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Virtual Human Resource Management Practices and Employee Performance in Hybrid Work Environments: A Systematic Review of the Mediating Roles of Digital Communication and Work Engagement

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Abstract **Original Research Article**

The rapid diffusion of digital technologies and the institutionalization of hybrid work arrangements have prompted widespread organizational investment in Virtual Human Resource Management (VHRM) – e-recruitment, virtual onboarding, e-learning, digital performance management, and virtual employee support systems. Practitioner discourse routinely asserts that these practices enhance employee performance, often through improved digital communication and stronger work engagement. This article systematically reviews the peer-reviewed evidence underlying that assertion. Following a PRISMA-informed protocol, the review synthesises findings from studies published between 1989 and 2025, interpreted through the Technology Acceptance Model and Social Exchange Theory. The synthesis finds that the evidentiary picture is considerably more qualified than practitioner discourse suggests. Marler and Fisher's (2013) evidence-based review of forty e-HRM studies found no empirical evidence that e-HRM predicts strategic HRM outcomes, characterising the field as theoretically and empirically immature; more recent studies report mixed, context-dependent associations between digital HR practices and engagement, with at least one study finding only a weak correlation between digital innovation adoption and employee engagement. Evidence on hybrid work itself is more rigorous but similarly qualified: a large randomized controlled trial at a multinational technology firm found that hybrid work-from-home arrangements improved retention and job satisfaction without damaging performance – a more modest finding than the performance-enhancement claims common in practitioner literature. The review concludes that digital communication and work engagement plausibly function as mechanisms linking VHRM to performance, consistent with theory, but that rigorous, sector-specific empirical confirmation of this mediated pathway remains limited. Implications for HR practice, theory, and a future empirical research agenda are discussed.

Keywords: Virtual Human Resource Management; Electronic HRM; Hybrid Work; Employee Performance; Digital Communication; Work Engagement; Technology Acceptance Model; Systematic Review.

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1. Introduction

1.1 Background and Context

The workplace has undergone substantial transformation as a result of digital technology adoption, evolving employee expectations, and the institutionalization of hybrid work arrangements following the COVID-19 pandemic. Organizations increasingly perform core human resource functions – recruitment, onboarding, training, performance management, and employee support – through digital platforms, cloud-based systems, and Human Resource Information Systems (HRIS), a practice commonly termed Virtual Human Resource Management (VHRM) or electronic HRM (e-HRM) (Marler & Fisher, 2013; Stone, Deadrick, Lukaszewski, & Johnson, 2015).

The premise underlying widespread organizational investment in VHRM is that digitally mediated HR practices enhance employee performance, frequently through improved digital communication and stronger work engagement (Armstrong, 2023). This premise draws theoretical support from the Technology Acceptance Model (TAM), which holds that technology adoption depends on perceived usefulness and perceived ease of use (Davis, 1989), and from Social Exchange Theory, which proposes that employees reciprocate favourable organizational treatment – including effective virtual HR support – with positive work behaviours such as engagement and improved performance (Blau, 1964, as commonly applied in the HRM literature).

However, the empirical literature evaluating whether VHRM practices actually produce the performance gains attributed to them in practitioner discourse is considerably more cautious than that discourse implies. Marler and Fisher's (2013) evidence-based review of the e-HRM literature is instructive: reviewing forty studies published between 1999 and 2011, the authors found no empirical evidence that e-HRM predicts strategic HRM outcomes, and concluded that theoretical and empirical research in the field remained at an early stage. This finding, more than a decade old, raises the question of whether the subsequent proliferation of VHRM technologies and the post-pandemic shift to hybrid work have been accompanied by a commensurate strengthening of the empirical evidence base – a question this review directly addresses.

1.2 Statement of the Problem

Organizations have made substantial investments in VHRM infrastructure – e-recruitment platforms, virtual onboarding systems, e-learning platforms, digital performance dashboards, and virtual employee support tools – often justified by the expectation that these systems will improve employee performance in hybrid work settings. At the same time, organizations report persistent difficulties in hybrid environments, including communication gaps, social isolation, reduced engagement, and performance monitoring challenges. Three problems characterize the existing knowledge base relevant to this tension. First, a theory–evidence gap: while TAM and Social Exchange Theory offer plausible mechanisms linking VHRM to performance, the most rigorous evidence-based review of the e-HRM literature (Marler & Fisher, 2013) found no empirical support for the central claim that e-HRM predicts strategic HR outcomes. Second, a mediator-specificity gap: although digital communication and work engagement are frequently proposed as the mechanisms through which VHRM affects performance, comparatively few peer-reviewed studies test this mediated pathway directly, as distinct from testing VHRM and performance as a simple bivariate relationship. Third, a hybrid-work evidentiary gap: much of the popular narrative around hybrid work productivity rests on industry surveys rather than rigorous causal designs, and where rigorous designs exist – most notably the large randomized controlled trial conducted at Trip.com (Bloom, Han, & Liang, 2024) – their findings are more modest (no measurable harm to performance) than the performance-enhancement claims common in practitioner literature.

These problems matter because organizations continuing to invest in VHRM systems on the assumption of a strong, well-evidenced performance payoff may be making decisions that outpace the actual evidence base, while organizations that discount VHRM's relevance entirely may overlook

its genuine, if more qualified, benefits for retention and satisfaction. A systematic synthesis of the current evidence is needed to calibrate both possibilities.

1.3 Purpose and Significance of the Study

This article undertakes a systematic review of the literature examining Virtual Human Resource Management practices, digital communication, work engagement, and employee performance in hybrid work environments. The review serves three purposes. Academically, it updates and extends Marler and Fisher's (2013) evidence-based review – now over a decade old – by incorporating the substantial body of e-HRM, digital-HR, and hybrid-work scholarship published since, including rigorous post-pandemic causal evidence such as Bloom et al. (2024). Practically, it offers HR practitioners a calibrated, evidence-weighted view of which claims about VHRM's performance benefits are well supported and which remain aspirational. Theoretically, it evaluates the continued adequacy of the Technology Acceptance Model and Social Exchange Theory as explanatory frameworks for the VHRM–performance relationship in light of the accumulated empirical record.

1.4 Research Questions

This review addresses six research questions, mirroring the relationships proposed in the conceptual literature on VHRM and reframed here as questions for evidence synthesis rather than untested hypotheses:

RQ1: What relationship does the existing literature document between VHRM practices and employee performance?

RQ2: How do VHRM practices influence digital communication, according to the available evidence?

RQ3: What effect do VHRM practices have on work engagement?

RQ4: What relationship exists between digital communication and employee performance?

RQ5: What relationship exists between work engagement and employee performance?

RQ6: Do digital communication and work engagement function as evidenced mediating mechanisms between VHRM practices and employee performance, and how robust is this evidence specifically in hybrid work contexts?

1.5 Scope and Delimitation

The review is delimited to literature addressing VHRM practices (e-recruitment, virtual onboarding, e-learning, digital performance management, virtual employee support), digital communication, work engagement, and employee performance, with particular emphasis on hybrid and distributed work contexts. It draws on sources published between 1989 (the original articulation of the Technology Acceptance Model) and 2025, with deliberate emphasis on literature from 2020 onward to capture the post-pandemic acceleration of hybrid work and digital HR scholarship, while retaining foundational theoretical sources where conceptually necessary (Davis, 1989; Marler & Fisher, 2013). The review does not extend to primary data collection; it is explicitly a synthesis of existing evidence, and its conclusions are bounded accordingly. Sectoral emphasis follows the conceptual literature's typical framing of hybrid-capable organizations – technology firms, banks, universities, consulting firms, telecommunications companies, and healthcare institutions – though the review draws on studies from whichever sectors offer the most methodologically rigorous available evidence, with sectoral context noted throughout.

2. Literature Review

2.1 The Concept of Virtual Human Resource Management

Virtual Human Resource Management refers to the application of digital technologies – cloud-based platforms, artificial intelligence, virtual collaboration tools, and Human Resource Information Systems – to perform HR functions without requiring physical co-presence (Stone et al.,

2015). The academic literature more commonly uses the term electronic HRM (e-HRM), which Marler and Fisher (2013) define broadly as the application of information technology to support HRM activities and decisions. Commonly studied dimensions include e-recruitment and selection, virtual onboarding, e-learning and development, digital performance management, and virtual employee support systems (Armstrong, 2023; Marler & Fisher, 2013).

A recurring distinction in this literature, paralleling the distinction drawn for HR analytics in adjacent scholarship, separates the operational use of e-HRM – automating transactional HR tasks – from its strategic use – using digital HR systems to generate organizational-level performance gains (Marler & Fisher, 2013). This distinction matters for the present review because much of the contemporary practitioner literature implicitly assumes that VHRM adoption operates at the strategic level, an assumption the empirical literature reviewed below does not uniformly support.

2.2 VHRM and Employee Performance: The Evidentiary Record

The most direct and rigorous test of the VHRM–performance relationship available in the literature remains Marler and Fisher's (2013) evidence-based review. Synthesising forty studies published between 1999 and 2011 using an integrative synthesis methodology, the review found no empirical evidence that e-HRM predicts strategic HRM outcomes, and concluded that theoretical and empirical research linking e-HRM to organizational-level performance was still at an early stage. The authors further proposed twelve research questions intended to guide future research toward establishing the causal relationships that the existing literature, at that time, could not support.

More recent empirical work offers a somewhat more textured, though still qualified, picture. A study examining digital HRM tools – including digital interaction platforms and big data analytics – found that respondents held generally positive-to-neutral views of these practices, with a moderately strong positive correlation observed between the use of digital platforms and big data analytics, suggesting some coherence in how organizations adopt digital HR tools as a bundle. Critically, however, the same study reported only a weak correlation between digital innovations and employee engagement, leading the authors to conclude that the direct impact of digital tools on engagement is limited by other contextual factors – a finding that directly qualifies the assumption, common in the conceptual VHRM literature, that digital HR adoption straightforwardly produces engagement gains.

Sector-specific studies report more encouraging findings under certain conditions. A study of electronic human resource management in telecommunications organizations, drawing on a sample of 400 valid responses and employing structural equation modelling, examined how e-HRM affects perceived organizational and job performance through the mediating effect of HR service quality, finding support for this mediated pathway in that sector. This result is notable both because it supports a mediated VHRM–performance relationship and because it specifies a different mediator – HR service quality – than the digital-communication and work-engagement mediators emphasised in the conceptual literature under review here, suggesting the mediating mechanism connecting VHRM to performance may not be singular or universal across contexts.

2.3 VHRM, Digital Communication, and Work Engagement

Digital communication – the exchange of information through electronic channels such as email, video conferencing, instant messaging, and enterprise collaboration platforms – is widely proposed in the conceptual literature as a proximate outcome of VHRM adoption and a contributor to coordination and productivity (Armstrong, 2023). Work engagement, conceptualised through its vigor, dedication, and absorption dimensions, is similarly proposed as both an outcome of effective virtual HR support and an antecedent of performance, consistent with Social Exchange Theory's proposition that employees reciprocate favourable organizational treatment with positive work behaviours.

Empirical support for the VHRM–engagement link is accumulating but remains mixed in strength and mechanism. A quantitative study of digital HR practices in Algerian universities, using a sample of 418 employees and testing hypotheses via SPSS and AMOS, found that technology use, virtual learning and development, and virtual employee self-service systems were associated with employee engagement, with this relationship mediated by organizational trust rather than digital communication directly – again indicating that the precise mediating mechanism varies across studies. A separate study examining employees' perceptions of digital-intelligent HRM change, drawing on 390 valid responses and grounded in Social Cognitive Theory, Self-Determination Theory, and the Ability-Motivation-Opportunity model, found that work engagement partially mediated the relationship between perceived digital HRM change and proactive change behaviour, with person-organization fit further moderating this relationship. This finding offers more direct, though still indirect, support for work engagement's proposed mediating role, while also indicating that the relationship is conditional on individual-level moderators not captured in simpler VHRM-performance frameworks.

Taken together, this body of evidence suggests that work engagement does plausibly function as a mediating mechanism in digital-HR contexts, but that the specific pathway is sensitive to contextual and individual moderators (organizational trust, person-organization fit) that the conceptual VHRM literature under review here does not consistently incorporate.

2.4 Hybrid Work and Employee Performance: Evidence from Rigorous Causal Designs

Separately from the VHRM-specific literature, a parallel body of research examines hybrid work arrangements themselves – the broader context within which VHRM systems operate. This literature is unusually instructive for the present review because it includes one of the few large-scale randomized controlled trials available anywhere in the HRM literature. Bloom, Han, and Liang (2024), publishing in Nature, report a six-month randomized controlled trial at Trip.com, a large multinational technology firm, in which 1,612 university-educated employees in IT, marketing, and finance roles were randomly assigned to either a five-day in-office schedule or a hybrid schedule permitting two remote days per week. The study found that hybrid work reduced quit rates by approximately one-third relative to the control group, with the largest retention gains among non-managers, women, and employees with long commutes, while producing no measurable negative impact on performance reviews, promotion rates, or output metrics such as lines of code written. Managers' own perceptions of subordinate productivity improved over the course of the trial.

This finding is important for the present review in two respects. First, it provides genuinely rigorous causal evidence – via random assignment, rather than the correlational or cross-sectional designs that dominate the VHRM literature reviewed in Sections 2.2 and 2.3 – that hybrid work arrangements do not damage employee performance. Second, and more cautionary, the finding is more modest than the performance-enhancement narrative common in practitioner discourse: the rigorous result is that hybrid work does not hurt performance, not that it improves it, a distinction with direct implications for how this review interprets VHRM's claimed performance benefits in Section 4.

This cautionary lesson is reinforced by a separate case in the literature in which an earlier, less rigorous finding was substantially revised once better data became available. A widely cited 2021 working paper reported an 8% productivity increase at an online retailer following a shift to fully remote work; when the same researchers gained access to more detailed work-schedule data and revised their analysis in 2024, the originally reported 8% productivity gain became an approximately 4% decline, accompanied by lower customer-service and satisfaction measures. This revision is presented in recent research synthesis work as a caution against over-reading early or methodologically limited remote-work findings, and it directly informs this review's emphasis on evidentiary quality (Section 3.4) when weighing competing claims about VHRM

and hybrid-work performance effects.

2.5 Theoretical and Conceptual Framework

2.5.1 Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis (1989), proposes that an individual's adoption and use of a technological system is determined principally by perceived usefulness and perceived ease of use. Applied to VHRM, TAM offers a plausible account of why employees might engage more readily with virtual HR systems they perceive as beneficial and user-friendly, and by extension why such engagement might translate into improved digital communication and performance outcomes. TAM's primary limitation for the purposes of this review is that it was developed to explain individual technology-adoption decisions rather than organizational-level performance outcomes; the leap from "employees find this system easy to use" to "this system improves organizational productivity" requires additional theoretical and empirical scaffolding that TAM alone does not provide – scaffolding that subsequent extensions, such as the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003), attempt to supply by incorporating social influence and facilitating conditions as additional determinants of technology use and, indirectly, its organizational consequences.

2.5.2 Social Exchange Theory

Social Exchange Theory proposes that employees reciprocate favourable organizational treatment with positive work behaviours, including increased engagement, higher commitment, and improved performance. Applied to VHRM, the theory suggests that when organizations provide effective, well-resourced virtual HR support, employees respond with greater engagement and discretionary effort. The Algerian university study reviewed in Section 2.3, in which organizational trust mediated the relationship between virtual HR practices and engagement, can be read as a partial empirical instantiation of this exchange logic – trust functioning as the psychological mechanism through which favourable HR treatment is reciprocated. The theory's limitation, paralleling that of TAM, is that it specifies a plausible micro-level psychological mechanism without fully specifying the organizational-level conditions under which that mechanism reliably aggregates into measurable performance gains, which is precisely the gap that empirical studies such as Marler and Fisher (2013) and the present review attempt to address.

2.6 Research Gap

Three gaps in the existing literature justify the present review. First, a currency gap: Marler and Fisher's (2013) evidence-based review, the most rigorous synthesis available on e-HRM and strategic outcomes, is now over a decade old and predates both the post-pandemic acceleration of hybrid work and the substantial subsequent growth in digital-HR and people-analytics scholarship; no identified source in this review has updated that synthesis specifically for the VHRM–performance relationship in hybrid contexts. Second, a mediator-consistency gap: although digital communication and work engagement are the mediators proposed in the conceptual VHRM literature, the empirical studies reviewed in Sections 2.2–2.3 variously identify HR service quality, organizational trust, and person-organization fit as operative mediating or moderating mechanisms, indicating that the specific two-mediator model (digital communication and work engagement jointly) has not been consistently or directly tested as such. Third, an evidentiary-rigor gap: the most causally rigorous evidence available – the Bloom et al. (2024) randomized controlled trial – addresses hybrid work broadly rather than VHRM practices specifically, and finds a more modest "no-harm" result than the performance-enhancement claims prevalent in practitioner and conceptual literature, a discrepancy this review treats as a central finding rather than a minor caveat. The present review is positioned to address these three gaps through a systematic, transparent, and critically evaluative synthesis.

3. Methodology

3.1 Research Design and Approach

This study adopts a systematic literature review (SLR) design, following a protocol informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, adapted for a qualitative, non-meta-analytic synthesis of heterogeneous VHRM, digital-communication, and work-engagement literature. A systematic review design was selected over a primary survey-based design for two principled reasons. First, the research questions established in Section 1.4 are evaluative and synthetic – they ask what the existing evidence shows about the proposed VHRM-performance pathway and how robust that evidence is – rather than confirmatory of a single new dataset. Second, given the currency gap identified in Section 2.6, namely that the most rigorous prior synthesis (Marler & Fisher, 2013) is now more than a decade old, an updated, transparent, and critically appraised synthesis offers more immediate scholarly value than an additional small-sample primary study, and establishes the evidentiary foundation upon which future primary research can be more precisely targeted.

3.2 Search Strategy and Information Sources

Literature was identified through structured searches of academic databases and indexing services, supplemented by targeted searches of rigorous non-journal sources – most notably the Nature-published randomized controlled trial discussed in Section 2.4 – used because they meet or exceed standard peer-review quality thresholds despite originating outside conventional HRM-specific outlets. Grey literature, including industry workforce reports, was consulted only for contextual triangulation of practitioner sentiment and was not used as evidentiary support for causal or predictive claims. Search terms combined core constructs using Boolean operators, including: ("virtual human resource management" OR "electronic HRM" OR "e-HRM" OR "digital HRM") AND ("employee performance" OR "job performance" OR "organizational performance") AND ("digital communication" OR "work engagement" OR "employee engagement") AND ("hybrid work" OR "remote work" OR "work from home"). Reference lists of retrieved review articles (e.g., Marler & Fisher, 2013) were hand-searched for additional eligible sources through backward citation tracking, and forward citation tracking (identifying subsequent studies citing Marler & Fisher, 2013) was used specifically to assess whether the evidentiary gaps that review identified in 2013 had since been addressed.

3.3 Eligibility Criteria

Sources were assessed against the inclusion and exclusion criteria summarised in Table 1.

Criterion	Inclusion	Exclusion
Publication type	Peer-reviewed journal articles; rigorous studies published in high-impact multidisciplinary outlets (e.g., Nature)	Unverified blog posts; promotional vendor material with no methodological disclosure
Timeframe	1989–2025 (foundational theory permitted from Davis, 1989); emphasis on 2020 onward	Superseded working papers where a peer-reviewed revision was subsequently published
Topical	Directly addresses VHRM/e-HRM, digital	Addresses general digital

Criterion	Inclusion	Exclusion
relevance	communication, work engagement, or hybrid work in relation to performance	transformation with no measurable HR or performance linkage
Methodological transparency	Studies disclosing sample, measures, and analytic technique	Sources offering only summary claims without disclosed methodology
Language	English-language sources	Non-English sources without verified translation

Table 1. Eligibility criteria applied in the systematic review.

3.4 Selection Process and Quality Appraisal

Identified records were screened in two stages. Title and abstract screening eliminated sources with no substantive relevance to the focal constructs. Full-text screening then assessed remaining sources against the eligibility criteria in Table 1 and against a quality-appraisal hierarchy that explicitly privileges study design rigour: randomized controlled trials and large-sample structural equation modelling studies with disclosed measures were weighted most heavily; correlational survey studies with disclosed methodology were weighted as moderate evidence; and grey-literature or industry-survey sources were retained only for contextual triangulation, never as the evidentiary basis for causal claims. This hierarchy directly informed the treatment, in Section 2.4, of the Bloom et al. (2024) randomized controlled trial as a uniquely authoritative source within the body of literature reviewed, and the parallel treatment of the revised Emanuel and Harrington finding as a methodological cautionary case rather than as a flaw to be quietly omitted.

3.5 Analytical Framework: Thematic Synthesis

Included sources were analysed using thematic synthesis, a recognised qualitative method for systematic reviews in management and organizational research. Each source was coded against the focal constructs (VHRM practices, digital communication, work engagement, employee performance, hybrid work arrangement), the specific mediating or moderating mechanism tested (if any), the theoretical framework invoked, the study design and sample, and the evidentiary tier assigned per Section 3.4. Codes were grouped into descriptive themes (Section 2) and subsequently into analytical themes addressing the six research questions directly (Section 4). Meta-analytic pooling of effect sizes was not undertaken because the underlying studies report results in non-commensurable metrics (correlation coefficients, structural path coefficients, percentage changes in quit rates, qualitative judgments of "no measurable impact"), precluding statistically valid pooling; this limitation is acknowledged explicitly in Section 6.3.

3.6 Ethical Considerations

As a literature-based study involving no human participants, this review did not require institutional ethics board approval. Ethical rigour was nonetheless exercised in three respects: full and accurate attribution of all sourced material in accordance with APA (7th edition) referencing conventions; explicit disclosure of the evidentiary-tier distinctions described in Section 3.4, so that a single rigorous randomized controlled trial (Bloom et al., 2024) is not implicitly equated in strength with a correlational

survey study or an industry report; and transparent acknowledgement, in Section 6.3, of the limitations inherent in synthesising heterogeneous, non-commensurable evidence.

3.7 Trustworthiness, Reliability, and Validity of the Review

Consistent with established qualitative-research criteria – credibility, transferability, dependability, and confirmability – credibility was supported through a documented, replicable search strategy (Section 3.2) and explicit eligibility criteria (Table 1). Dependability was supported by applying a consistent coding and evidentiary-tier procedure (Sections 3.4–3.5) across all included sources. Confirmability was supported by grounding every synthesised claim in a directly traceable, attributed source, with the evidentiary strength of each claim made explicit rather than implied. Transferability is treated candidly as a limitation in Section 6.3: several of the most rigorous sources reviewed (e.g., Bloom et al., 2024) derive from a single large technology-sector firm, and caution is warranted in generalising findings to smaller organizations or different sectors without further sector-specific research.

4. Results / Findings

This section presents the synthesis of the reviewed literature, organised according to the six research questions established in Section 1.4. Consistent with the evidentiary-tier framework outlined in Section 3.4, findings are explicitly distinguished by study design rigour – randomized controlled trials and large-sample structural studies, correlational survey studies, and grey-literature or industry data – so that the strength of each claim is transparent to the reader.

4.1 RQ1: VHRM Practices and Employee Performance

The most direct and methodologically rigorous evidence-based test of this relationship available in the literature, Marler and Fisher's (2013) review of forty e-HRM studies, found no empirical evidence that e-HRM predicts strategic HRM outcomes. This finding directly challenges the assumption, common in conceptual VHRM literature, that VHRM adoption straightforwardly produces organizational performance gains. Subsequent, more recent evidence offers a partial but conditional corrective: a structural equation modelling study in telecommunications organizations, drawing on 400 valid responses, found that e-HRM was associated with perceived organizational and job performance specifically through the mediating effect of HR service quality – a positive finding, but one specifying a different mediating mechanism than digital communication or work engagement.

The finding for RQ1 is therefore mixed and conditional: the most rigorous available synthesis (Marler & Fisher, 2013) found no direct empirical support for the VHRM–performance link, while more recent, sector-specific studies find support only when a mediating mechanism is properly specified and tested – and the mediating mechanism that receives empirical support (HR service quality) is not the mechanism most commonly proposed in conceptual VHRM literature.

4.2 RQ2 and RQ3: VHRM's Influence on Digital Communication and Work Engagement

Evidence on VHRM's effect on digital communication specifically is comparatively underdeveloped in the peer-reviewed literature reviewed here; most studies addressing digital HR tools assess their relationship with engagement or performance directly, rather than treating digital communication as a distinct, separately measured intermediate outcome. Where digital communication is addressed, it is typically folded into broader "digital interaction platform" constructs rather than isolated and tested as a discrete mediator, a gap this review notes for future research (Section 6.5).

Evidence on VHRM's effect on work engagement is more developed but mixed in strength. A study of digital interaction platforms and big data analytics found a moderately strong positive correlation between digital-platform use and big-data-analytics adoption, but only a weak correlation between digital innovation overall and employee engagement, leading the study's authors to conclude that other

contextual factors substantially limit the direct impact of digital tools on engagement. By contrast, a study of digital HR practices in Algerian universities, using a sample of 418 employees, found that virtual learning and development and virtual employee self-service systems were positively associated with engagement – but with this relationship mediated by organizational trust rather than occurring as a direct effect.

The finding for RQ2 and RQ3 jointly is that VHRM's effect on engagement is empirically supported in several studies, but the strength of that effect varies considerably depending on which digital practices are examined and which mediating or boundary conditions are present, while VHRM's effect on digital communication specifically remains under-isolated as a distinct construct in the reviewed literature.

4.3 RQ4 and RQ5: Digital Communication, Work Engagement, and Employee Performance

Direct peer-reviewed evidence connecting digital communication specifically (as distinct from broader digital-HR constructs) to employee performance was not located in a methodologically rigorous, isolated form within this review's search; the construct is more often treated as a contextual enabler within broader e-HRM or hybrid-work studies than as an independently tested predictor. Evidence on work engagement's relationship with performance-adjacent outcomes is stronger: the digital-intelligent-HRM-change study reviewed in Section 2.3 found that work engagement partially mediated the relationship between perceived digital HRM change and proactive change behaviour – a performance-relevant outcome, albeit not employee performance in the narrower productivity sense emphasised in the conceptual VHRM literature under review.

The finding for RQ4 and RQ5 is therefore asymmetric: work engagement's relationship with performance-relevant outcomes carries moderate empirical support, drawing on established work-engagement theory and at least one directly relevant mediation study, while digital communication's direct relationship with performance remains comparatively under-tested as an isolated construct in the peer-reviewed literature reviewed here.

4.4 RQ6: The Mediating Pathway, and the Hybrid-Work Evidentiary Anchor

Addressing the integrative question of whether digital communication and work engagement jointly mediate the VHRM–performance relationship, as proposed in the conceptual literature under review, this synthesis finds that no single peer-reviewed study located in this review tests precisely this two-mediator model. Individual components of the proposed pathway receive scattered support – work engagement as a mediator in adjacent digital-HRM-change research (Section 2.3), HR service quality as a mediator in telecommunications e-HRM research (Section 2.2), organizational trust as a mediator in university-sector digital-HR research (Section 2.3) – but these findings collectively suggest a more variable, context-dependent set of mediating mechanisms than the conceptual literature's two-mediator framework implies.

The most methodologically rigorous evidence available in this review's broader scope – the Bloom, Han, and Liang (2024) randomized controlled trial – addresses hybrid work arrangements rather than VHRM practices narrowly, but its finding is directly relevant to RQ6's underlying concern about hybrid-context performance: hybrid work-from-home arrangements produced no measurable negative impact on performance reviews, promotion rates, or output, while substantially improving retention and job satisfaction. This is a more modest finding than the performance-enhancement narrative implicit in much conceptual VHRM literature, which often frames virtual HR systems as directly boosting productivity. The cautionary parallel of the revised remote-work productivity finding – an originally reported 8% productivity gain that became an approximately 4% decline upon reanalysis with better data – further reinforces this review's calibrated reading: claims of substantial VHRM- or hybrid-work-driven performance improvement should be treated with considerably more caution than is typical in practitioner discourse, even though the weight of rigorous evidence does support the more modest claim that well-implemented hybrid

and virtual HR arrangements do not damage, and may modestly support, performance and retention.

Table 2 summarises the synthesis across the six research questions, distinguishing the strength of theoretical grounding from the strength of available peer-reviewed empirical support – the central evidentiary finding of this review.

Relationship (RQ)	Direction (Theory)	Peer-Reviewed Empirical Support	Key Evidentiary Anchor	Strength
VHRM → Employee performance (RQ1)	Positive	No direct support found at field level; conditional support when mediator specified	Marler & Fisher (2013)	**Weak**
VHRM → Digital communication (RQ2)	Positive	Under-isolated as a distinct construct in reviewed studies	Limited direct sources	**Weak**
VHRM → Work engagement (RQ3)	Positive	Mixed; weak-to-moderate, contingent on mediators (trust, fit)	Multiple correlational studies	**Moderate**
Digital communication → Performance (RQ4)	Positive	Not directly isolated in rigorous form	None located as isolated test	**Weak**
Work engagement → Performance (RQ5)	Positive	Moderate support via adjacent mediation studies	Digital-HRM-change mediation study	**Moderate**
Joint mediation → Hybrid performance (RQ6)	Positive	Two-mediator model untested as such; rigorous RCT shows "no-harm" rather than enhancement	Bloom, Han, & Liang (2024)	**Moderate**

Table 2. Synthesis matrix of VHRM–performance relationships identified in the reviewed literature.

The overall finding across RQ1–RQ6 is that the conceptual VHRM-performance-via-digital-communication-and-engagement model receives partial, mechanism-inconsistent support rather than the strong, unified empirical confirmation implied by much practitioner and conceptual literature. Work engagement carries the most consistent (if still moderate) support as a performance-relevant mechanism; digital communication's direct role remains the least empirically isolated; and the most rigorous available causal evidence on hybrid work itself supports a more modest "no-harm-to-

performance, clear-benefit-to-retention" conclusion rather than a performance-enhancement conclusion.

5. Discussion

5.1 Interpreting the Synthesis against Theory

The pattern of findings reported in Section 4 sits in an instructive tension with the theoretical frameworks adopted in this review. The Technology Acceptance Model (Davis, 1989) predicts that perceived usefulness and ease of use drive technology adoption, and by extension, that well-designed VHRM systems should generate the engagement and communication improvements that conceptual literature links to performance. The synthesis offers qualified support for the adoption-engagement portion of this chain (Section 4.2) but considerably weaker support for the engagement-to-organizational-performance portion (Sections 4.1, 4.3). One plausible reading, consistent with Marler and Fisher's (2013) original diagnosis, is that TAM operates convincingly at the individual psychological level – explaining why an employee finds a system easy to use and engages with it – without resolving the considerably harder empirical question of whether aggregated individual technology acceptance reliably translates into organizational-level productivity gains, a translation that requires additional boundary conditions (system design quality, organizational implementation fidelity, role-task fit) that neither TAM nor the studies reviewed here fully specify.

Social Exchange Theory fares somewhat better against the evidence, particularly where studies explicitly model a reciprocity-relevant mediator such as organizational trust (Section 2.3) or HR service quality (Section 2.2): VHRM-engagement and VHRM-performance relationships are more consistently observed when such a mediator is present than when VHRM and performance are tested as a simple bivariate pair, as in Marler and Fisher's (2013) original finding of no direct effect. This pattern suggests that Social Exchange Theory's emphasis on a relational, trust-based mechanism may be doing genuine theoretical work that simpler technology-adoption framing does not capture.

5.2 Comparison with Existing Literature

This review's central comparative finding is that Marler and Fisher's (2013) decade-old conclusion – no empirical evidence that e-HRM predicts strategic HRM outcomes – has not been comprehensively overturned by the subsequent literature, although it has been meaningfully qualified. Studies published after 2013 increasingly find conditional support for VHRM-performance and VHRM-engagement relationships, but consistently through context-specific mediators (HR service quality, organizational trust, person-organization fit) rather than through the simple, direct, two-mediator (digital communication and work engagement) pathway proposed in the conceptual literature this review set out to evaluate. This finding extends rather than simply confirms Marler and Fisher (2013): the field has matured empirically since 2013, but its accumulated findings point toward a more mechanism-plural, context-dependent model than either the original 2013 review or the conceptual VHRM literature anticipated.

The review's treatment of hybrid-work evidence (Section 2.4) also extends the existing literature in a specific way: by explicitly weighing the Bloom et al. (2024) randomized controlled trial's "no-harm" finding against the more optimistic performance-enhancement framing common in practitioner and conceptual sources, and by foregrounding the Emanuel and Harrington revision as a documented case of an initially favourable finding being substantially overturned by improved data, this review applies a level of evidentiary scrutiny to hybrid-work performance claims that much of the conceptual VHRM literature – including the manuscript motivating this review – does not consistently apply.

5.3 Theoretical Significance

Theoretically, this review's principal contribution is the empirical disaggregation of what conceptual VHRM literature typically presents as a unified two-mediator pathway (VHRM → digital communication and work engagement → performance) into a more accurate, mechanism-plural picture in which different studies support different mediators under

different conditions. This has implications for how strategic HRM theory should frame VHRM's organizational consequences: rather than treating digital communication and work engagement as the mediators of the VHRM-performance relationship, the evidence supports a more precise theoretical claim in which the operative mediator is itself an empirical question contingent on organizational context – trust in some settings, service quality in others, engagement in still others – a finding that argues for context-sensitive rather than universal mediation models in future VHRM theorising.

5.4 Practical and Managerial Significance

For HR practitioners and organizational leaders in hybrid-capable organizations, the practical implication is one of calibrated rather than uniform confidence in VHRM's performance payoff. Investment in hybrid work arrangements can be pursued with relatively strong confidence that, properly implemented, such arrangements will not damage performance and will meaningfully improve retention and satisfaction, consistent with the rigorous randomized controlled trial evidence reviewed in Section 2.4 – though leaders should not expect or promise the performance-enhancement gains sometimes claimed in less rigorous sources. Investment in VHRM systems specifically (e-recruitment, virtual onboarding, e-learning, digital performance management) should be accompanied by explicit attention to the mediating mechanism through which performance gains are expected to materialise – organizational trust, service quality, or engagement – since the evidence indicates these mechanisms are not interchangeable and a system's success in one organization does not guarantee comparable results elsewhere absent the same mediating conditions.

5.5 Addressing Contradictions and Unexpected Patterns

One pattern in the synthesis warrants explicit discussion because it directly addresses a tension in the literature this review was designed to resolve: the conceptual VHRM literature (including the manuscript motivating this review) consistently frames VHRM and hybrid work as performance-enhancing, while the most methodologically rigorous available evidence (Marler & Fisher, 2013; Bloom et al., 2024) more cautiously supports a "no significant direct effect" or "no-harm" conclusion rather than a performance-enhancement conclusion. This is not, on reflection, a contradiction but rather an illustration of a well-documented asymmetry in management research: studies and narratives reporting large, easily communicated performance gains are more likely to be widely cited and incorporated into practitioner conceptual models than null or modest findings, even when the latter derive from considerably more rigorous designs. The revised Emanuel and Harrington finding – an 8% productivity gain that became a 4% decline on reanalysis – is a particularly clear illustration of this dynamic within the remote/hybrid-work literature specifically. This review's calibrated conclusions in Section 4 are intended to correct for this asymmetry by weighting design rigour explicitly (Section 3.4) rather than allowing the most widely circulated or intuitively appealing claims to stand in for the strongest available evidence.

6. Conclusion

6.1 Summary of Key Findings

This review systematically synthesised the literature examining Virtual Human Resource Management practices, digital communication, work engagement, and employee performance in hybrid work environments. Six conclusions follow directly from the synthesis presented in Section 4. First, the relationship between VHRM practices and employee performance is weakly supported at the field level, with the most rigorous available synthesis (Marler & Fisher, 2013) finding no direct empirical evidence for this relationship, and more recent sector-specific studies finding support only when an explicit mediator is specified and tested (RQ1). Second and third, VHRM's influence on digital communication remains under-isolated as a distinct empirical construct, while its influence on work engagement is moderately, though inconsistently, supported (RQ2–

RQ3). Fourth and fifth, digital communication's direct relationship with performance is not well isolated in the reviewed literature, while work engagement's relationship with performance-relevant outcomes carries moderate support via adjacent mediation research (RQ4–RQ5). Sixth, the proposed two-mediator pathway (digital communication and work engagement jointly mediating VHRM–performance) has not been directly tested as such in the literature reviewed here, and the most rigorous causal evidence on hybrid work specifically (Bloom, Han, & Liang, 2024) supports a more modest "no-harm-to-performance, clear-benefit-to-retention" conclusion rather than a performance-enhancement conclusion (RQ6).

6.2 Scholarly Contribution

This review makes three identifiable contributions to the literature. First, it provides the first identified update, to the knowledge developed through this review, of Marler and Fisher's (2013) evidence-based e-HRM review specifically in relation to the post-pandemic hybrid-work context, establishing that the field's core empirical caution – limited direct evidence linking digital HR practices to strategic or performance outcomes – remains substantially, if not entirely, applicable more than a decade later. Second, it identifies a mechanism-plurality finding with direct theoretical implications: rather than confirming or disconfirming a single proposed mediator (digital communication and work engagement), the evidence indicates that the operative mediating mechanism in VHRM-performance relationships varies by organizational context (trust, service quality, engagement), a finding meriting explicit incorporation into future VHRM theorising rather than treatment as a methodological inconvenience. Third, it offers a transparent evidentiary-tiering methodology, explicitly distinguishing randomized controlled trial evidence from correlational survey evidence and grey literature, that future reviews in this domain may adopt to avoid the evidentiary asymmetry problem discussed in Section 5.5.

6.3 Limitations of the Review

This review is subject to limitations that should inform how its conclusions are used. As a qualitative thematic synthesis rather than a statistical meta-analysis, it does not produce pooled effect-size estimates and cannot quantify the precise magnitude of the relationships it identifies; this approach was a deliberate methodological choice given the non-commensurable outcome measures across included studies (Section 3.5), but it limits the precision of practical recommendations. The review is further limited by its reliance, for its most rigorous causal evidence, on a single large-scale randomized controlled trial conducted at one multinational technology firm (Bloom et al., 2024); while this study's design rigour is a genuine strength, its single-firm origin means generalisation to smaller organizations, different sectors, or different national labour-market contexts should proceed cautiously. Finally, the mediator-specificity gap this review identifies (Section 2.6) is itself partly a limitation of the available literature rather than of this review's search strategy: the absence of a study directly testing the precise two-mediator model proposed in conceptual VHRM literature means this review's RQ6 conclusion is necessarily an inference from related but non-identical studies rather than a direct empirical confirmation or refutation.

6.4 Recommendations

1. Organizations should continue to invest in hybrid work arrangements with reasonable confidence that, when properly implemented, such arrangements do not damage performance and meaningfully improve retention, consistent with the rigorous randomized controlled trial evidence reviewed in Section 2.4, while avoiding overstated expectations of direct performance enhancement.

2. HR departments should explicitly identify and monitor the specific mediating mechanism (organizational trust, HR service quality, or work engagement) through which a given VHRM system is expected to influence performance in their particular organizational context, rather than assuming a generic digital-communication-

and-engagement pathway will automatically operate.

3. Organizations piloting new VHRM systems should, where feasible, adopt randomized or quasi-experimental rollout designs (e.g., phased implementation across comparable teams) to generate internally rigorous evidence of performance impact, given the scarcity of such designs in the wider published literature.

4. HR analytics and reporting functions should explicitly distinguish, in internal reporting to leadership, between VHRM outcomes supported by rigorous evidence (e.g., retention effects of hybrid work) and outcomes that remain aspirational or weakly evidenced (e.g., direct productivity enhancement from digital HR tools), to avoid the evidentiary asymmetry problem discussed in Section 5.5 propagating into organizational decision-making.

5. Academic researchers should prioritise studies that directly test the joint mediating role of digital communication and work engagement together, using designs capable of isolating digital communication as a distinct construct from broader digital-HR adoption measures, to close the mediator-specificity and construct-isolation gaps identified in Sections 2.6 and 4.2–4.3.

6.5 Suggestions for Future Research

Building directly on the gaps and findings identified above, four directions for future research are proposed. First, studies directly and jointly testing digital communication and work engagement as parallel or sequential mediators of the VHRM-performance relationship, using validated, construct-distinct measures of digital communication (as opposed to broader "digital HR adoption" composites), would directly address the most significant gap this review identifies. Second, replication of randomized or quasi-experimental hybrid-work designs of the kind employed by Bloom et al. (2024) across a wider range of firm sizes, sectors, and national contexts would substantially strengthen the generalisability of this review's most rigorous evidentiary anchor. Third, longitudinal designs tracking VHRM adoption, the proposed mediators, and performance outcomes over time within the same organizational sample would allow more confident causal inference than the predominantly cross-sectional designs identified in this review. Fourth, future research employing meta-analytic techniques, once a sufficient body of commensurably measured studies accumulates around a consistently specified mediator model, could quantify effect-size magnitudes that the present qualitative synthesis was not designed to produce.

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Appendix A: PRISMA-Informed Selection Flow

The table below summarises the staged selection process described in Section 3.4, reported in narrative form consistent with PRISMA reporting conventions adapted for a non-meta-analytic qualitative synthesis.

Stage	Process and Rationale
Identification	Database and targeted high-impact-outlet searches conducted using the Boolean search strings specified in Section 3.2.
Screening	Title and abstract review to remove records with no substantive relevance to VHRM, digital communication, work engagement, or hybrid-work performance.
Eligibility assessment	Full-text review against the inclusion/exclusion criteria in Table 1, with evidentiary-tier appraisal distinguishing randomized controlled trial, structural/survey, and grey-literature sources.
Inclusion and synthesis	Eligible sources coded thematically (Section 3.5) and synthesised against the six research questions in Section 4.

Table A1. Staged selection and synthesis process.