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HUMAN RESOURCES ENGINEERING THEORY (HRET): RE-ENGINEERING WORK AND WORKFORCE FOR AI-ENABLED ORGANIZATIONS

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ABSTRACT

Purpose. This paper is a step forward in the idea that organizations fail to transform to artificial-intelligence (AI) not due to the weaknesses of their HR technologies but instead because the human work system has never been designed. It establishes Human Resources Engineering Theory (HRET), a mid-range theory that is domain specific, based on the more general Business Engineering paradigm, that describes the process by which organizations re-engineer work systems, workforce architecture and human capabilities to attain sustainable performance in the AI age. HRET is presented as a mid-range theory which, as the amount of empirical data grows, can be part of a larger paradigm shift- not as something that is already known.

Design / Methodology. The theory-building is carried out with the help of an integrative literature review and comparative theoretical synthesis, the study selection is reported with the help of a PRISMA flow. It is based on the theory of Socio-Technical Systems (STS) and Dynamic Capabilities Theory (DCT).

Findings. HRET defines a central thesis, a multi-stage causal process (Engineering Design → Human–AI Alignment → Dynamic Capabilities → AI Transformation → Institutional Sustainability), five engineering principles, five engineering capabilities, a five-level maturity model, express boundary conditions and five test propositions.

Originality / Value. The essence of the contribution is a re-specification of unit of analysis: instead of HR being an administered activity, the human-technical system is an engineered, re-configurable design object. The distinguishing capability is Algorithmic Engineering and the theory is defined by the engineering architecture as a whole.

Limitations / Implications. The study is a conceptual contribution and does not provide a tested tool; it suggests operational pointers and a research program to be tested in future studies among organizational settings.

> *Though it is referred to as the Human Resources Engineering, the scope of the theory goes beyond the HR role to engineering of the work, the human resources and the capabilities of the human resources in the organization; the HR is a point of entry to the system rather than a point of terminus.*

Keywords:
Human Resources Engineering Theory; Business Engineering; Human–AI Alignment; Algorithmic Engineering; Socio-Technical Systems; Dynamic Capabilities.

1. INTRODUCTION

The central management question has been redefined by the spread of artificial intelligence (AI), machine learning (ML), and large language models (LLM) into the life of organizations. No longer is it a question of How do we use AI in HR but instead of that, it is How do we re-engineer the human system so that it can be congruent with the technical system? The difference is not a rhetorical one. The former question is focused on AI as an addition to a pre-existing functionality; the latter is focused on the human-technical system as a design object to be re-engineered. This paper contends that the latter framing is truly the accurate one, and that the repeated failure of the AI transformation is fundamentally a failure of design and not technology adoption.

This argument starts not at the discipline of human resource management (HRM) per se, but at the reasoning of engineering which emerged out of Business Engineering (Abuhaimed, 2026a). In this perspective, HRET can be viewed as a domain theory, which uses engineering-design logic to the work, labor and human abilities of the organization during the AI era. The real contribution, then, is not HR itself but rather the introduction of the logic of systematic design into it.

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It is the logic of systematic design, the combination of analysis, design, optimization and verification in order to create a system that is able to do its functions in an efficient way that the term engineering is used to signify the literal meaning of civil and mechanical engineering. The term Human Resources Engineering (HRE) is used intentionally and with clear differentiation to refer to the concept or viewpoint, with the term Human Resources Engineering Theory (HRET) being the coherence of theoretical construction created here.

This reframing is urgent due to an increasing gap between the fast-growing capabilities of AI and organizational structures that continue to be modeled after pre-AI times. With organizations starting to embrace smart technologies the binding challenge ceases to be technological availability, but redesigning human-technical systems that can effectively work together with algorithmic agents. It is this discrepancy, that HRET is designed to describe and to solve.

Although the literature on Digital HR, data-driven HR, and predictive HR is abundant, the streams largely consider change as a functional modernization (Marler and Boudreau, 2017): they enhance tools and processes without re-engineering the human system itself. HRET breaks this tradition by considering the human-technical system as a unit of analysis and questioning how this system should be designed and not how its tools can be enhanced.

The following is the outline of the paper. Section 2 is a review of the theoretical basis and the previous literature to come up with the research gap. Section 3 states HRET, its main thesis, causal mechanism, variables, boundary conditions, theoretical status and its place in relation to neighboring theories. The problem, objectives, and significance are mentioned in sections 4 and 5. Section 6 introduces the propositions of the theory which are scientifically grounded and operationalized and discusses testability. The theory-building design is described in section 7. Section 8 introduces the conceptual framework: principles, capabilities and the maturity model. Section 9 describes contributions, Section 10 provides future direction of developing Human Resources Engineering Theory, Sections 11-13 provide recommendations, limitations and conclusion.

2. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

2.1 Theoretical Anchors: STS and Dynamic Capabilities

Socio-Technical Systems (STS) theory. The STS is based on the idea that the social and technical subsystems should be jointly designed (joint optimization), as only in this case the organizational performance can be improved (Trist and Bamforth, 1951; Davis et al., 2014). The maximization of one subsystem (standing alone) results in impairment of the entire. STS provides HRET with its fundamental design principle: the human and algorithmic subsystems should not be designed in series, but rather as a unit.

Dynamic Capabilities Theory (DCT). According to Teece et al. (1997), and Teece (2007), dynamic capabilities refer to the ability of the firm to sense, seize and transform-reconfiguring its resource base to respond to environmental change. DCT provides HRET with the reasoning behind its maturity model: engineering capabilities are built up and reconfigured over time.

The construction is based on a combination of these two theories as opposed to either one, since they cover a dimension not covered by the other. STS describes the correspondence needed between the human and technical subsystems when the design is being done (the static-structural dimension), and DCT describes evolution and constant reconfiguration over time (the dynamic-developmental dimension). HRET therefore requires STS to articulate how alignment is attained and DCT to articulate how the organization transitions between levels of maturity; it is a combination of the two that enables the theory to make simultaneous design and evolution explanations.

2.2 Ontological Position of HRE

The article does not argue that HR Engineering is a fully-fledged and autonomous science. It advances HRE as a mid-range theory which could be used as a base of future research that could further develop the HRM field in AI-based workplaces. The human-technical system in the organization is the unit of analysis in which structures, skills, processes, data, and algorithms interact.

2.3 Review of Prior Work

This argument has three literatures that bear on it. The former, the digital transformation and Business Engineering, lays the groundwork of redesigning organizational systems as opposed to automating tasks (Österle et al., 2011; Galbraith, 2014; Puranam, 2018). The second, AI in management and HRM, records the applications as well as the tensions algorithmic recruitment, performance analytics, predictive attrition, and the automation-augmentation paradox (Brynjolfsson and McAfee, 2014; Tambe et al., 2019; Raisch and Krakowski, 2021; Vrontis et al., 2022; Budhwar et al., 2022) but usually describes AI as a toolkit, not a design problem. The human-AI relation is reimagined as conjoined agency and system-level collaboration through a growing strand, (Daugherty and Wilson, 2018; Murray et al., 2021; Anthony et al., 2023; Rai et al., 2019), and critical work on algorithmic

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management foreshadows control, fairness, and contested judgment (Kellogg et al., 2020; Lebovitz et al., 2022; Cheng and Hackett, 2021). In this stream, research on early adopting organizations of AI also demonstrates that workforce-level facilitating factors like knowledge sharing mediate the relationship between talent practices and AI adoption (Abuhaimed et al., 2024, 2025). The third, socio-technical and sustainable design, provides the principle of joint optimization and the long-horizon concern with the governance and sustainability (Clegg, 2000; Baxter and Sommerville, 2011; Winby and Mohrman, 2018; Pasmore et al., 2019; Kramar, 2014; Aust et al., 2020). They are needed to be put together by each stream; none of it incorporates them into a design theory of the human-technical system, and recent demands to theorize emerging technology at the relational level and on a system level (Bailey et al., 2022; von Krogh, 2018) highlight the need that HRET fulfills.

2.4 Why Existing Concepts Are Insufficient

Current notions tackle transformation in one dimension: HRM at the individual level, Strategic HRM (SHRM) at the alignment level, Digital HR at the digitization of the processes, HR analytics at the data level and Sustainable HRM at the human-environmental level. The common thread among them is that they all lack an approach to the human-technical system, as an integrated design object, and they all fail to approach the algorithmic dimension in a methodical way as part of a overall design logic. It is this gap that HRET covers.

2.5 Research-Gap Matrix

Table 1. Research-Gap Matrix

Theme	Representative literature	Gap
Digital transformation & Business Engineering	Österle et al. (2011); domain studies	Focus on enterprise engineering without designing the human system
Organizational technology	Process- and IT-centric work	Adoption emphasized over system redesign
AI in HRM	Tambe et al. (2019); Huang & Rust (2021); Meijerink et al. (2021)	No engineering framework for AI applications in HR
Socio-technical systems	Baxter & Sommerville (2011); Davis et al. (2014)	Principle stated but not operationalized for HR
Sustainability	Kramar (2014); Aust et al. (2020)	Sustainability detached from technical transformation
Dynamic capabilities	Teece et al. (1997); Eisenhardt & Martin (2000)	Capabilities not linked to engineering of the human system

2.6 What Distinguishes This Study

- It redefines the unit of analysis: no more unit of analysis of a unit of activity of a unit of data but rather of the human-technical system as an engineered system.
- It merges three literatures (organizational, digital, algorithmic) into a single architecture as opposed to addressing them as distinct ones.
- It has a dual theoretical base, STS and DCT, rather than being based on either.
- It provides a conceptual, staged maturity model, which puts theory and practice in touch without purporting to provide a ready-made measure tool.

3. HUMAN RESOURCES ENGINEERING THEORY: FROM FRAMEWORK TO THEORY

Foundational Definitions

Work: The activities, processes and value flows that are carried out in the organization to help it meet its objectives.

Workforce: any resources that perform work, including human, digital and algorithmic (humans, intelligent systems, and algorithmic agents) resources, rather than humans.

Human Capabilities: the combination of knowledge, skills, practices that facilitate the adaptation and learning of the workforce to work with the algorithmic systems.

It is not just a synthesis of the literature, but it takes a step in the direction of a theory, having a core thesis, a causal mechanism, variables and boundary conditions. The difference is substantive: one of the frames explains what, and another one explains why and how.

3.1 Central Thesis

Central Thesis of HRET

The nature of AI transformation is more of a system-design than a technology-adoption challenge. HRET believes it is not about adopting the technologies that the success of transformation of AI can be achieved, but rather re-engineering the system of work and the workforce to align the human, the organization and the

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algorithm. Organizations do not fail because their digital tools are weak; rather, the human work system was not initially designed to be in congruence with the algorithmic system.

This thesis transforms the locus of explanation off of technology quality onto to system-design quality, to make the difference between HRET and Digital HR literatures, which implicitly presumes the problem is tools, as opposed to system architecture. This design is based on the principle of achieving Human–AI Alignment: the human system is designed to be aligned with the algorithmic system, value is emitted; otherwise, the lack of such design leads to misalignment and stagnation of transformation despite the quality of technology.

Though the theory is referred to as the Human Resources Engineering, the area of the theory is not just limited to the HR aspect but is also applied to the design of the work system, the work force and the human capabilities at the organizational level; the HR is an entry point into the system not the limit.

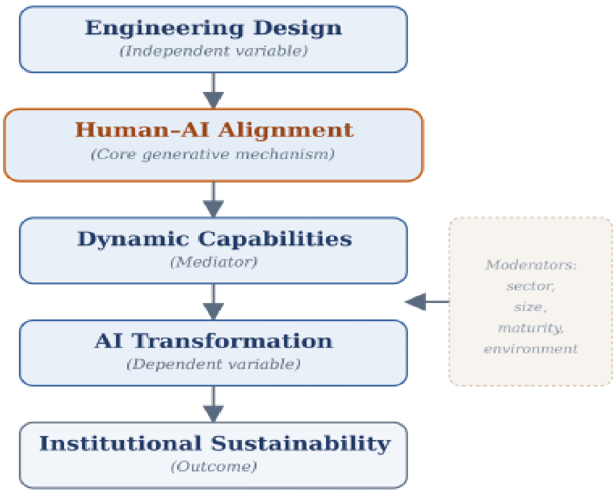
Why "Human Resources Engineering" and Not "Work System Engineering"?

Since the work design, workforce design and capability design comprise a significant portion of the coverage of the theory, it is not unreasonable that a reviewer might inquire why not call the theory Work System Engineering. The naming is not hasty, because of three reasons. To begin with, it determines the center of gravity of explanation: throughout the causal chain, the subsystem organizations that most regularly mis-engineer- and whose mis-design most consistently stalls AI transformation- is the human subsystem; the theory is called by the binding constraint. Second, it makes the name of what the system finally optimizes: work and technology are made in service of human value and thus the name work system refers to the object of design and human resources to the telos whose service it provides. Third, the label maintains theoretical ancestry: HRET is juxtaposed to SHRM, HPWS, HR Architecture and Algorithmic HRM--a discourse it can only restate within the human-resources tradition. The expanded focus is not thus antithetical to the name; it is the result of designing the work and workforce to the human subsystem.

3.2 Causal Mechanism

HRET defines a chain of causality. Human -technical system engineering design generates Human -AI fit; fit generates dynamic human and organizational capabilities; capabilities create successful AI transformation; and institutional sustainability, created through sustained transformation. The theory does not thus assume a direct relationship between design and outcomes: the connection between engineering design and transformation outcomes is through alignment, and STS describes how alignment develops and DCT how it is transmitted within different levels of maturity.

Figure 1. The HRET Casual Model



Defining Human–AI Alignment

Since Human-AI Alignment is the generative process of the theory, it needs to be defined accurately. In HRET, Human AI Alignment refers to the contrived state of mutual congruence between the human subsystem (roles, skills, structures, norms), and the algorithmic subsystem (models, data, decision logic), where each subsystem reinforces instead of conflicts with the other in the creation of organizational value. It is built-in and not a spontaneous inclination of people.

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Multidimensional meaning of alignment To achieve alignment, it is important to have at least five facets: (1) task alignment: human and algorithmic division of labor aligns with the respective competencies of each side; (2) cognitive alignment: human mental models and algorithmic representations are mutually intelligible, which facilitates calibrated trust; (3) structural alignment, human and algorithmic roles, authority, and accountability are redesigned around human - algorithm interaction, and (4) value alignment: algorithmic goals are aligned with organizational and ethical commitments (fairness, transparency, sustainability); and (5) strategic alignment: AI systems, organizational capacities, and organizational-design choices are congruent with the long-term strategic goals of the organization. Combined these aspects make Human-AI Alignment a multidimensional construct that can be measured in the future.

There are three neighbouring constructs that need to be differentiated. Alignment is not fit, which in the contingency tradition refers to a fixed-point correspondence between structure and context; alignment is dynamic and contrived and is reconstituted as the algorithmic subsystem adapts. It is not to be confused with congruence in socio-technical theory which deals with the social and technical subsystems in general; HRET narrows congruence to the human-algorithmic relation and makes it a design goal with quantifiable aspects. And it is contrasted with human-AI collaboration, which characterizes a level of interaction at a task or team level; alignment is the system level property that enables effective collaboration. Teamwork is a visible phenomenon; alignment is the created condition that produces it.

3.3 Constructs and Nomological Structure

To improve the theoretical accuracy, and to allow empirical testing in the future, HRET clearly specifies its core constructs and their causal functions. The antecedent state that creates Human-AI Alignment is Engineering Design; the state of Alignment in its turn facilitates the creation of dynamic capabilities, which will lead to the successful AI transformation and eventually to the institutional sustainability. A summary of the constructs and their theoretical functions is given below.

Table 2. Constructs and Their Theoretical Roles

Construct	Role in the theory
Engineering Design	Independent variable (antecedent)
Human–AI Alignment	Core generative mechanism
Dynamic Capabilities	Mediating variable
AI Transformation	Dependent variable
Institutional Sustainability	Outcome variable

Formulated as a nomological network, HRET is based on the assumption that an AI transformation occurs as a result of a causal process and not as a result of technology adoption per se: Engineering Design → Human–AI Alignment → Dynamic Capabilities → AI Transformation → Organizational Performance → Institutional Sustainability. These relationships are likely to be stronger or weaker depending on the context of the organization, the nature of the industry, level of digital maturity, organizational size, and dynamism of the environment, the moderators that will be outlined in the causal model. This network provides a conceptual map to empirical research aimed to prove and expand the theory.

3.4 Falsifiability

A scientific theory should indicate the circumstances in which the theory could be questioned. In line with the principle of falsifiability, HRET specifies such conditions. The theory would suffer refutation should the results of future empirical studies always show that organizations can successfully transform to sustainable AI without engineering the human-technical system, or without creating Human-AI Alignment. It would also need to be revised in case Human-AI Alignment would prove to have no significant correlation with the results of transformation in various organizational settings. These conditions make HRET susceptible to empirical testing, refinement and enhancement as opposed to being closed to disconfirmation.

3.5 Central Theoretical Proposition

The main theoretical hypothesis comes next in line: the extent to which the human-technical system is programmed defines the extent to which the AI transformation achieves success and becomes long-term. Section 6 (all propositions) expounds different aspects of this one explanatory claim.

3.6 Alternative Explanations

A number of explanations are in conflict to explain AI transformation in an organization: researchers have credited the success of technology quality, leader commitment, organizational culture, digital maturity or resource availability. HRET does not disrule such accounts, it suggests that their effect is conveyed via the engineering

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quality of the human-technical system. Even higher technologies cannot create value in case of misalignment between workforce, structures and algorithmic systems. HRET therefore does not compound rival causes but rearranges them and the locus of explanation moves to system engineering and the rival factors are subsumed as conditions whose impact is mediated via alignment.

3.7 Levels of Analysis

Even though HRET is used in the organizational level, where the human-technical system is architectured, the explanatory logic is spread on the adjacent levels. At individual level it deals with human-AI interaction and adaptation; at team level, work design and coordination; at organizational level, architecture of a system and, at the institutional level, long-term sustainability and governance. This multi-level reach is not total but delimited: the organizational level is the home of the theory, the other levels are where its mechanism can be found and where it can be further developed by future cross-level research.

3.8 A Potential Paradigm Shift: From Digital HR to HRE

HRE is not sold as a quantitative extension of Digital HR but as a possible qualitative change in underlying logic-one which must be proven by cumulative empirical evidence to prove. The comparison is listed below.

Table 3. Comparison Between Digital HR and HRET

Dimension	Prevailing model (Digital HR)	Proposed model (HRET)
Unit of analysis	HR function / process	Human–technical system
Logic of change	Digitize and automate existing tasks	Re-engineer the system from its foundations
Role of AI	A tool added to the function	A design dimension around which the system is reshaped
Explanation of failure	Weak tools or insufficient skills	Socio-technical misalignment from absent design
Stance	Adaptive / incremental	Generative / architectural

3.9 Original Contribution

The original input of HRET is twice. To begin with, and most fundamentally, it redefines the unit of analysis--reconstituting HR as an administered function into a re-configurable system. This is not a specific technique but rather a reframing that is the main contribution of the theory. Second, in the engineering architecture, the distinguishing capability that makes HRET stand out of the schools next to it is Algorithmic Engineering: where HRET has an identical organizational, digital, enablement, and sustainability capability, such as the enabling conditions it shares with the adjacent schools, it is unique in the sense that it builds the algorithmic logic as a design dimension around which the human system is reformed. To put it briefly, HRET is distinguished by Algorithmic Engineering, although the engineering architecture, in general, determines it. It is important not to confuse two different claims: Human-AI Alignment is the defining generative process of HRET -the causal relationship by which engineering design brings about change-whereas Algorithmic Engineering is its distinguishing ability, the design competence that makes it stand out among schools in its vicinity. The first one is its description of the working of the theory; the second one is its explanation of the novelty.

3.10 Why HRET Is a Theory, Not a Framework

A framework explains a phenomenon and groups its elements in a descriptive way (without propositions); a theory explains and predicts the phenomenon by causal relationships and testable mechanisms. A theory should identify What, How, Why and When/Who as suggested by Whetten (1989). HRET meets these requirements as below.

Table 4. HRET Meets the Criteria of Theory (Whetten, 1989)

Criterion	Question	Realization in HRET
What	Which constructs?	Five principles, five capabilities, five maturity levels, precisely specified
How	How are they related?	Causal chain: design → alignment → capabilities → transformation → sustainability
Why	Why are they related?	Central thesis: absent engineering design yields socio-technical misalignment that blocks value
When/Who	Under what conditions?	Explicit boundary conditions (moderators: sector, size, maturity, environment)

3.11 Theoretical Positioning

HRET can be identified by comparing it to the closest schools and theories, in terms of focus and point of differentiation.

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Table 5. Theoretical Positioning

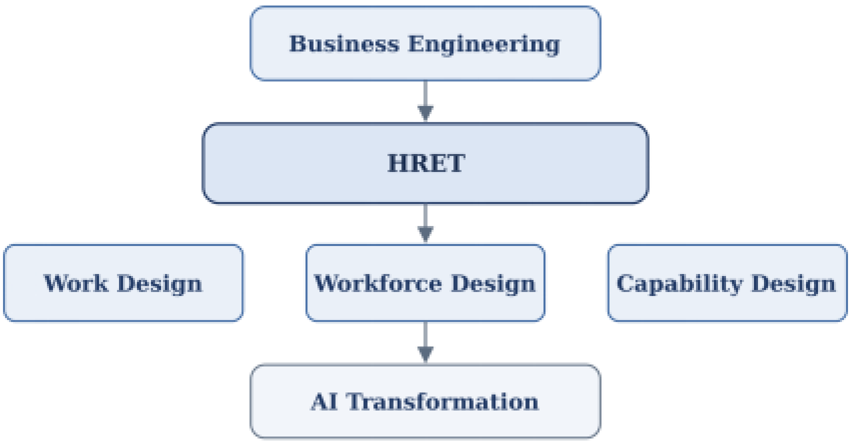
School / theory	Focus / unit of analysis	How HRET differs
Strategic HRM (SHRM)	Aligning HR practices with strategy	Aligns an existing system; HRET re-engineers the system's architecture itself
High-performance work systems (HPWS)	Bundles of practices that improve performance	Improves practices; does not re-engineer the human–algorithmic relation as a design unit
HR Architecture	Differentiating human-capital categories	Describes an existing structure; HRET supplies a design logic and causal mechanism
Socio-Technical HR	Social–technical congruence	Adopts its principle but adds the algorithmic dimension and a measurable maturity model
Algorithmic HRM	Effects of algorithms on managing people	Describes a phenomenon; HRET frames the algorithm as an engineering capability within a design theory
Dynamic Capabilities / RBV	The firm and resource reconfiguration	Operates at the firm level; HRET descends specifically to designing the human–technical system

Positioning summary

HRET does not introduce a new HR role or simply increases the efficiency of the existing ones, but suggests re-reading the HR system, as it is not an administered function, but a re-configurable design object. HRET in this sense is a unique nucleus of theory. It does not replace Strategic HRM it merely makes perfect sense to precede it, by clarifying how work systems are designed first before they can be aligned in a strategic fashion; a system cannot be strategically aligned until its design has been engineered.

Figure 2 places HRET as a domain specific theory based on Business Engineering, and the applicable logic to the design of work, workforce, and capabilities, to the AI transformation.

Figure 2. HRET as a Domain-Specific Theory Derived from Business Engineering



Derivation Without Reduction: Why HRET Is a Theory, Not a Domain Application

There is a logical question that follows: how come that the HRET is based on the Business Engineering, and it is not a customary domain application, but a novel theory? The process is that derivation is not reduction. HRET inherits a general design orientation of Business Engineering: the predisposition to conceptualize organizational arrangements as engineered entities; it provides, at the level of the human to technical system, theoretical content lacking specifications in the parent paradigm. It has three arguments that prove its autonomous position. A discrete unit of analysis and explanandum: Business Engineering theorizes the enterprise as an entirety, whereas HRET theorizes the human-technical system, where workers, smart systems, and algorithmic agents are jointly configured, and why AI transformation is successful or stalls. Second, a domain-specific generative mechanism: Business Engineering does not have an analog to Human-AI Alignment, which is presented by HRET in addition to the propositions (P1-P5) that can be drawn out of it and cannot be inferred out of the mother paradigm. Third,

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this is a generative, not subsumptive relationship: between HRET and Business Engineering, the mid-range theory the grand theory is what provides the orienting assumptions, the specific, testable structure of a limited area.
More importantly, this derivation is an issue of intellectual descent as opposed to logic dependence. HRET stands alone: it has its constructs, mechanism, propositions, and limits which are justified in its own terms and are testable without any reference to the parent paradigm. Even a reader who is not familiar with Business Engineering will be able to evaluate HRET as an independent mid-range theory.

3.12 Theory Boundary

The boundaries that HRET has are clear. It is relevant to the design of the human-technical system in the context of organizations that are engaged in digital or AI transformation, and not to the explanation of all the behavioral/psychological phenomena of individuals. It is not meant to substitute strategic HRM theories, it is a design theory that describes the process of rebuilding the human system in AI-enabled environments. It is an organizational, not an individual (psychological) or a macro-economic level, and presupposes a minimum level of digital infrastructure that renders the concept of engineering design significant.
To clarify this breadth: HRET is not a theory of individual behavior or the psychological nature of the workers; it limits itself to a theory of the design of the human-technical system on the organizational level- it is a system-level theory not an individual-level one.
Despite being connected to the logic of design theories, HRET goes beyond generic design theory: it not only explains how to design but defines a causal mechanism, variables, testable propositions, and clear limits. HRET, in contrast to generic design theories, defines causal mechanisms, propositions, limits, and relationships that are testable.
All mid-range theories, including HRET, are most explanatory under certain conditions and less so as those conditions are met in the past. The applicability of the matrix to the organizational contexts is summarized in the matrix given below.

Table 6. Organizational Contexts and Applicability

Organizational context	Applicability of HRET
AI-enabled and digitally transformed organizations	High
Knowledge-intensive organizations and technology startups	High
Public-sector organizations undergoing AI adoption	High
Traditional organizations undergoing digitalization	Moderate
Manufacturing organizations	Moderate
Micro-enterprises with limited digital infrastructure	Limited
Organizations lacking digital infrastructure	Low

In line with this, HRET can be interpreted as a theory of human-technical system design in organizations that seek to transform with the help of AI. It has a more limited explanatory range than grand organizational theories, and a wider range than context-specific frameworks, and fits in an intermediate range that balances both foundational organizational theory and practical models of transformation- just the limited focus that allows cumulative development but does not go too far..

4. Problem Statement

The gap in the previous studies is twofold. On the one hand, the literature on AI in HRM available enhances the tools without re-engineering the human system per se. Conversely, organizational change is hardly theorized as an engineering problem making the design of the human-technical system to be under theorized. So the main question of the research is:

Central Research Question

What is the theoretical basis of Human Resources Engineering (HRET), as a mid-range theory that re-engineers the human-technical system in the organization in the era of AI, and what is the conceptual framework and model of maturity that reflects this theory?

5. Objectives and Significance

The purpose of the study is to: (1) establish HRET as a domain specific, mid-range theory based on Business Engineering; (2) define its main thesis, causal mechanism, variables and boundary conditions; (3) elucidate a conceptual framework of principles, capabilities, and maturity levels; and (4) formulate testable theoretical propositions with operational indicators. It has three meanings: theoretically, it shifts the unit of analysis to the human-technical system; methodologically, it finds a model of theory-building based on an integrative synthesis; and practically, it provides organizations with a diagnostic logic of AI transformation.

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6. Theoretical Propositions and Their Grounding

Since the theory is conceptual in nature, none of the following are developed as empirically established relationships but rather are the theoretical propositions that can be formed through the construction of HRET- a foundation researchers can build and empirically test in future research across the different organizational settings. Both are introduced with its scientific basis and proposed indicators of operation.

Theoretical Hypothesis 1 (H1): It is theorized that the more the engineering of the HR system, the more successful is the organizational AI transformation.
Scientific basis: It is based on the Dynamic Capabilities Theory (Teece et al., 1997) which correlates reconfiguring the resources with performance and the evidence of SHRM (Becker and Huselid, 2006) that reported performance implications of engineered human systems.
Suggested operational indicators: Degree of HR-process redesign; level of HR–digital-systems integration; degree of organizational flexibility.

Theoretical Hypothesis 2 (H2): The theory assumes that Human-AI Alignment is positively correlated with the effectiveness of organizational change and can account for its differences in the organizations.
Scientific basis: Based on the Socio-Technical Systems theory (Trist and Bamforth, 1951; Baxter and Sommerville, 2011) and the concept of joint optimization, and in the idea of Human-AI symbiosis.
Recommended operational measures: Level of human-algorithm interaction; acceptance of AI results by the employees; dependence on the AI results; quality of human-machine interaction.

Theoretical Proposition 3 (P3): The theory is that the five engineering capabilities do not work in a vacuum but rather they work together to increase the maturity of HR engineering.
Scientific grounding: Based on the integrative-design logic of Business Engineering and the story of capability accumulation and reconfiguration provided by DCT.
Recommended measures of operations: Level of maturity of each of the five capabilities; level of integration between them; design coherence across dimensions.

Theoretical Proposition 4 (P4): The theory projects that the HR engineering is developed in sequential levels of maturity, and that failure to take all the levels undermines the success of transformation.
Scientific grounding: Based on capability-maturity literatures and in the sense of the sense make seize transform sequence (Teece, 2007).
Proposed operational indicators: The level of maturity where the organization is; the preconditions of each of the levels are in place before transitioning to the next level; the impact of level-skipping on the effectiveness of transformation.

Theoretical Prop. 5 (P5): The theory assumes that institutional sustainability in the long-run is better with a greater HR-engineering maturity.
Scientific grounding: It is scientifically grounded due to the literature on sustainable-HRM (Ehnert, 2009; Kramar, 2014) and is also grounded on evidence in the Saudi context (Abuhaimed et al., 2025).
Proposed operational indicators: Governance and algorithmic-fairness indicators; continuity of human capabilities; continuous learning and improvement of organization.

The research does not provide a ready-made tool to confirm the propositions mentioned above; it provides preliminary conceptual indicators that can be used to create measurement tools and confirm their validity and reliability when it comes to further research. The propositions thereby can be tested without the study turning into a scale-development exercise.

6.1 Testability of HRET

Even though HRET is a sophisticated theory as a conceptual theory, it meets one of the most crucial requirements of theory constructions testability. To this end, the given study suggests initial operational indicators of each proposition, without purporting to have comprehensive measurement tools. The elaboration of measures and validation of psychometric properties is still the task of the further research. HRET thus integrates conceptual rigor and openness to empirical testability-exactly what makes theory-building papers and closed descriptive models different.

6.2 Operationalization of Constructs

To convert abstract constructs to testable relationships, the table below operationalizes each of the core constructs of HRET: its conceptual definition, the indicators that it suggests should be used in empirical tests, the proposed

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level of measurement, and the proposition that it is primarily concerned with. The indicators are provided as a starting place to the development of an instrument, not a validated scale.

Table 7. Operationalization of Constructs

Construct (definition)	**Suggested indicators**	**Measurement level / data source**	**Link**
Engineering Design — deliberate design of the human–technical system	Degree of HR-process redesign; HR–digital systems integration; structural flexibility	Organizational; survey of managers + document analysis	P1
Human–AI Alignment — engineered congruence between human and algorithmic subsystems	Task, cognitive, structural, value, and strategic alignment; acceptance of and reliance on AI outputs	Individual + organizational; multi-item perceptual scale + system audit	P2
Dynamic Capabilities — capacity to sense, seize, and reconfigure the system	Integration among the five engineering capabilities; design coherence; reconfiguration speed	Organizational; capability-maturity assessment	P3
AI Transformation — movement across maturity levels	Position on the five-level maturity ladder; completeness of each level's preconditions; effect of level-skipping	Organizational; maturity-ladder placement + longitudinal tracking	P4
Institutional Sustainability — durable capacity for governed co-evolution	Governance and algorithmic-fairness indicators; continuity of human capabilities; continuous learning	Institutional; governance indicators + longitudinal performance data	P5

The moderators in the causal model such as sector, organizational size, digital maturity, and environmental dynamism are operationalized as contextual variables that are likely to qualify the intensity of the P1-P5 relationships as opposed to being constructs in the core chain.

7. STUDY DESIGN

7.1 Method

The research deploys theory-building based on an integrative literature review, which is backed by a comparative theoretical synthesis, and seeks to develop a mid-range theory as opposed to empirical hypothesis testing. This is a standard practice in theorizing articles: the theoretical structure is based on the generalization of the literature, and not on the gathering of field data.

7.2 Sources and Selection

The review relied on peer-reviewed articles in the field of management, information systems, and HR, both in Arabic and English, within the 2010-2026 timeframe with references to original articles. Inclusion criteria: had to engage substantively with digital/AI transformation, socio-technical design, or organizational capabilities; exclusion: purely technical AI papers that did not have organizational relevance.

7.3 Data and Coding

The data were academic books and their conceptual information. Metadata of the references were extracted in a structured extraction sheet, including research stream, key concepts, the theory invoked, and contribution to building HRE. Thematic coding was done at two levels; firstly, open coding to identify concepts within each source, followed by axial coding to group these concepts into five streams/dimensions (ORG, DIG, ALG, ENB, SUS), and based on which the principles and capabilities were obtained.

7.4 Analysis and Documentation (PRISMA)

The screening was done according to a PRISMA logic (identification - screening - eligibility - inclusion) such that transparent records of the source selection are provided and the selection bias is minimised during the synthesis.

8. CONCEPTUAL FRAMEWORK: PRINCIPLES, CAPABILITIES, AND MATURITY

8.1 The Five Engineering Principles

HRET is based on five design principles: (1) joint optimization- design the human and technical subsystems jointly; (2) work before jobs- design the work system first, and then design individual roles afterwards; (3) capabilities before skills- develop organizational capabilities, not just individual skills; (4) human-AI complementarity- design to work with, not replace; and (5) engineering before administration- design as a design object, not as an administered function.

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8.2 The Five Engineering Capabilities

These five capabilities were no selection by chance but rather a result of theoretical synthesis of the five literature streams, considered in Section 2 (digital transformation and Business Engineering; organizational technology; AI in HR; socio-technical systems; and sustainability). Each capability embodies the engineering expression of a single stream of the human-technical system, making sure that the organizational, digital, algorithmic, human, and sustainability dimensions are covered without overlaps or gaps.

Table 8. Five Engineering Capabilities

Capability	Definition	Theoretical anchor
Organizational Engineering	Redesign of structures, processes, and policies	STS: joint design
Digital Engineering	Building the digital infrastructure and data integration	DCT: sensing
Algorithmic Engineering	Embedding algorithmic logic and decision support by design	Distinguishing capability
Enablement Engineering	Building workforce readiness, skills, and continuous learning	Human capital
Sustainability Engineering	Governance, algorithmic fairness, and continuous improvement	DCT: transforming

The fact that these dimensions are described as engineering (organizational, digital, algorithmic, enablement, sustainability) does not mean that they are independent and stand-alone engineering disciplines, but rather are interdependent engineering capacities of the same architecture- Human Resources Engineering. The label refers to the common design logic that makes them all be the same not to be divided into different fields.

8.3 The Conceptual Maturity Model

The maturity model is not an empirically validated tool but a conceptual framework ranking the progression of the organization in moving past organizing the human system, to digitizing it, to automating it, to making it AI-enabled, and lastly of the maintenance and governance of the organization.

The model presupposes that HR-engineering capabilities gain incrementally, with each level being a condition to the other; a successful AI enablement is impossible before organizing, digitizing and automating is finished. It is this cumulative ordering which puts the model into its explanatory logic and not a descriptive ladder.

Table 9. Conceptual Maturity Model

Level	Label	Focus	Anchor
1	Organize	Re-engineer processes and structures	STS
2	Digitize	Build digital infrastructure and HRIS	DCT: sensing
3	Automate	Automate routine processes	DCT: seizing
4	Enable AI	Integrate algorithmic models	STS: technical congruence
5	Sustain	Governance and continuous learning	DCT: transforming

8.4 Measurement Implications

Although the study does not construct a validated instrument, its five engineering capabilities are operation able: all of them can be mapped to an initial measurement space, organizational engineering to redesign processes and structural flexibility, digital engineering to infrastructure readiness and data integration, algorithmic engineering to AI utilization and decision-support quality, enablement engineering to digital skills and lifelong learning, sustainability engineering to governance and algorithmic fairness. Such capability-level domains are complementary to the construct level indicators table provided in the operationalization table (Section 6.2); such a set of indicators provides a starting point on which future researchers can build and prove measures, but does not form a ready to apply scale.

9. DISCUSSION

9.1 Interpreting the Construction

The synthesis substantiates that AI change in HR is not a linear and tool-based process, but it is an iterative and design-driven process: transformation requires re-engineering and feedback loops which aligns with P2 and P3. The results are in line with Bondarouk and Brewster (2016), who observe that digital transformation usually fails due to lack of attention to the organizational aspect of it, and follows it up with predicting that Human–AI alignment is the pivotal factor (P2), thus validating the main thesis of the theory.

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9.2 Expected Empirical Patterns

Based on the theoretical background and evidence in the Saudi context (Abuhaimed et al., 2025), empirical studies in the future are likely to affirm the five propositions, especially the correlation between HR-engineering maturity and transformation success (P1) and the focal role of the Human-AI alignment (P2).

9.3 Theoretical Contribution

The main input of HRET is the shift of the explanatory locus of AI transformation. In a place where most of the literature finds results to be a result of technology adoption, digital maturity or leadership support, HRET finds the main source of success or failure to be the engineering quality of the human-technical system itself, that is, re-configurable design object and the provision of an explanatory mechanism that connects engineering principles, organizational capabilities and maturity levels. The most basic contribution of the theory is this change in the focus of the explanations and not any new construct in particular.

Theoretical Contributions

1. Redefining the unit of analysis in HR management.
2. Moving HR from "an administered function" to "an engineered system."
3. Supplying an explanatory causal mechanism centered on Human–AI Alignment.
4. Proposing a staged institutional maturity model linking theory to practice.

The essence of the HRET conceptual difference in this contribution is that the differentiating capability is that of Algorithmic Engineering: the organizational, digital, enablement, and sustainability capabilities are enabling conditions that HRET share with neighboring schools, but the only concept that HRET adds is the algorithmic logic, as a design dimension around which the human system is restructured. The defining statement is thus: HRET is differentiated by Algorithmic Engineering, but the engineering architecture in general characterizes the same.

Explanatory and Predictive Power

The strength of HRET does not only lie in its differentiation but what it explains that the other theories fail to explain. Three phenomena shown in the following table display its unique explanatory extent.

Table 10. Explanatory and Predictive Power

Phenomenon	Limit of existing theories	HRET explanation
Transformation failure despite high technology quality	Attributes failure to tools or skills (Digital HR)	Explains it through socio-technical misalignment from absent engineering design
Variance in AI returns among technologically similar firms	Lacks a variable to explain variance at equal technology	Attributes it to differing engineering maturity of the human–technical system
System resistance to optimal algorithmic solutions	Treats the algorithm as a solution in itself (Algorithmic HRM)	Explains it through absent joint design that embeds the algorithm humanly and organizationally

In addition to explicative, HRET has a predictive aspect: it predicts that more mature organizations will have higher levels of socio-technical congruence, more organizational capabilities and more likely to sustain transformation - propositions P1-5 are directly testable propositions that, in my view, keeps the explanatory lens open to empirical testing rather than closed to propositions of explanatory only.

9.4 Significance and Lineage

HRET reacts to requests of conceptual underpinnings that can make sense of how work, workforce organization, and organizational capabilities evolve with growing integration of algorithms (Bailey et al., 2022; von Krogh, 2018). It is also important not so much as to offer another digital-transformation framework but to provide an open theoretical platform: its constructs, propositions, mechanism, and maturity logic are designed to facilitate the development of measurement, the empirical testing, and comparative study without becoming over-extended like the latter half of the mid-range theories.

This disposition is bequeathed of the Business Engineering tradition a tradition of the mind and not a tradition of procedure. HRET is the specialization of that tradition, which sees organizational arrangements as designed objects, to the human-technical system, and then defends its own constructs and propositions on its own. The shift is comparable to the intellectual-capital theory refining the resource-based view, and similar to other related work positioning the notion of algorithmic systems as manageable capital resources under the resource-based view and intellectual-capital theory (Abuhaimed, 2026b), which complements the approach of HRET to the algorithmic subsystem as a design object.

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10. FUTURE DEVELOPMENT OF HRET

Being a conceptual construction, HRET is fully developed with all elements such as a defined object, central thesis, causal mechanism, boundary conditions, and testable propositions, but its evolution into a validated theory is made possible by any further work. There are three directions that are salient. First, measurement: operationalizing Human–AI Alignment and HR-engineering maturity into validated measures and determining their psychometric characteristics. Second, the five propositions, especially the mediating effect of alignment (P2) and the sequential logic of the maturity model (P4) should be empirically tested. Third, test on boundaries: investigate the behaviour of the theory on sectors, organizations of different sizes and digital maturity levels to refine them. These guidelines are related to the maturing of HRET as such, and not its expansion into other areas.

11. RECOMMENDATIONS

11.1 Future Research Streams

HRET defines several coherent research streams through which the theory can be tested and extended:

- **Stream 1: HRET and AI preparedness:** the contribution of HR engineering to AI preparedness in organizations in various industries and sectors (healthcare, government, finance).
- **Stream 2 — HRET and organizational performance:** how HR-engineering maturity is linked with operational, financial and strategic performance.
- **Stream 3: HRET and algorithmic management:** the impact of the engineering design on the emergence and performance of algorithmic-management systems.
- **Stream 4 - HRET and workforce resilience:** how HR engineering can enhance the workforce adaptability and resilience in the face of technological disruption.
- **Stream 5 - measurement development:** developing and validating measures of HR-engineering maturity and Human-AI Alignment (factorial validity, reliability) and empirically testing propositions P1-P5, its mediating role of alignment, and cross-country comparative designs.

11.2 Academic Implications

- Embark on introducing HRE concepts in the graduate level of both HR and MIS.
- Create interdisciplinary initiatives that integrate HR, data science and organizational engineering to form co-design competencies.

11.3 Practical Implications

- Welcome the maturity logic as a self-diagnostic positioning/roadmap designing tool.
- Organize re-engineering preceding the introduction of algorithmic solutions, respectful of the joint-design principle.
- Create AI governance within the HR with algorithmic fairness, transparency and sustainability.
-

12. LIMITATIONS

Type of study: it is a conceptual, founding study that seeks to develop theory but not to test it; no instrument or test is given and the researchers can develop measures and test the model in the organizational setting.
Limits of constructs: the construction is based on five dimensions; the other dimensions (cultural, legal) were not clearly introduced and should be extended in the future.
Methodological coverage: the synthesis relied on the literature available on identified databases and in Arabic and English, which might not cover literature in other languages; conceptual coding also involves interpretation despite a standardized coding sheet.
Temporal and contextual constraints: coverage 2010-2026 based on foundational work, implicit applied coverage large organizations in the Arab/Saudi context.

13. CONCLUSION

Human Resources Engineering Theory (HRET) promotes a new theoretical view, which describes how HR is changing with re-engineering of the human-technical system. The research provides a conceptual construction components, mechanism, and boundaries without purporting to be complete or empirically valid, and its essence is Human-AI Alignment as the connection that describes why transformation is successful or terminates. It is not proposed as a procedural design, or as a ready-to-hand tool, but as an explanatory, testable theory: as a first integrated construction, to which researchers are challenged to transform into measures, to test against the propositions, to re-examine within an organizational context.

Final Theoretical Statement | | HRET is a simple yet consequential claim: organizations | do not change because of artificial intelligence, but when the human systems are carefully designed to work in unison with the intelligent

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systems. The AI-era challenge to organizational performance might not be the complexity of AI, but the caliber of the Human Resources Engineering around it, and the main management task of the AI era will be not the uptake of technology, but the engineering of human-technical systems that can be sustained in co-evolution with intelligent actors.

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