]. Organizations characterized by open communication, mutual respect, and supportive managerial practices are more capable of transforming individual knowledge into collective innovation and strategic capability [24]. In contrast, rigid hierarchical cultures and low-trust environments inhibit creativity, reduce employee participation, and limit the effectiveness of knowledge management implementation.

Therefore, the behavioral foundations of organizational interaction are increasingly recognized as essential preconditions for sustainable innovation and organizational adaptability.

Industry 5.0 perspectives further reinforce the necessity of integrating human-centered values into organizational systems. Unlike earlier industrial paradigms focused primarily on automation and efficiency, Industry 5.0 emphasizes collaboration between humans and intelligent technologies while preserving ethical, social, and humanistic dimensions of work [3]. This paradigm shift highlights the strategic importance of behavioral competencies such as empathy, teamwork, ethical awareness, adaptability, and collective intelligence in organizational environments. Human resource systems operating within Industry 5.0 frameworks must therefore support behavioral development alongside technological advancement in order to sustain organizational learning and resilience.

Moreover, the rapid evolution of artificial intelligence and machine learning technologies in organizational contexts has generated complex ethical and managerial paradoxes. While AI-based systems improve decision-making speed and operational efficiency, they may also weaken interpersonal interactions, reduce emotional engagement, and create concerns regarding fairness and transparency [9, 11]. Researchers have argued that organizations must establish behavioral and ethical frameworks capable of balancing automation with human-centered organizational values [10]. This balance is particularly important in knowledge management environments where collaborative interaction, trust, and shared meaning remain indispensable for effective knowledge exchange.

Contemporary HR research also emphasizes organizational resilience and adaptability as critical outcomes of value-oriented behavioral systems. Organizations capable of maintaining collaborative behavior, ethical accountability, and employee engagement during uncertainty are more resilient in responding to environmental and technological disruptions [25, 26]. Behavioral values such as mutual support, trustworthiness, and responsibility contribute to organizational stability by strengthening communication networks and reducing interpersonal conflict. Similarly, resilient organizations often demonstrate stronger learning cultures and more effective knowledge-sharing processes because employees perceive themselves as integral contributors to collective organizational success.

Ethical and sustainable organizational governance further depends on the establishment of fair, transparent, and supportive HR practices. Studies on sustainable supply chains and ethical organizational systems indicate that HR departments increasingly function as guardians of ethical behavior, professional accountability, and organizational integrity [27]. Through recruitment, performance evaluation, training, reward systems, and leadership development, HR systems shape the behavioral norms governing organizational interactions. Consequently, behavioral value adherence cannot be viewed as an individual phenomenon alone; rather, it represents an organizational capability emerging from managerial systems, leadership approaches, and institutional cultures.

Another important issue concerns the alignment between employee competencies and organizational intellectual capital. Knowledge-intensive organizations rely heavily on competency-based intellectual capital, which includes employees' expertise, communication skills, ethical conduct, and collaborative capacities [28]. Organizations that fail to develop behavioral competencies alongside technical skills often encounter difficulties in sustaining organizational learning and knowledge integration. Therefore, behavioral values should be considered strategic assets contributing to intellectual capital development and long-term organizational competitiveness.

Public sector organizations and service-oriented institutions face additional challenges regarding behavioral values and knowledge management implementation. Bureaucratic rigidity, limited technological readiness, and resistance to organizational change often reduce the effectiveness of knowledge-sharing systems [29]. Nonetheless, studies indicate that organizations characterized by participatory leadership, supportive communication, and employee-centered management practices demonstrate stronger organizational learning outcomes and more effective knowledge dissemination processes [15]. This highlights the importance of designing integrated behavioral models capable of addressing both structural and human dimensions of knowledge management implementation.

Despite the growing body of literature on HRM, sustainability, digital transformation, and knowledge management, significant conceptual and empirical gaps remain regarding the specific behavioral values required for effective knowledge management implementation. Existing studies often examine isolated variables such as leadership, technological readiness, or organizational culture independently, while limited attention has been devoted to constructing comprehensive behavioral value models integrating ethical, relational, motivational, managerial, and knowledge-oriented dimensions simultaneously [30]. Furthermore, many studies emphasize technological aspects of knowledge management while underestimating the central role of behavioral adherence and value congruence in sustaining knowledge-oriented organizational cultures [2].

In addition, the increasing complexity of modern organizational environments necessitates multidimensional frameworks capable of integrating behavioral ethics, collaborative learning, organizational support, innovation orientation, and knowledge-sharing mechanisms within unified conceptual structures [17]. Such models are particularly relevant for organizations operating in dynamic and competitive contexts where employee behavior directly influences organizational adaptability, innovation capability, and sustainable development outcomes. Consequently, identifying the components of behavioral value adherence within knowledge management implementation can provide both theoretical and practical insights for organizational policymakers, HR managers, and knowledge management specialists.

Furthermore, educational and humanistic perspectives emphasize that organizational standards and governance mechanisms should not merely function as control systems but should also promote empowerment, participation, and human development [31]. In this regard, behavioral value adherence within knowledge management frameworks should be understood as a developmental and participatory process aimed at strengthening ethical commitment, organizational trust, collective learning, and shared responsibility among employees. Such an approach aligns with emerging perspectives advocating human-centered organizational systems capable of balancing technological efficiency with ethical and relational sustainability.

Overall, the literature suggests that behavioral values constitute foundational prerequisites for successful knowledge management implementation. Organizational trust, ethical communication, collaborative learning, participatory leadership, motivational reinforcement, innovation support, and transparent managerial systems collectively shape employees' willingness to engage in knowledge-oriented behaviors. However, the absence of integrated models identifying and organizing these behavioral components remains a significant challenge for organizations seeking to institutionalize knowledge management practices effectively. Therefore, the present study aims to identify the components of the human resource behavioral values adherence model within the framework of knowledge management implementation.

Methodology

The present study was conducted using a qualitative research approach with an applied-developmental orientation. The primary purpose of the study was to identify and conceptualize the dimensions and components of organizational infrastructure development in the field of human capital within Mahshahr Gas Company. Given the exploratory nature of the research problem and the need to gain an in-depth understanding of organizational experiences, managerial perceptions, and human capital development mechanisms, a qualitative design was considered the most appropriate methodological approach. The study was carried out as a field-based qualitative investigation in which data were collected directly from knowledgeable individuals within the organizational setting.

The qualitative phase of the research focused on exploring the underlying dimensions, concepts, and relationships associated with organizational infrastructure development in the area of human capital. The unit of analysis in this study was the individual expert. Accordingly, participants were selected from among managers, senior specialists, and experienced personnel working in Mahshahr Gas Company who possessed substantial knowledge and professional experience related to organizational management, human resource development, organizational culture, and operational processes. The selection of experts was based on the assumption that individuals with extensive organizational experience and direct involvement in strategic and operational activities could provide rich and meaningful insights into the phenomenon under investigation.

The study population consisted of organizational experts who met specific inclusion criteria. These criteria included having at least five years of effective professional experience in Mahshahr Gas Company or related sectors, occupying managerial, supervisory, or specialized positions in areas such as human resources, planning, operations, or organizational management, possessing direct familiarity with organizational policies and processes, and demonstrating willingness and capability to participate in in-depth interviews. These criteria were established to ensure the richness, relevance, and credibility of the collected qualitative data.

Sampling was conducted using purposive sampling, which is widely employed in qualitative research when the objective is to select information-rich participants capable of providing deep insights into the studied phenomenon. In this study, participant selection was guided by the informational value and professional experience of potential interviewees rather than statistical representativeness. The sampling process continued until theoretical saturation was achieved. Theoretical saturation refers to the stage at which additional interviews no longer contribute new concepts, categories, or insights to the analysis process. In the present study, saturation was achieved after conducting interviews with fourteen experts, at which point data collection was concluded.

The research was conducted within the organizational context of Mahshahr Gas Company. Concentrating on this organization provided a suitable context for identifying the dimensions of organizational infrastructure and human capital development due to its operational structure, managerial complexity, and human resource characteristics. The findings of the qualitative phase were intended to generate an analytically transferable framework applicable to organizations with similar structural and operational characteristics within the gas and energy industry.

Data were collected through semi-structured interviews, which served as the primary qualitative data collection instrument in this study. Semi-structured interviewing was selected because it allows researchers to maintain a coherent conceptual framework while simultaneously providing flexibility to explore emerging themes, experiences, and perceptions

in greater depth during the interview process. This method is particularly appropriate for exploratory qualitative studies aimed at model development and conceptual extraction.

The interview guide was developed based on the theoretical foundations of the study, previous literature in the fields of organizational infrastructure and human capital development, and the objectives of the research. The main interview topics focused on issues such as organizational coordination and integration, employee commitment, human resource empowerment, organizational adaptability, managerial support mechanisms, human capital development practices, and the organizational factors influencing infrastructure development in the human capital domain. Although a general structure guided the interviews, the sequence and depth of questions were adjusted according to participants' responses and the natural flow of the discussion.

The interviews were conducted individually in an environment that ensured participants' comfort and confidentiality. Prior to each interview, informed consent was obtained from the participants, and they were informed about the objectives of the study, the voluntary nature of participation, and the confidentiality of the collected information. Each interview was recorded with participants' permission and subsequently transcribed verbatim for analysis. The duration of interviews varied depending on the depth and breadth of participants' experiences and explanations.

To enhance the credibility and trustworthiness of the data collection process, several qualitative rigor strategies were employed. These included prolonged engagement with the data, continuous comparison of emerging concepts, participant validation of interpretations, and careful documentation of the data collection and analysis procedures. In addition, efforts were made to minimize researcher bias by grounding interpretations in participants' actual statements and experiences.

The qualitative data obtained from the semi-structured interviews were analyzed using thematic analysis. Thematic analysis was selected because it provides a systematic and flexible approach for identifying, analyzing, and interpreting meaningful patterns and themes within qualitative data. This analytical approach is particularly suitable for studies aimed at discovering conceptual dimensions and constructing theoretical frameworks grounded in participants' experiences and perceptions.

The analysis process began with repeated reading and close examination of the interview transcripts in order to achieve deep familiarity with the data. During the initial stage, meaningful statements and significant units of information related to organizational infrastructure development and human capital were identified and coded. These initial codes represented fundamental concepts extracted directly from participants' narratives and experiences.

In the subsequent stage, similar and related codes were grouped together to form preliminary categories and themes. The identified themes were then reviewed, refined, and compared continuously to ensure internal consistency and conceptual distinction among categories. Through iterative analysis and constant comparison, broader dimensions and conceptual relationships were identified, resulting in the extraction of the principal dimensions and components associated with organizational infrastructure development in the field of human capital.

The final stage of analysis involved defining and naming the themes and clarifying the relationships among them to develop a coherent conceptual framework. The analysis process ultimately led to the identification of the major dimensions underlying organizational infrastructure development within Mahshahr Gas Company and contributed to the construction of a context-specific conceptual model grounded in empirical organizational experiences.

To facilitate systematic coding, organization, and retrieval of qualitative data, the MAXQDA software package was utilized throughout the analysis process. The software supported efficient management of interview transcripts, coding procedures, thematic categorization, and conceptual mapping, thereby enhancing the transparency, rigor, and consistency of the qualitative analysis.

Findings and Results

The qualitative sample consisted of 14 experts from Mahshahr Gas Company. Most participants were male (85.7%), while women constituted 14.3% of the sample. In terms of age, the largest group was between 40 and 49 years old (50.0%), followed by participants aged 30–39 years (28.6%) and those aged 50 years and above (21.4%). Regarding education, 50.0% held a master's degree, 35.7% held a bachelor's degree, and 14.3% held a doctoral degree. In terms of work experience, most participants had 11–15 years of service (35.7%), followed by 16–20 years (28.6%), 5–10 years (21.4%), and more than 20 years (14.3%). The participants also represented different organizational positions, including senior managers, middle managers, supervisors, and senior experts. This composition indicates that the interviewees had sufficient professional maturity, managerial insight, and organizational familiarity to provide rich qualitative data for identifying the dimensions and components of organizational infrastructure development in the field of human capital.

Table 1

Demographic Characteristics of Interviewed Experts (N = 14)

Characteristic	Category	Frequency	Percentage	Interviewee Codes
Gender	Male	12	85.7%	A1–A12
	Female	2	14.3%	A13, A14
Age Group	30–39 years	4	28.6%	A1, A6, A9, A14
	40–49 years	7	50.0%	A2, A3, A4, A7, A10, A11, A13
	50 years and above	3	21.4%	A5, A8, A12
Education	Bachelor's degree	5	35.7%	A3, A5, A8, A10, A12
	Master's degree	7	50.0%	A1, A2, A4, A6, A9, A11, A14
	Doctoral degree	2	14.3%	A7, A13
Work Experience	5–10 years	3	21.4%	A1, A6, A14
	11–15 years	5	35.7%	A2, A4, A9, A11, A13
	16–20 years	4	28.6%	A3, A7, A10, A12
	More than 20 years	2	14.3%	A5, A8
Organizational Position	Senior manager	4	28.6%	A2, A5, A8, A13
	Middle manager	5	35.7%	A3, A4, A7, A10, A12
	Supervisor	3	21.4%	A1, A9, A11
	Senior expert	2	14.3%	A6, A14
Field of Expertise	Human resources	4	28.6%	A2, A5, A10, A13
	Operations and technical affairs	5	35.7%	A3, A4, A7, A9, A12
	Planning and development	3	21.4%	A1, A6, A14
	Safety and quality	2	14.3%	A8, A11

The first stage of qualitative analysis produced 48 initial codes from the interview transcripts. After repeated review, deletion of repetitive or non-applicable items, and refinement of overlapping concepts, 31 final codes were retained. These codes reflected the most relevant indicators of management culture and organizational infrastructure development in the field of human capital. The extracted codes covered issues such as transparency of values, systemic thinking, delegation of authority, strategic participation, human resource training, information management, competency-based selection, teamwork, organizational mobility, job enrichment, and commitment to organizational values.

Table 2*Final Extracted Codes from the Qualitative Interviews*

No.	Extracted Code
1	Clear expression of principles and values
2	Development of systemic thinking
3	Improvement of quality standards
4	Supervision of proper task performance
5	Participation in strategic decisions
6	Delegation of authority and trust in employees
7	Rational decision-making
8	Alignment of training with human resource needs
9	Appropriate training process
10	Strengthening information management
11	Participation of employees and managers in training processes
12	Selection of employees based on competence
13	Hard work and speed in performing tasks
14	Attention to individual capabilities
15	Initiative in work
16	Belief in employees' abilities and use of all capacities
17	Tireless effort
18	Empathy and social spirit
19	Team orientation, unity, and synergy
20	Expansion of group and team work
21	Enhancement of team spirit
22	Creation of an atmosphere of empathy, cooperation, and self-belief
23	Organizational mobility
24	Dynamism, knowledge retention, and acceptance of training capable future managers
25	Reduction of organizational gaps
26	Motivation of managers and employees and creation of a competitive atmosphere
27	Enhancement of organizational commitment
28	Strong managerial decision-making toward strategic goals
29	Strengthening organizational identity
30	Belief in organizational values
31	Belief in organizational visions

The thematic analysis showed that the final codes were organized into eight basic themes, four organizing themes, and two overarching themes. The first overarching theme was organizational infrastructure development in the field of human capital, which consisted of coordination and integration as well as work commitment. Coordination and integration included organizational transparency and delegation of authority, while work commitment included development and learning as well as skill and expertise. The second overarching theme was management culture, which consisted of human resource empowerment and work adaptation. Human resource empowerment included assigning responsibility to individuals and teamwork, while work adaptation included dynamism and creativity as well as attitudes and values.

Table 3.*Final Themes, Organizing Themes, Basic Themes, and Codes*

Overarching Theme	Organizing Theme	Basic Theme	Number of Codes	Main Codes
Organizational infrastructure development in human capital	Coordination and integration	Organizational transparency	4	Clear expression of principles and values; systemic thinking; quality standards; proper supervision
		Delegation of authority	3	Participation in strategic decisions; delegation and trust; rational decision-making
	Work commitment	Development and learning	4	Training aligned with needs; appropriate training process; information management; participation in training
		Skill and expertise	3	Competency-based selection; hard work and speed; attention to individual capabilities

Management culture	Human resource empowerment	Assigning responsibility to individuals	4	Initiative; belief in employee abilities; tireless effort; empathy and social spirit
		Teamwork	4	Team orientation; expansion of teamwork; team spirit; empathy and cooperation
	Work adaptation	Dynamism and creativity	4	Organizational mobility; knowledge retention; reduction of organizational gaps; competitive motivation
		Attitudes and values	5	Organizational commitment; strategic decision-making; organizational identity; organizational values; organizational vision

The reliability of the qualitative coding was examined through intercoder agreement. Three interviews were independently coded by the researcher and a trained research colleague. The total number of codes was 76, with 23 agreements and 17 disagreements. Based on the reliability formula, the overall intercoder reliability was 60%, which was considered acceptable for confirming the consistency of the qualitative coding process. Theoretical saturation was also achieved after the twelfth interview, and the thirteenth and fourteenth interviews only confirmed and enriched the existing categories without producing new themes. Participant review, expert review, and rich description were also used to strengthen the credibility and confirmability of the qualitative findings.

Discussion and Conclusion

The present study aimed to identify the dimensions and components of organizational infrastructure development in the field of human capital in Mahshahr Gas Company using a qualitative thematic analysis approach. The findings revealed that organizational infrastructure development in the human capital domain is formed around two overarching themes, namely organizational infrastructure development in the field of human capital and management culture. These overarching themes were further categorized into four organizing themes, including coordination and integration, work commitment, human resource empowerment, and work adaptation, as well as eight basic themes encompassing organizational transparency, delegation of authority, development and learning, skill and expertise, assigning responsibility to individuals, teamwork, dynamism and creativity, and attitudes and values. The findings demonstrate that human capital infrastructure in operational and technical organizations is a multidimensional phenomenon that extends beyond traditional human resource functions and incorporates managerial, cultural, structural, and behavioral dimensions.

One of the major findings of the study was the significance of coordination and integration as a foundational dimension of organizational infrastructure development. This organizing theme consisted of organizational transparency and delegation of authority. The findings indicated that experts considered transparent communication of organizational principles and values, systemic thinking, supervision of work processes, and clear quality standards as essential requirements for strengthening organizational coordination. These findings are consistent with studies emphasizing the role of structural capital and organizational systems in supporting institutional effectiveness and technical development (Sichinava, 2024 #427601; Pelaez, 2024 #427593). Structural and organizational capital create consistency in organizational behavior and reduce ambiguity in decision-making processes. In the context of Mahshahr Gas Company, transparency and coordination appear to function as mechanisms for reducing operational uncertainty and strengthening collective understanding among employees and managers.

The identified role of delegation of authority further indicates that organizational infrastructure development requires participatory management and employee involvement in strategic processes. The experts emphasized participation in strategic decision-making, rational decision-making, and trust-based delegation as critical dimensions of effective

infrastructure. This finding aligns with studies highlighting the importance of employee voice, participatory leadership, and human agency in organizational effectiveness {Irawanto, 2023 #427618; Lin, 2021 #427627}. Organizations that decentralize authority and encourage participation are more likely to develop adaptive and knowledge-oriented work systems. In operational organizations such as gas companies, where rapid decisions and coordination between units are essential, empowering employees through delegated authority can improve responsiveness, accountability, and organizational cohesion.

Another important finding was the identification of work commitment as a core organizing theme. Work commitment consisted of development and learning as well as skill and expertise. The participants emphasized that organizational infrastructure in the field of human capital depends heavily on the alignment of training with organizational needs, effective educational processes, information management, and competency-based employee selection. These findings support previous research showing that human capital development strategies significantly improve employee productivity, organizational readiness, and institutional performance {Ositadimma, 2025 #331000; Purwanto, 2025 #332617; Saadah, 2022 #427609}. Organizations that systematically invest in learning and employee capability development are better prepared to adapt to technological and managerial changes.

The findings related to development and learning also confirm the growing importance of knowledge management and learning organizations in modern institutions. Participants stressed that educational participation, knowledge sharing, and continuous learning are essential for sustaining organizational capability. This result is consistent with studies suggesting that knowledge management infrastructure and intellectual capital are major determinants of organizational performance and sustainability {Smuts, 2022 #427590; Wang, 2021 #427625; Kucharska, 2022 #427589}. In knowledge-intensive and technically complex organizations such as gas companies, learning infrastructures contribute not only to employee competence but also to organizational continuity, operational safety, and innovation capacity.

The study further revealed that skill and expertise represent another critical component of organizational infrastructure development. The experts highlighted competency-based recruitment, individual capability recognition, and professional work discipline as key indicators of effective human capital management. This finding aligns with previous studies emphasizing the strategic value of intellectual capital and competence-based human resource systems {Barpanda, 2021 #427598; Faiz, 2023 #427615; Zakiy, 2024 #427619}. Human capital becomes organizationally valuable when employee expertise is systematically identified, developed, and integrated into organizational processes. In the context of Mahshahr Gas Company, the emphasis on expertise reflects the operational sensitivity of the gas industry, where organizational performance is highly dependent on technical precision and professional capability.

Human resource empowerment emerged as another major organizing theme in the study. This dimension included assigning responsibility to individuals and teamwork. The findings indicated that experts considered employee initiative, trust in employee abilities, social empathy, and responsibility-sharing as central to organizational empowerment. These findings correspond with research demonstrating that empowerment-oriented organizational cultures improve performance, engagement, and organizational sustainability {Ariyanto, 2024 #427624; Rahmani, 2025 #332182}. Empowerment creates a sense of ownership among employees and encourages proactive behavior, which is especially important in organizations facing complex operational challenges.

The emphasis on teamwork and collaborative culture was another notable result of the study. The participants consistently highlighted team orientation, group cooperation, synergy, and collective problem-solving as essential dimensions of organizational infrastructure. These findings are supported by studies emphasizing the role of social capital and relational capital in improving organizational and project performance {Sulayem Saleh Musallam Saeed, 2021 #427613;Sahebnazar, 2023 #427612}. Team-based organizational cultures strengthen communication, facilitate knowledge exchange, and improve coordination between organizational units. In operational environments such as gas companies, teamwork is particularly important because organizational tasks are highly interconnected and often require coordinated technical and managerial responses.

The findings also identified work adaptation as a central organizing theme composed of dynamism and creativity as well as attitudes and values. The experts believed that organizational mobility, knowledge retention, future-oriented managerial development, and the creation of competitive and motivating work environments are necessary for sustaining organizational adaptability. These results are consistent with research on organizational redesign, innovation ecosystems, and adaptive organizational systems {Munjirin, 2024 #427608;Gong, 2024 #427604;Omelyanenko, 2023 #427617}. Organizations operating in dynamic technological and economic environments must continuously adapt their structures, managerial systems, and human resource practices. In the gas industry, where operational technologies and environmental conditions evolve rapidly, adaptability and creativity become strategic organizational capabilities.

The identified importance of attitudes and values further demonstrates that organizational infrastructure development is deeply connected to management culture. The findings showed that organizational commitment, strategic orientation, organizational identity, belief in organizational values, and alignment with organizational vision are among the most influential cultural dimensions. This finding is consistent with studies indicating that organizational culture and value orientation significantly influence innovation, sustainability, and institutional performance {Ramirrez-Urraya, 2022 #427621;Syahidun, 2024 #427614}. Organizational values provide employees with a shared sense of direction and reinforce commitment to collective goals. In the context of Mahshahr Gas Company, cultural cohesion and value alignment appear to support organizational stability and operational reliability.

Another important implication of the findings is that organizational infrastructure development in the field of human capital is inherently interconnected with digital transformation and technological capability. The identified themes of information management, systemic thinking, learning, and adaptability reflect the increasing need for organizations to integrate human and technological infrastructures. Previous studies have shown that digital transformation affects organizational performance primarily through the mediating role of human capital {Kampoowale, 2026 #407655;Pratama, 2024 #427594}. Therefore, organizations that fail to strengthen their human capital infrastructure may encounter difficulties in implementing technological and managerial innovations effectively.

The study also contributes to the broader literature on intellectual capital and organizational capability by demonstrating that human capital infrastructure is not limited to individual employee characteristics. Rather, it emerges from the interaction between organizational systems, managerial culture, social relationships, knowledge processes, and institutional structures. This interpretation is consistent with previous findings indicating that intellectual capital includes human, structural, social, and innovation dimensions that collectively shape organizational outcomes {Chatterji, 2022 #427592;Gross-Gołacka, 2021

#427605;Marchiori, 2023 #427600}. The present findings extend this understanding by identifying the specific dimensions through which these components manifest within the organizational context of a gas company.

Furthermore, the findings highlight the contextual nature of organizational infrastructure development. Although many previous studies have explored intellectual capital, organizational performance, and human resource development in sectors such as higher education, manufacturing, tourism, and entrepreneurship ecosystems, the present study provides evidence from the gas industry in Iran {Dewi, 2022 #427606;Adebanjo, 2023 #427628;Jamali, 2025 #427599}. The extracted dimensions and themes reflect the operational realities, managerial conditions, and organizational culture of Mahshahr Gas Company. Therefore, the study offers a context-specific conceptual framework that may assist similar energy-sector organizations in identifying and strengthening their human capital infrastructures.

The reliability and validity procedures employed in the study further support the credibility of the findings. The achievement of theoretical saturation after the twelfth interview, the acceptable intercoder agreement, participant review, and expert validation indicate that the extracted themes were grounded in participants' experiences and organizational realities. The use of thematic analysis and systematic coding also enabled the researchers to identify both explicit and latent organizational dimensions associated with human capital infrastructure development.

Overall, the findings suggest that organizational infrastructure development in the field of human capital is a multidimensional and culturally embedded process that requires coordinated attention to structural systems, managerial practices, employee empowerment, organizational learning, teamwork, adaptability, and value orientation. The study demonstrates that sustainable organizational performance in the gas industry depends not only on technical resources but also on the organizational capacity to develop, support, and integrate human capital within a coherent managerial and cultural framework.

One of the limitations of the present study was that it was conducted within a single organizational context, namely Mahshahr Gas Company, which may limit the transferability of findings to organizations with different structures, cultures, or operational conditions. In addition, the study relied exclusively on qualitative interviews with organizational experts, meaning that the findings were based on participants' perceptions and experiences. Although theoretical saturation and credibility strategies were achieved, the absence of quantitative validation may restrict the generalizability of the extracted framework. Another limitation relates to the operational sensitivity of the gas industry, which may have limited participants' willingness to discuss certain managerial or structural challenges in full detail.

Future research is recommended to examine the identified dimensions and components through quantitative or mixed-method approaches in order to validate the proposed framework statistically. Comparative studies between organizations in different sectors of the energy industry may also provide a deeper understanding of the contextual and sector-specific determinants of human capital infrastructure development. Additionally, future studies may investigate the relationship between organizational infrastructure dimensions and variables such as organizational resilience, innovation performance, employee engagement, digital readiness, and operational safety. Longitudinal studies could further explore how organizational infrastructure development evolves over time in response to technological, economic, and managerial changes.

From a practical perspective, managers of gas and energy organizations should prioritize the development of transparent managerial systems, participatory decision-making structures, and competency-based human resource policies.

Organizational leaders should invest in continuous learning programs, knowledge management systems, and empowerment-oriented work environments that encourage teamwork, initiative, and innovation. Establishing mechanisms for organizational learning, employee participation, and value alignment can strengthen organizational adaptability and improve long-term performance. In addition, attention to organizational culture, trust-building, and professional commitment can help organizations create a sustainable human capital infrastructure capable of responding effectively to future operational and technological challenges.

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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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