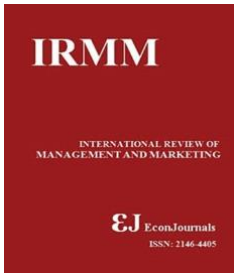

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Human Capital Development as a Driver of Sustainable Development: The Mediating Role of Innovation Capability in the UAE

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ABSTRACT

Despite increasing recognition of human capital development (HCD) as a foundation for national progress, little is known about how it accelerates sustainable development outcomes. Prior studies have primarily examined human capital from an economic perspective, overlooking the mechanisms that transform workforce investments into broader sustainability outcomes. To address this gap, this paper aims to explore the mediating role of innovation capability on the relationship between HCD and sustainable development, conceptualized through economic, social, and environmental dimensions. Drawing upon resource-based and capability perspectives, this study develops and tests the proposed model using data collected from 384 employees working in government organizations in the United Arab Emirates. Structural equation modeling was applied to examine direct and indirect relationships. The results reveal that HCD exerts a significant positive effect on sustainable development. Moreover, innovation capability was found to mediate this relationship by enabling knowledge, skills, and competencies to translate into economic, social, and environmental sustainability outcomes. This study is among the first to analyze the mediating role of innovation capability on the relationship between HCD and sustainable development in the context of the United Arab Emirates. The findings contribute to theory by integrating HCD with sustainability research and provide practical implications for policymakers seeking to align workforce strategies with national sustainability agendas.

Keywords: Human Capital Development, Innovation Capability, Sustainable Development, Economic Sustainability, Social Sustainability, Environmental Sustainability, United Arab Emirates
JEL Classifications: M12

1. INTRODUCTION

In the past decade, human capital development (HCD) has become one of the most critical priorities for governments and organizations worldwide as they seek to sustain growth and achieve long-term competitiveness (Arshad, 2023; Mishra, 2017). The role of human capital is being redefined as education, training, health, and lifelong learning are no longer seen only as drivers of productivity but also as strategic enablers of innovation and sustainability (Saiyed et al.,2025; Poulose et al., 2024). Thus, the concept of "HCD" is emerging to amalgamate workforce skills with broader social and environmental objectives, making nations more adaptive, knowledge-driven, and capable of achieving sustainable progress in dynamic economic environments (Singh et al., 2022). A long with the rapid expansion of HCD, sustainable development has become as a vital driver for the future survival and prosperity of societies from sustainability perspectives.

The pursuit of sustainable development seeks to minimize harmful impacts on ecosystems while promoting inclusive growth and social equity (Mensah, 2019). Thus, sustainability has become of utmost critical as the global community faces risks of climate change, resource scarcity, and demography. Studies have established that HCD and sustainability play a tremendous role in

shaping resilient societies, and this alignment has the potential to create more sustainable societies in the future (Estoque and Wu, 2024; Vasilev et al., 2023). Based on that, achieving this integration requires national-level commitment to lead the transformation process to be strategic investments in education, training, and healthcare systems (Kulkov et al., 2023). Therefore, the first guiding question of this study is:

RQ1: How does human capital development impact sustainable development?

Many scholars argue that linking HCD to sustainability requires organizations and governments to design new strategies, frameworks, and policies that create long-term value (Alkaraan et al., 2024; Qahtani and Alsmairat, 2023). This has lead in a stream of efforts focusing on how investments in skills, knowledge, and workforce readiness can be effectively aligned with sustainability agendas. Furthermore, the development of these strategies often creates trade-offs between meeting immediate labor market needs and preparing for future sustainability goals, requiring societies to strengthen their capacity to innovate (Bali Swain and Yang-Wallentin, 2020; Nayyar and Malhotra, 2023). Hence, we argue that innovation capability is the dynamic capacity of nations and organizations to transform human capital into new products, services, and processes that foster sustainability while remaining adaptive to emerging challenges (Hao et al., 2019; J Nair et al., 2024).

On the other hand, the literature has highlighted the role that innovation capability plays in enabling sustainability through HCD (Chaudhuri et al., 2023). This perspective emphasizes that human capital investments acquire greater value when supported by innovation systems that drive resource efficiency, social inclusivity, and environmental responsibility (Carayannis et al., 2022). Innovation capability thus creates the mechanisms through which knowledge, education, and skills are converted into sustainable-oriented practices involving multiple stakeholders across value chains (Benitez et al., 2022; Zhu, 2024). The existing body of researches have provided some initial understanding of how human capital contributes to growth and competitiveness. Furthermore, management and organizational research has extensively recognized the importance of innovation capability in accelerating the relationship between resources and sustainability outcomes (Liu and Liang, 2024; Taghizadeh et al., 2024). However, the previous studies remains silent on how innovation capability mediates the relationship between HCD and sustainable development across its three pillars—economic, social, and environmental. To fill these research gaps, our study aimed to address the following research question:

RQ2. How does innovation capability mediate the relationship between human capital development and sustainable development, conceptualized across economic, social, and environmental dimensions?

To answer our research questions, we develop a theoretical model which we validate using survey data from 384 employees working in government organizations in the United Arab Emirates by applying structural equation modeling techniques. We build on the resource-based view (RBV) and the dynamic capability view (DCV) in our assumptions to explain the links, which we believe represent the unique contribution of this study. The rest of the paper is structured as follows. Section 2 represents the theoretical background and hypothesis development. Section 3 outlines the research methodology. Then the empirical results represented in Section 4. Section 5 discusses the findings of the study a long with the conclusion, implications, limitations, and recommendations for future research.

2. THEORETICAL BACKGROUND

In the past decade, nations and organizations have faced growing level of uncertainty along with increasing sustainability pressures, enforcing to be conscious of the strategic value of human resources and their continuous development (Garrigós-Simón et al., 2021). Therefore, scholars investigating management and sustainability often rely on the RBV theory to explain how human capital contributes to long-term value creation (Arda et al., 2023). Thus, we suggest expanding RBV theory with two enhanced theoretical lenses, the DCV and the PBV. DCV has emerged as one of the most influential perspectives in strategic and human resources management (Mele et al., 2024). DCV extends RBV by explaining that organizations and nations can gain and sustain advantages in dynamic environments when they are able to reconfigure and redeploy their resources, especially human capital, in ways that foster adaptability and innovation (Pitelis et al., 2024). Dynamic capabilities, also known as higher-order capabilities allow business to integrate, transform, and reconfigure their resources to meet emerging social, economic, and environmental challenges.

Despite varied definitions, there is broad agreement that dynamic capabilities consist of "identifiable and specific routines" operating at different levels—individual, managerial, and organizational (Kim et al., 2015). In prior studies, the application of DCV to conceptualize innovation and human resource development has extensively investigated (Ashraf et al., 2024). HCD through investments in education, training, skills, and health—creates the foundation for innovation capability, which in turn drives sustainable outcomes (Al-Tit et al., 2022). This incorporation enables individuals and organizations to transform knowledge into innovative solutions that address economic competitiveness, social inclusion, and environmental protection. In the context of dynamic capability, this process is not limited to knowledge creation alone but extends to reconfiguring entire systems of practices, involving individuals, teams, and institutions. Thus, HCD is likely to influence societies, organizations, and entire economies, shaping the pathways through which sustainability is achieved (Boon et al., 2018). To enable this transformation, governments and organizations must develop not only educational systems but also innovation infrastructures that convert skills into sustainable practices, supported by systematic learning at all levels.

However, resource-based and dynamic capabilities perspectives do not fully explain why organizations or nations differ in leveraging human capital for sustainability. Here, the PBV provides additional explanatory power. PBV asserts that entities often do not exploit all possible practices that could enhance their performance, even when these practices are publicly available and transferable across contexts (Fleury et al., 2018). Accordingly, HCD initiatives may

yield better outcomes when they are aligned with proven practices in innovation and sustainability management.

As discussed by (Zubac et al., 2010) resources identified by RBV and even higher-order capabilities in DCV may not always deliver value unless integrated with practices that embed learning, inclusivity, and innovation into everyday operations. Based on the PBV, we can better understand how innovation capability is developed through concrete practices such as research collaboration, training programs, digital innovation hubs, and sustainability-driven projects. Thus, PBV helps bridge the link between HCD and sustainability by identifying the role of innovation practices in fostering economic, social, and environmental performance. These practices, supported by national policies and organizational strategies, create systematic routines for embedding sustainability into workforce development. Along these lines, HCD reinforced by innovation capability may raise the level of sustainability outcomes both at the organizational level and across broader institutional boundaries (Albloush et al., 2022).

In line with the tenets of RBV, DCV, and PBV, we theorize and develop our research model. As shown in Figure 1, the linear progress path of the model follows a PBV framework (Bromiley & Rau, 2016), where the explanatory construct (HCD) builds higher-order capabilities (innovation capability), which then drive practices aligned with economic, social, and environmental sustainability outcomes. RBV explains the foundational importance of resources, DCV captures their transformation into dynamic innovation capabilities, and PBV clarifies how these capabilities are enacted through transferable practices that deliver sustainable development.

3. HYPOTHESES DEVELOPMENT

3.1. Human Capital Development and Sustainable Development

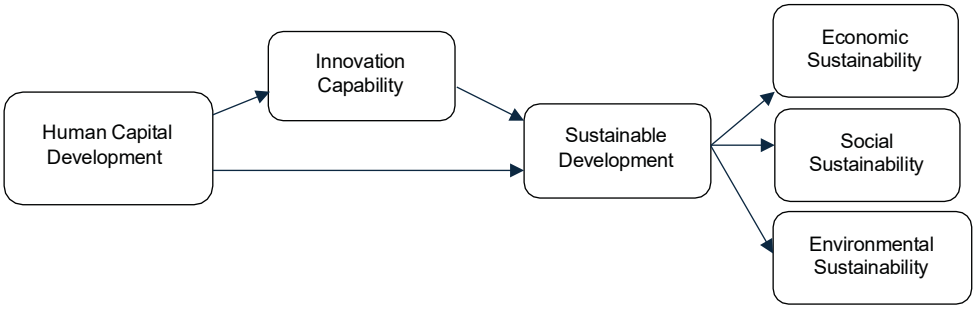
Sustainable development has recently more attention in the human capital studies (Vasilev et al., 2023). The existing literature supports the critical role of HCD in achieving higher sustainability in national and organizational performance (Albloush et al., 2022; Mensah, 2019). This contribution is usually related to the economic and social dimensions of sustainability. For instance, (Mhlanga, 2022) found that HCD, through investments in education and training, effectively improves productivity and competitiveness, thereby strengthening long-term economic growth. (Akbar et al., 2024) concluded that improvements in workforce health and skills development reduce poverty, enhance social equity, and promote inclusive participation, which are essential components of social sustainability.

Furthermore, the current research is increasingly focusing on the environmental benefits of HCD. For instance, (Wang et al., 2022) found that a workforce equipped with sustainability-oriented education and training has significant potential to improve environmental performance through green practices, resource efficiency, and reduced emissions. (Shahzad et al., 2022) emphasized that sustainability-focused innovation training supports organizations in adopting clean technologies and environmentally friendly operations. Several benefits outcomes can be achieved such as increased awareness of ecological issues, the integration of environmental responsibility into organizational culture, and greater employee involvement in green initiatives.

More holistically, Bekele et al., (2024) demonstrated that HCD—when strategically aligned with sustainability goals—can positively impact all three pillars of development: economic, social, and environmental. Furthermore, several studies have proved that different components of HCD contribute to sustainable development outcomes. Alkhaldi et al., (2023) linked investments in workforce readiness to the achievement of national development strategies, particularly in emerging economies such as the UAE. Gerhart and Feng, (2021) stated that systematic management of human capital resources enhances transparency, efficiency, and responsible resource use, which are vital for sustainability.

Overall, existing literature pointed out that it appears to be a positive basic consensus that HCD is a backbone for sustainable strategies across nations and organizations. Although the role of human capital is now more explicitly acknowledged and distinguished from related concepts such as human resource management or training (Singh et al., 2022), the relationship between HCD and the three dimensions of sustainability is still ambiguous in the literature. Several studies have indicated the potential mediating role of innovation capability, but the scope and mechanisms of these interrelationships remain underexplored (Shou et al., 2017). However, the results of previous studies could support us to conceptualize the direct and indirect impact of HCD on economic, social, and environmental sustainability. Several scholars have recommended that HCD incorporates profound changes in reshaping organizational processes, societal values, and environmental awareness (UNDP, 2020; World Bank, 2022). Therefore, it is proposed that the capabilities built

Figure 1: Research model



through education, skills, and training could promote sustainable development by making knowledge more communicable, transferable, and applicable across economic, social, and environmental contexts.

Authors such as (Albloush et al., 2022; Bekele et al., 2024) suggested that innovation-oriented HCD acts as a catalyst for embedding sustainability in business and policy agendas. At the organizational and national levels, it has been established that HCD provides not only technical expertise but also managerial and leadership competencies to integrate sustainability into strategic planning (Akbar et al., 2024). Moreover, as sustainable development highlights the simultaneous pursuit of economic, social, and environmental objectives, it has also been raised that strong human capital systems could induce significant progress toward national sustainability strategies (UN, 2015; OECD, 2021). Thus, we propose that:

H_1: Human capital development positively affect sustainable development.

$H_{1.1}$: Human capital development positively affect Economic Sustainability.

$H_{1.2}$: Human capital development positively affect Social Sustainability.

$H_{1.1}$: Human capital development positively affect Environment Sustainability.

3.2. Human Capital Development and Innovation Capability

On another note, HCD has shown a positive association with innovation capability. several studies have indicated a positive association between education and training programs and the development of organizational innovation (Haile and Tüzüner, 2022), Other aspects of human capital, such as health, leadership, and employee well-being, have also positively influenced creativity, problem-solving, and the ability to adopt new practices (Hillberg Jarl, 2024). However, there appears to be a general tendency in the literature that HCD could assist organizations and societies build the capacity to generate, absorb, and apply knowledge, enabling them to use resources more efficiently and achieve higher innovation outcomes. The extant literature highlighted different ways to establish this link and to mitigate related barriers. For instance, (Liu, 2023) mentioned a set of practical mechanisms through which education and professional training strengthen innovation systems. Importantly, they stated that a proficient way to build innovation capability is through systematic investment in people and continuous skills upgrading. Casanova et al., (2023) further emphasized that sustainability-oriented education and professional development programs can bridge current skill exploitation with future knowledge exploration. Furthermore, HCD harnesses human assets and knowledge capital (Kianto et al., 2017), fosters innovation capabilities (Diebolt and Hippe, 2019), and bridges the capacity of current knowledge application with future opportunities for exploration. Prior studies argued that a proper HCD strategy contributes to enhancing innovation capability, enabling organizations and nations to achieve adaptability, creativity, and improved sustainable performance (Chaudhuri et al., 2023). All these arguments lead to the following hypothesis:

H_2. Human capital development has a significant positive effect on innovation capability.

3.3. The Mediating effect of Innovation Cabapilitty on the Relation between Human Capital Development Capabilities and Sustainable Development

Previous studies addressed the relation between innovation capability and sustainable development. For instance, the effect of innovation on sustainability is addressed by (Ortiz-Avram et al., 2024) arguing that innovation-driven utilization of organizational knowledge and resources is required to adopt and implement sustainable strategies. In there studies, Severo et al., (2017) proved that innovation capability within organizations had a critical sustainability impact across all three sustainability dimensions. Moreover, (Liu and Liang, 2024; Okunade et al., 2022) suggested that innovation capability embedded in HCD would reduce organizational shortages and improve long-term performance. Overall, there appears to be a positive fundamental tone in the literature about the effect of innovation capability on sustainable development. In general, the literature proves the positive relationship between innovation capability and sustainable performance.

Besides, innovation capability may provide a a significant opportunity to achieve higher sustainable development with the ongoing enhancement of human capital. (Chen et al., 2023) pointed out that innovation plays a vital role in preventing organizations from the natural tendency for polarized development that emphasizes either economic or environmental priorities. On the other hand, in the long term, this narrow approach could be counterproductive and susceptible to placing organizations in challenging situations. This oucome support in the study of (Maine et al., 2020) confirming that higher sustainable outcomes could be attained by recognizing and reconciling divergences and tensions between knowledge exploration and exploitation.

Furthermore, HCD harnesses human asset capital and knowledge capital, fosters innovation capabilities, and bridges the capability of current knowledge exploitation to future and projected knowledge exploration (Al-Tit et al., 2022; Okunade et al., 2022; Vasilev et al., 2023). Prior studies argued that a proper integration of HCD with innovation strategies contributes to enhancing organizational capabilities, enabling the reach of advanced innovation outcomes and improving sustainable performance (Bekele et al., 2024; Diebolt and Hippe, 2019). Hence, we hypothesize that:

H_3: Innovation capability mediates the relation between Human capital development capabilities and sustainable development.

Accordingly, the following research model is proposed:

4. RESEARCH METHOD AND DATA ANALYSIS

Using a judgmental sampling technique, 384 government employees in the United Arab Emirates were surveyed. To test the proposed research hypotheses, we collected data using a questionnaire-based survey from public organizations. Although

this sampling strategy is prone to researcher bias, it offers an advantage in recruiting participants based on their expertise and knowledge pertinent to the subject under investigation. This ensured the representativeness of the study sample. A screening question was used to ensure that respondents had direct involvement in HCD initiatives, innovation activities, or sustainability-related projects. The survey was emailed to employees across the selected Governmental organizations. Our sample comprised 384 respondents, where males constituted 62% of the sample.

To reduce the potential threats of common method variance (CMV), we engaged key informants within these organizations, chosen based on their in-depth knowledge of their organization's workforce development policies, innovation capability, and sustainability initiatives. This approach guarantees participants' engagement with the subject of interest. In addition, the anonymity and confidentiality of the participants was assured (Podsakoff et al., 2003). Harman's single-factor test was used to test CMV, and the results indicated that one factor explained 28.3% of the variance, which is less than the 50% threshold (Podsakoff et al., 2003). As for the research measures, the target participants (i.e., employees) have heavy and busy schedules and to reduce their cognitive efforts and confusion, multi-item scales were adapted and operationalized to capture the concrete and observable dimensions of HCD, innovation capability, and sustainable development. HCD was measured using six items, Innovation capability was measured using five items, Sustainable development was measured across its three dimensions: Economic sustainability with four items, social sustainability with five items, and environmental sustainability with four items.

SEM includes statistical procedures for measurement testing, functional, predictive, and causal hypotheses. SmartPLS software version 4 was employed to analyze the survey data. The analysis was conducted in two stages. The initial stage involved assessing the reliability and construct validity of the scales, followed by testing the research hypotheses related to HCD, innovation capability, and sustainable development, following the recommendations of leading scholars (Hair et al., 2019).

5. RESULTS

5.1. Measurement Model

The validity and reliability of the measurement items were assessed using factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) following the recommendations by (Hair et al., 2019). The results in Table 1 below outline that all items had loadings above 0.8, which is considered excellent, indicating that each item was strongly representative of its corresponding construct. The alpha and CR values of all constructs exceeded 0.9, demonstrating high internal consistency (Hair et al., 2019). Besides, the results shown that the AVE values for all constructs were greater than the 0.50 threshold, confirming sound convergent validity.

Next, discriminant validity was measured using the Fornell-Larcker criterion (Fornell and Larcker, 1981). The results in Table 2 indicate that the square root of each construct's AVE was greater than its correlations with other constructs. Thus, we inferred that the operationalized measures for HCD, innovation capability, and sustainable development demonstrated adequate discriminant validity.

5.2. Assessment of Structural Model

In the aftermath of bias and normality checks, construct validity was further assessed. The coefficient of determination (R^2) values demonstrated strong explanatory power, with $R^2 = 0.379$ for Innovation Capability, $R^2 = 0.604$ for Economic Sustainability, $R^2 = 0.731$ for Social Sustainability, and $R^2 = 0.611$ for Environmental Sustainability. These results suggest that HCD has substantial predictive relevance for Innovation Capability and that, together, these constructs explain a significant portion of the variance in the three dimensions of Sustainable Development. Furthermore, the standardized root mean square residual (SRMR) was employed as a model fit index to capture the average discrepancy between observed correlations and those predicted by the model. The SRMR value was 0.046, which is below the recommended threshold of 0.08, indicating that the structural model achieved an excellent fit with the observed data.

Table 1: The measurement model assessment

Construct	Item	Factor loading	Mean	SD	Cα	CR	AVE
Human capital development (HCD)	HCD1	0.84	4.25	0.76	0.821	0.845	0.611
	HCD2	0.87	4.18	0.81			
	HCD3	0.86	4.12	0.79			
	HCD4	0.90	4.30	0.74			
	HCD5	0.85	4.21	0.83			
	HCD6	0.88	4.28	0.78			
Innovation capability (IC)	IC1	0.86	4.34	0.72	0.836	0.853	0.632
	IC2	0.89	4.40	0.75			
	IC3	0.88	4.32	0.78			
	IC4	0.91	4.29	0.70			
	IC5	0.87	4.37	0.74			
	IC6	0.90	4.36	0.73			
	IC7	0.92	4.41	0.71			
Economic sustainability (SD-Eco)	Eco1	0.84	4.20	0.79	0.910	0.839	0.620
	Eco2	0.88	4.24	0.76			
	Eco3	0.87	4.27	0.74			
	Eco4	0.89	4.31	0.73			
Social sustainability (SD-Soc)	Soc1	0.85	4.23	0.80	0.828	0.850	0.662
	Soc2	0.87	4.28	0.78			
	Soc3	0.90	4.35	0.75			
	Soc4	0.89	4.32	0.77			
	Soc5	0.91	4.38	0.72			
Environmental sustainability (SD-Env)	Env1	0.86	4.22	0.79	0.915	0.844	0.637
	Env2	0.88	4.30	0.76			
	Env1	0.87	4.25	0.77			
	Env2	0.90	4.36	0.74			

SD: Standard deviation

Table 2: Discriminant validity (Fornell-Larcker criterion)

Construct	HCD	IC	SD-Eco	SD-Soc	SD-Env
HCD	**0.843**				
IC	0.692	**0.856**			
SD-Eco	0.641	0.688	**0.849**		
SD-Soc	0.622	0.670	0.695	**0.873**	
SD-Env	0.610	0.659	0.678	0.702	**0.858**

SD: Standard deviation, Note: Bold values are the square root of AVE

This study employed PLS-SEM to test the proposed hypotheses, adopting a bootstrapping approach with 5,000 resamples to estimate path coefficients (β) and assess their statistical significance through t-values. This rigorous non-parametric procedure ensures robustness in evaluating the hypothesized direct and mediating relationships. Figure 2 provides a summary of the structural model and the results obtained.

The structural model assessments presented in Table 3. The analysis results represent that the direct effect of HCD on innovation capability is positive and significant at the 1% level (Path coeff. = 0.715, P < 0.001); hence, H1 is supported.

However, the effects of innovation capability on the three sustainability dimensions are not statistically significant: innovation capability → Economic (Path coeff. = 0.08, P = 0.057), innovation capability → Social (Path coeff. = 0.06, P = 0.108), and innovation capability → Environmental (Path coeff. = 0.05, P = 0.139). Accordingly, H_{2a}–H_{2c} are not supported. Likewise, the direct paths from HCD to the sustainability dimensions are not significant (P > 0.05), indicating that the hypothesized direct effects on economic, social, and environmental sustainability are not supported. Consistent with these results, the bootstrapped indirect effects (HCD → innovation capability → Sustainability) also fail to reach significance (P > 0.05), providing no evidence for the mediating role of innovation capability under the current data. The overall model fit remains acceptable (SRMR = 0.046), but the non-significant paths suggest that additional antecedents or alternative mechanisms may be required to explain variance in the sustainability outcomes.

While testing the mediating impact of innovation capability between HCD and sustainable development, we noted that innovation capability has positive and significant mediating effects on the relationship between HCD and overall sustainable development (β = 0.398, P < 0.001) and between HCD and economic sustainability (β = 0.120, P = 0.001). However, the mediating effect of innovation capability on the paths between HCD and social sustainability and environmental sustainability was not significant (P > 0.05). The result confirms the mediation role of innovation capability in the HCD → sustainable development path, providing evidence in favor of H_3 and $H_{3.1}$. This finding aligns with the view that strengthening innovation capability is essential to convert human-capital investments into measurable sustainability outcomes within resource-based and dynamic capability perspectives.

6. DISCUSSION

Public and governmental institutions are increasingly mobilizing new people-centred and innovation-oriented practices to enhance system efficiency, coordination, and long-term sustainability. Despite the clear sustainable potential of such practices, the specific pathway from HCD, through innovation capability, to sustainable development has received comparatively little scholarly attention. Addressing this void, we drew on the practice-based view (PBV) to focus on leveraging concrete, imitable routines—targeted upskilling, knowledge sharing, cross-functional problem-solving, and collaborative research—and on the dynamic capability view

Figure 2: The path model

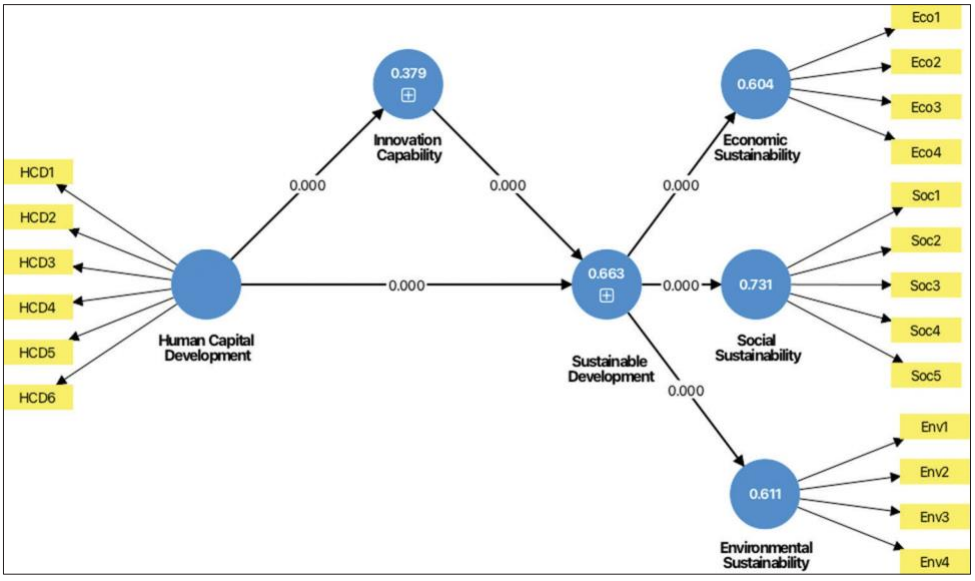


Table 3: Direct hypothesis results

Hypothesis	Original sample	Sample mean	Standard deviation	T-statistics	P-values
H_1: Human Capital_ Development -> Sustainable _Development	0.237	0.237	0.039	6.134	0.000
$H_{1.1}$: Human Capital_ Development -> Economic Sustainability	0.088	0.090	0.046	1.907	0.057
$H_{1.2}$: Human Capital_ Development -> Social_ Sustainability	−0.064	−0.065	0.040	1.605	0.108
$H_{1.3}$: Human Capital_ Development ->Environmental_Sustainability	0.069	0.068	0.046	1.481	0.139
H_2: Human Capital_ Development -> Innovation _Capability	0.616	0.617	0.032	19.071	0.000

Note: p < 0.05 were considered statistically significant.; p ≥ 0.05 not significant.

Table 4: Indirect hypothesis results

Hypothesis	Original sample	Sample mean	Standard deviation	T-statistics	P-values
H_3: Human Capital_ Development -> Innovation _Capability -> Sustainable _Development	0.398	0.398	0.033	12.070	0.000
$H_{3.1}$: Human Capital_ Development -> Innovation _Capability -> Economic Sustainability	0.120	0.120	0.035	3.436	0.001
$H_{3.2}$: Human Capital_ Development -> Innovation _Capability -> Environmental_ Sustainability	−0.004	−0.003	0.035	0.120	0.905
$H_{3.3}$: Human Capital_ Development -> Innovation _Capability -> Social_ Sustainability	−0.044	−0.045	0.027	1.637	0.102

Note: $p < 0.05$ were considered statistically significant.; $p \geq 0.05$ not significant.

(DCV) to explain how innovation capability operates as a higher-order capacity that converts people investments into sustained outcomes. Based on our analyses outcomes, the empirical findings paint an instructive picture that extends the existing body of knowledge about the relationship between HCD, innovation capability, and sustainable development. Table 4 presents a concise outline of evidence in support or non-support of the proposed hypotheses. Conjointly, these results carry substantial implications for current theory by opening new research questions and by offering actionable avenues to managers seeking human-capital-driven, innovation-enabled sustainability.

Specifically, while prior studies using the resource-based view (RBV) and DCV have argued that people-based resources and organizational capabilities enable higher sustainability performance (Acar and Polin, 2015; Al-Shammari, 2023), many arguments hinged on the assumption that building skills or adding resources would, on its own, drive better decisions and outcomes. Yet, as several scholars suggest, realized sustainability is about the whole system, boosted by transformational and innovative work practices that strengthen knowledge sharing, access, responsible use, regeneration, organization, and reuse of resources to deliver services and products faster, more efficiently, and more sustainably (Akbar et al., 2024; Alkhaldi et al., 2023; Al-Tit et al., 2022). In this sense, the critical issue is not only how much human capital is accumulated, but how that human capital is configured into innovation routines that reliably translate skills into sustainable results.

In line with PBV, our findings assert that HCD was found to promote innovation capability (first hypothesis supported). In other words, investments in education, training, and knowledge systems can be leveraged through transformational people practices to drive innovative business models while seeking more sustainable interaction and value creation across organizational and inter-organizational settings. This constitutes a novel contribution, because prior research often concentrated on human capital inputs while neglecting the swift movement toward new people-centred operating models and complementary managerial change needed to achieve higher sustainable development outcomes.

In addition to that, innovation capability was found to positively affect the relationship between HCD and sustainable development, and to mediate this relationship significantly. This finding corroborates earlier work suggesting that successful operational and strategic changes are strongly shaped by the organization's capacity to generate, absorb, and apply new ideas, thereby delivering economic benefits—productivity gains, cost efficiencies, and improved resource use—that register as measurable sustainability outcomes (Cordeiro et al., 2023; Gasco-Hernandez et al., 2022). At the same time, the indirect effects on social sustainability and environmental sustainability, while positive in sign, did not reach statistical significance. This pattern indicates partial mediation and implies that additional complementary mechanisms—stakeholder engagement, green governance processes, environmental incentives, and cross-agency coordination—may be necessary to convert human-capital investments into tangible social inclusion and ecological performance. In line with this interpretation, when combined with complementary social and environmental practices, are more likely to yield strong social and ecological outcomes than HCD alone. The traditional view that equates human-capital accumulation with sustainable development therefore risks overlooking how people capabilities must be coupled with purpose-built innovation routines and sustainability infrastructures to realize their full impact.

Finally, the overall picture is an integrated path from HCD to sustainable development that runs through innovation capability. For theory, this refines RBV, DCV, and PBV by specifying which people-centred practices actually carry effects forward and by highlighting where additional social and environmental enablers are required. For practice, the results indicate that managers should pair workforce development with explicit innovation pipelines tied to sustainability targets; embed mechanisms for social inclusion and environmental stewardship; and monitor realization using variance explained, overall model fit, and bootstrapped indirect effects to ensure that human-capital investments materialize as a pathway—through innovation capability—to durable economic, social, and environmental outcomes.

7. CONCLUSION

The relationship between HCD and sustainable development has been widely discussed in the literature due to the pressure on public institutions and industries to meet sustainability goals while improving short-term efficiency and coordination. Therefore, the primary aim of this study was to examine the distinct and joint effects of HCD and innovation capability on sustainable development across its economic, social, and environmental dimensions. These two approaches have often been separated and studied individually, and their combined effect—and the concrete pathway that links them—has been largely overlooked.

Based on the analysis of the interrelationships between these approaches and their effects on achieving higher sustainable development, our findings propose a set of highly relevant paths that contribute to the outcome. First, integrating innovation capability directly into the relationship between HCD and sustainable development yields a significant indirect effect at the aggregate level and a clear impact on the economic dimension. Second, implementing HCD backed by structured innovation systems (for example, problem-solving routines, knowledge-sharing mechanisms, and collaborative project pipelines) provides a practical route to realize productivity gains, cost efficiencies, and improved resource use. Third, for social and environmental outcomes, innovation capability needs to be coupled with complementary practices—such as stakeholder engagement, green governance, environmental incentives, and cross-agency coordination—which can substitute for purely training-led approaches when the direct effects of HCD are weak, thereby helping to reconcile the sustainability dilemma.

Taken together, these results address initial debates that tended to provide a narrow picture of how people investments translate into sustainability and that often led to conflicting viewpoints. By showing that the realized pathway runs from HCD through innovation capability to sustainable development—while also identifying where complementary practices are required—this study provides a broader and more integrated account of the human-capital–sustainability nexus. We argue that our findings offer several relevant implications that advance theory on people-centred sustainability and furnish clear directions for policy makers and managers: prioritize HCD that is explicitly configured as innovation systems; align those systems with economic targets where effects are strongest; and bolster social and environmental results by embedding partnership, governance, and incentive mechanisms that help convert capability into inclusive and ecological performance.

7.1. Theoretical Implications

Our results contribute to the theoretical literature on people-centred operations and sustainability in several ways. First, as noted earlier, our study is among the first to examine the combined effects of HCD and innovation capability on sustainable development across its economic, social, and environmental dimensions, rather than treating these levers in isolation. In doing so, the study provides empirical evidence that complements prior work—often predominantly conceptual—on how people resources can be converted into sustainability outcomes through capability building. Framed within RBV and DCV, and interpreted through the practice lens of PBV, our results specify the realized pathway from HCD to sustainable development through innovation capability and clarify where this pathway is strongest (economic) and where additional complementary practices are needed (social and environmental).

Second, at the level of construct specification, we advance the literature by offering a granular perspective on HCD, innovation capability, and sustainable development (disaggregated into economic, social, and environmental outcomes), together with a transparent set of validated sub-constructs and measures for government organizations. These measurement models were statistically verified for reliability and for convergent and discriminant validity, enabling researchers to reuse and compare the instruments in future investigations and across contexts.

Third, the implications drawn from our findings open new theoretical questions about boundary conditions and configurational effects in the human-capital–innovation–sustainability nexus. In particular, the pattern of supported mediation at the aggregate and economic levels, alongside non-significant mediation for social and environmental outcomes, directs attention to complementary practices (for example, stakeholder engagement, green governance routines, and incentive systems) as potential catalysts that PBV would recognize as transferable and imitable. This helps to reconcile mixed findings in prior work by positing that people investments realize their sustainable potential when embedded in practice architectures that channel capability into targeted outcomes.

Fourth, our analytical approach contributes methodologically to this stream of research. The use of structural equation modeling for hypothesis testing, complemented by post-hoc configurational analysis using fuzzy-set qualitative comparative analysis, enables the examination of both net-effects and asymmetric causal configurations. Such a dual lens helps overcome well-known limitations of single-method models (for example, sensitivity to collinearity and reduced power in higher-order interactions) when theorizing about complex capability-practice-outcome systems (Fiss, 2011). Together, these contributions refine RBV and DCV by identifying which people-centred practices PBV would deem consequential, and they provide a cumulative platform for future theory building on how human capital is converted, via innovation capability, into robust and context-sensitive sustainable development.

7.2. Managerial Implications

Beyond theoretical contributions, our findings offer practical guidance for senior officials and managers who seek to turn people investments into measurable sustainability outcomes. First, the evidence shows that HCD is a powerful lever for building innovation capability. Managers should treat training, education, and knowledge systems not as stand-alone programmes but as the front end of an innovation pipeline. Concretely, this means pairing upskilling with structured experimentation, cross-functional problem-solving teams, idea-to-pilot processes, and incentives for learning by doing. When HCD is configured in this way, organizations are more likely to realise economic sustainability benefits such as productivity gains, cost efficiency, and improved resource use.

Second, because innovation capability mediated the relationship between HCD and sustainable development overall—and specifically for the economic dimension—leaders should align workforce initiatives with explicit innovation targets linked to sustainability key performance indicators. This includes setting challenge statements tied to cost, waste, and resource intensity; allocating protected time and seed funding for pilots; and establishing governance routines for scaling successful solutions.

At the same time, the non-significant mediation for social and environmental outcomes signals that complementary practices are required. Managers should embed stakeholder engagement, green governance processes, environmental incentives, and inter-agency collaboration so that people development also translates into inclusion, wellbeing, and ecological performance.

Third, before committing to heavy investment, organizations should diagnose current capability at three levels—operational, managerial, and individual—and map gaps against sustainability priorities. A simple readiness assessment can guide whether to emphasise foundational skills (for example, project management, data literacy), innovation routines (for example, design thinking, rapid experimentation), or sustainability enablers (for example, green procurement, community partnerships). The strategic orientation matters: Units seeking rapid economic gains can prioritise innovation capability tied to efficiency challenges; units targeting social and environmental impact should pair the same innovation routines with dedicated mechanisms that reward citizen outcomes and environmental stewardship.

Fourth, managers should redesign performance systems so that human-capital efforts are judged by realised innovation and sustainability value, not only by training hours delivered. Practical steps include: linking promotion and appraisal to participation in improvement projects; using impact dashboards to track variance explained in key outcomes; and reviewing indirect effects from HCD through innovation capability to ensure that people investments are actually flowing into sustainable results.

Finally, the results point to an integrated path—HCD feeding innovation capability, which then drives sustainable development. Leaders can operationalise this path through a staged roadmap: (1) build a baseline of skills and shared language; (2) institutionalise innovation routines and cross-boundary teams; (3) connect those routines to economic, social, and environmental targets; and (4) reinforce with governance, incentives, and partnerships. Following this sequence will help organizations convert people investments into durable gains across the three pillars of sustainability while avoiding the common pitfall of training that does not reach practice or impact.

7.3. Limitations and Scope for Future Research

Despite the numerous contributions, we should recognize certain limitations to this study. First, the data collected for this study relied on subjective measures, thereby increasing the subjectivity of the findings despite using single knowledgeable respondents within each organization. Therefore, we solicit future research to use more objective indicators and longitudinal designs to evaluate the reliability and stability of our results. Second, our study's conceptual model does not include the dynamic environment that may set strong boundary conditions, which could promote or constrain the conversion of HCD into innovation capability and sustainable development. Third, our sample predominantly comprises public organizations from the United Arab Emirates. Thus, an issue of respondents' familiarity with the studied practices may arise, and the generalizability of the results to private sectors or other country contexts may be limited.

Future research could assess the role of a dynamic environment in amplifying or mitigating tensions while translating HCD into innovation capability and, in turn, into sustainable development. Moreover, advanced studies could investigate the combined effects of HCD, innovation capability, and complementary sustainability practices at the system level, which may better capture external tensions and the complexities surrounding these topics. Researchers are also encouraged to extend the analysis to multiple countries and sectors, incorporate multi-source data, and compare alternative model specifications to refine and broaden the current evidence base.

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