This research explores the reconstruction of job competencies for digital-intelligent finance and business positions under the background of Hainan's customs closure and industrial upgrading

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Abstract: *Hainan's customs closure operation drives the regional industry to upgrade toward cross-border, offshore, and digital-intelligent directions, and it generates a fundamental demand for reshaping the competency structure of finance and business positions. This study focuses on the reconstruction logic of job competencies for digital-intelligent finance and business positions under the background of industrial upgrading triggered by the customs closure. It systematically analyzes the deconstruction boundaries of traditional finance and business competency dimensions, the sudden changes in competency characteristics induced by digital-intelligent embedding, and the moderating effect of the customs closure environment on factor weights. It further reveals the impact mechanisms of cross-border data flow, offshore trade patterns, and industrial value chain reconstruction on the migration of finance and business functions, the tension between accounting and risk control capabilities, and the multi-skilled competency gradient. On this basis, this study proposes three major reconstruction pathways: the separation and recombination of capability units based on task granularity, the adaptive calibration mechanism for dynamic competency thresholds, and the topological optimization of the competency map for digital-intelligent finance and business positions. It then constructs a modular and iterative competency adaptation model. This research provides an analytical framework and operational tools for redefining the competencies of finance and business positions in the customs closure scenario.*

Key words: *digital-intelligent finance and business, competency reconstruction, customs closure industrial upgrading, separation of capability units, topological optimization*

Introduction

The superposition of accelerated cross-border factor flows, normalized offshore transactions, and deep embedding of digital-intelligent systems under the customs closure environment makes the traditional finance and business competency structure centered on accounting accuracy face systematic failure. Existing competency research is mostly based on static job descriptions or general competency dictionaries, and it fails to capture the nonlinear changes in the ranking of competency factor weights and the dynamic reorganization of task granularity in the customs closure scenario. Therefore, it is necessary to re-examine the competency composition of digital-intelligent finance and business positions from three levels: the evolutionary mechanism, the impact effect, and the reconstruction path. This study deconstructs the boundaries and mutation characteristics of traditional competency dimensions, and it clarifies the criteria for distinguishing retained, stripped, and newly emerged capabilities. It reveals the mechanism through which cross-border data flows and offshore trade affect the migration of finance and business functions and the tension of capabilities. It then proposes a reconstruction model featuring modular assembly, adaptive threshold calibration, and topological optimization. The industrial upgrading under the customs closure is not a partial business adjustment but a reset of the underlying logic of finance and business work, and adhering to traditional frameworks will lead to a structural mismatch between job competencies and business demands.

1. The Evolutionary Mechanism of Competency Factors for Digital-Intelligent Finance and Business Positions

1.1 The Deconstruction Boundary of Traditional Finance and Business Competency Dimensions

The competency dimensions of traditional finance and business positions center on accounting accuracy, compliance adherence, and financial report preparation, and their boundaries are defined by static business rules and periodic reconciliation processes. In a closed business system, the competency scope of finance and business personnel is mainly limited to the recording and aggregation of transaction data, and it lacks the ability to intervene at the front end of unstructured information. The existence of this boundary relies on a clear path of business document flow and a linear decision-making chain, and once external input conditions change, the adaptability of the original competency dimensions becomes insufficient. The necessity of deconstructing this boundary lies in the fact that, under the customs closure environment, the accelerated flow of cross-border factors breaks the original accounting closed loop, and finance and business positions need to incorporate new dimensions such as data governance and process analysis, thereby redefining the starting point and the end point of competencies.

From the perspective of competency structure, the deconstruction of traditional dimensions requires distinguishing between two parts: core retention and marginal stripping. The retention part covers basic functions such as statutory report preparation and tax compliance, while the marginal stripping refers to highly repetitive and rule-based accounting units. The basis for stripping lies in the fact that digital-intelligent systems can algorithmically replace these units without the need for continuous human intervention. At the same time, a fuzzy zone appears at the extension of the boundary, which includes activities between traditional accounting and analysis, such as cross-system data reconciliation and abnormal transaction tagging. These activities no longer belong to a single competency dimension; instead, they constitute a transition zone where old and new competencies overlap. Clarifying the deconstruction boundary helps to avoid losing necessary functions and to retain redundant capabilities during subsequent reconstruction.

1.2 The Sudden Changes in Competency Characteristics Induced by Digital-Intelligent Embedding

The embedding of digital intelligence manifests as the penetration of intelligent financial systems, automatic reconciliation platforms, and real-time reporting tools into the workflow of finance and business positions. This penetration shifts competency characteristics from "post-event verification" to "in-process monitoring" and from "manual account adjustment" to "rule configuration." The first level of sudden change occurs in the structure of cognitive load: finance and business personnel no longer need to memorize a large number of account codes or operation steps; instead, they need to understand system logic and data flow. This sudden change is not a gradual accumulation of skills but a qualitative transformation of capability forms, in which some weights of the original competencies are reduced to zero, and new characteristics such as abnormal pattern recognition and cross-system deviation tracing rapidly rise to become key indicators.

The second level of sudden change manifests as the coexistence of dimension compression and dimension emergence in competency characteristics. The compressed dimensions include low-value-added capabilities such as manual voucher preparation and paper document archiving, while the emerging dimensions include data lineage tracing, digital-intelligent rule verification, and cross-module process connection diagnosis. These new characteristics require finance and business personnel to possess abstract modeling thinking and to map business events into transaction flows within the system. Under the background of customs closure industrial upgrading, cross-border transactions increase, and the comparison between system logs and business logs becomes a routine task, so competency characteristics further shift toward "metadata understanding" and "digital-intelligent logic verification." The set of characteristics after the sudden change is no longer centered on accounting subjects but takes the integrity of the data link as its axis[1].

1.3 The Moderating Effect of the Customs Closure Environment on the Ranking of Factor Weights

The customs closure environment introduces new business factors such as cross-border capital flows, offshore settlement rules, and multi-currency accounting, and these factors change the relative importance of various competency factors for finance and business positions. The originally high weight of voucher review and account summary capabilities decreases, while the weights of

cross-border transaction identification, exchange rate fluctuation sensitivity analysis, and offshore account reconciliation capabilities increase significantly. The moderating effect manifests as a nonlinear reorganization of factor ranking: some capabilities that were marginalized in a closed environment, such as multi-source data matching, leap to become core indicators in the customs closure environment. This effect stems from the deepening decoupling of business flows and capital flows after the customs closure, and the traditional document-based verification logic struggles to cover cross-customs-zone transaction chains.

Furthermore, the moderating effect is also reflected in the changes in the interaction weights among competency factors. In the customs closure scenario, the warning information generated by the digital-intelligent system requires finance and business personnel to quickly judge its business rationality, which necessitates a high-weight coupling between data analysis capability and risk judgment capability. At the same time, the weight of single operation speed decreases because system automation has taken over most execution-level tasks. The ranking of competency factors is no longer based on the linear sequence of "accounting-audit-reporting" but is reconfigured according to the closed-loop sequence of "anomaly identification-link tracing-rule correction." This moderation makes the priority of competency factors dynamically dependent on the current transaction complexity and system anomaly thresholds, rather than on a fixed job description[2].

2. The Impact Effect of Customs Closure Industrial Upgrading on the Competency Structure of Finance and Business Positions

2.1 The Migration of Finance and Business Functions in the Process of Cross-Border Data Flow

Cross-border data flow breaks the information silos between the enterprise financial system and external counterparties, payment gateways, and customs data pools. Finance and business functions thus extend from the closed accounting of internal ledgers to the monitoring and verification of cross-system data interfaces. In the customs closure environment, the data corresponding to capital flows and goods flows are no longer transmitted through the same intra-domain link, and the first direction of functional migration manifests as the absorption of cross-border message parsing capabilities. Finance and business personnel need to identify the field mapping relationships between different data standards and to trace the accounting discrepancies caused by transmission delays or missing fields, and the original voucher-centered audit function is diverted to the mid-stage verification link of the data pipeline.

The second direction of functional migration is reflected in the identification of data sovereignty boundaries and the embedding of internal controls. Different customs zones have differences in data formats, encryption requirements, and retention periods, and finance and business positions need to maintain the integrity of their own accounts within these heterogeneous rules. The migrated function no longer pursues a comprehensive review of all data but focuses on threshold setting on key links and the automatic triggering of anomaly tags. This transformation shifts finance and business personnel from data entry workers to definers of data link rules, and their competency structure incorporates protocol understanding, interface log analysis, and cross-system timestamp alignment. The essence of functional migration is the coexistence of forward displacement and backward displacement of finance and business work nodes: the front end intervenes in data standardization design, while the back end receives discrepancy reports automatically generated by the system.

2.2 The Tension Between Accounting and Risk Control Capabilities Under Offshore Trade Patterns

In the offshore trade pattern, the contract flow, goods flow, and capital flow form separate paths inside and outside the customs zone, and the traditional accounting logic based on the integration of the three flows faces failure. The accounting capability needs to handle the physical location mismatch between order information and settlement documents, and it requires finance and business personnel to construct virtual transaction images as the basis for bookkeeping. An inherent tension exists between this accounting method and risk control: on the one hand, accounting requires that transactions be completely recorded and measured; on the other hand, risk control requires identifying the authenticity of counterparties and the compliance of capital paths. When offshore transactions lack physical logistics documents, the original vouchers relied upon by accounting are replaced by electronic contracts and payment instructions, while the traceability required by risk control decreases, and the two form mutually exclusive demands[3].

The specific manifestation of this tension is the differentiation of capability orientations. The accounting side tends to accept standardized electronic data packages and directly book them to improve processing efficiency, while the risk control side requires an anomaly score for each offshore transaction link and the retention of multiple independent verification clues. Finance and business positions need to assume both roles of fast booking and in-depth verification within the same workflow, which places high demands on the frequency of logical switching for personnel. The mitigation of the capability tension relies on rule layering built into the system, which automatically routes low-risk transactions into a fast accounting channel and transfers high-risk transactions to a manual verification path. This mechanism requires finance and business personnel to possess the ability to configure risk layering thresholds, rather than merely performing accounting operations themselves.

2.3 The Reshaping of the Multi-Skilled Competency Gradient by Industrial Value Chain Reconstruction

Under the customs closure environment, the industrial value chain shifts from a linear extension within a single region to modular collaboration across customs zones, and the multi-skilled competency gradient of finance and business positions is thus restructured. The original gradient forms a pyramid structure with financial accounting as the bottom layer, tax processing as the middle layer, and report analysis as the top layer. After the value chain reconstruction, the bottom-layer skills incorporate system log interpretation and data cleaning operations, the middle-layer skills integrate cross-module process connection design, and the top-layer skills shift to abnormal transaction pattern modeling and digital-intelligent rule inversion. The meaning of "multi-skilled" is no longer the dual capability of "accounting plus taxation" but the ternary integration of "accounting logic, data link, and system rules."

The reshaping of the competency gradient is also reflected in the changes in the capability transition path within the same position. In the past, the promotion path from accounts payable and receivable to general ledger accountant may be compressed or bypassed after the value chain reconstruction. The new transition path requires finance and business personnel to possess the ability to extract system optimization points from a single transaction flow and to feed that ability back to the rule configuration layer. Multi-skilled competency no longer takes years of accumulation as its main formation method; instead, it uses project-based tasks as training units, and each time personnel complete a cross-system reconciliation or rule correction, the competency gradient moves up one level. This reshaping makes the position boundary extendable, and the same position can accommodate combinations of multi-skilled competencies at different gradients, thereby forming a dynamic adaptation relationship.

3. The Modular Path and Adaptation Model for Competency Reconstruction

3.1 The Separation and Recombination of Capability Units Based on Task Granularity

The operational basis of capability unit separation is to break down the daily work of finance and business positions into independently definable task granules, and each granule corresponds to a clear input, output, and processing rule. Under the customs closure environment, tasks such as cross-border reconciliation, currency revaluation, and offshore transaction tagging can be extracted as minimal capability units, and the basis for their separation lies in whether they can be executed by a digital-intelligent system or require human intervention. During the separation process, redundant capability units, such as the manual review of paper documents, are marked as replaceable, while core capability units, such as the pattern discrimination of abnormal transactions, are retained and recombined. This separation is not a simple deletion but a labeling of capability units to provide standardized components for subsequent recombination. Furthermore, the separation operation needs to establish granularity control rules for task granules to avoid either excessively fine splitting, which would cause an explosion of combination complexity, or excessively coarse splitting, which would lead to a loss of recombination flexibility. Granularity control takes the atomicity of task execution as its boundary, meaning that a capability unit cannot be further decomposed into independently invocable subtasks[4].

The recombination method adopts a modular assembly logic, which reassembles different task granules into new competency modules according to business scenarios. For example, the competency module in the offshore trade scenario is assembled from three capability units: "cross-border message parsing, exchange rate deviation threshold setting, and abnormal link tagging," and it replaces the traditional linear module of "voucher entry, account summary, and report generation." The assembly

rules depend on the coupling strength and invocation frequency between tasks, and frequently collaborating capability units are encapsulated into the same module. The recombined competency modules have pluggable characteristics: when the customs closure business rules change, users only need to replace or add or remove several capability units without redesigning the entire job competency framework. Furthermore, modular assembly allows the same capability unit to be reused in different scenarios; for example, the "abnormal link tagging" unit can serve both the offshore trade scenario and the cross-border fund reconciliation scenario, thereby forming a cross-module reuse mechanism for capability units and reducing reconstruction costs.

3.2 The Adaptive Calibration Mechanism for Dynamic Competency Thresholds

The competency threshold refers to the minimum level of capability required for a finance and business position to complete a specific task. In the customs closure environment, this threshold cannot be fixed because the cross-border transaction volume, system automation rate, and data anomaly frequency are all in a state of change. The adaptive calibration mechanism collects system logs and manual operation durations during task execution, and it calculates in real time the degree of match between the current capability level and the task complexity. When the match deviation exceeds a set interval, the mechanism automatically adjusts the threshold upward or downward. The upward adjustment occurs in situations such as a surge in offshore transaction volume leading to an increased reconciliation error rate, while the downward adjustment occurs when part of the operations are taken over by automation after a system upgrade. This mechanism prevents the overkill or missed detection caused by static thresholds in a changing environment. The calibration mechanism also needs to introduce a task complexity coefficient, which incorporates variables such as transaction link length and data field missing rate into the threshold adjustment formula, so that the threshold change depends not only on historical performance but also reflects the intrinsic difficulty of the current task.

The core of the calibration mechanism is the closed-loop design of the feedback loop. After each task is completed, the system records the completion quality, such as the discrepancy detection rate and the rule correction accuracy rate, as well as the time consumption data, and it uses these as input variables for the next threshold adjustment. At the same time, the calibration mechanism distinguishes different competency dimensions and sets independent thresholds for each dimension; for example, the threshold for the data tracking dimension and the threshold for the rule configuration dimension can be adjusted asynchronously. When the task failure rate of a certain dimension continuously exceeds the upper tolerance limit of the threshold, the threshold for that dimension is split into finer sub-dimensions, thereby forming a threshold tree structure. This adaptive calibration keeps the competency requirements dynamically aligned with the actual demands of the position, and it avoids the coexistence of capability redundancy and capability gaps. The closed-loop design further incorporates threshold drift suppression logic to prevent frequent threshold fluctuations caused by short-term volatility. By setting a sliding time window and an upper limit on the rate of change, the calibration mechanism ensures the stability and convergence of the calibration process.

3.3 The Topological Optimization of the Competency Map for Digital-Intelligent Finance and Business Positions

The competency map is a topological structure in which nodes represent capability units and edges represent the collaborative relationships between capabilities. After the customs closure industrial upgrading, the efficiency of the original star topology, with the general ledger accountant as the central node and sub-nodes such as accounts receivable, accounts payable, and taxation, decreases because offshore business requires frequent interactions among multiple sub-nodes. The direction of topological optimization is to shift from a star topology to a hybrid structure of mesh and hierarchy. In the mesh part, direct connections are established among nodes such as cross-border reconciliation, exchange rate processing, and system rule configuration, thereby reducing the forwarding delay of the central node. In the hierarchical part, the bottom layer consists of data operation nodes, such as log reading and field mapping; the middle layer consists of rule verification nodes, such as anomaly detection and link tracing; and the top layer consists of rule correction nodes, such as threshold adjustment and module assembly. The hybrid structure supports both horizontal collaboration and vertical transmission: after the bottom-layer nodes complete data cleaning, they can directly trigger the middle-layer verification nodes without needing to go through top-layer scheduling.

The optimized topology possesses adaptive reconnection capability. When the task load of a certain capability node, such as exchange rate revaluation, exceeds the threshold, the system automatically

strengthens the connection between adjacent nodes, such as offshore transaction identification, and forms a temporary collaboration cluster with them. At the same time, the topological optimization identifies and prunes low-usage edges; for example, the connection between the traditional voucher review node and the offshore transaction node is automatically weakened in the customs closure environment. The topological optimization of the competency map is not a one-time reconstruction but a continuous iterative process, and each business rule change triggers local reconnection. The resulting topological structure can reflect the real collaborative relationships of digital-intelligent finance and business positions under the customs closure environment, and it provides a structured reference framework for talent selection and system design. The adaptive reconnection can further introduce an edge weight decay factor: the weight of a long-unused edge decays exponentially until it breaks, while the weight of a frequently collaborating edge increases and triggers node fusion, allowing the map structure to autonomously converge to an optimal form as the business evolves.

Conclusion

This study constructs a theoretical framework for the reconstruction of job competencies for digital-intelligent finance and business positions under the background of customs closure industrial upgrading from three progressive levels: evolutionary mechanism, impact effect, and reconstruction path. This study clarifies the deconstruction boundary of traditional finance and business competency dimensions, and it points out that the criterion for distinguishing core retention from marginal stripping lies in the degree of task algorithmizability. It demonstrates the qualitative transformation of competency characteristics induced by digital-intelligent embedding from "post-event verification" to "in-process monitoring" and "rule configuration," as well as the nonlinear moderating effect of the customs closure environment on the ranking of factor weights. Further analysis shows that cross-border data flow drives the migration of finance and business functions toward the front end of the data link, that the offshore trade pattern creates a capability tension between accounting and risk control, and that the reconstruction of the industrial value chain reshapes the gradient transition path of multi-skilled competencies. Based on the above analysis, this study proposes three reconstruction paths: task granularity separation and modular recombination, adaptive calibration of dynamic thresholds, and topological optimization of the competency map. These three paths correspond respectively to the component layer, the calibration layer, and the structural layer of competency reconstruction, and they form an iterative adaptation model. Future research directions include exploring the differentiated paths of competency reconstruction for enterprises of different sizes under the customs closure environment, introducing multi-agent simulation methods to verify the effectiveness of capability unit assembly rules, and extending the threshold calibration mechanism to cross-position collaboration scenarios to study the dynamic evolution laws and convergence conditions of the competency map.

Fund Projects

This study is supported by a project funded by the Education Department of Hainan Province. Project title: Research on the Reconstruction of Digital-Intelligent Finance and Business Job Competencies under the Background of Hainan's Customs Closure Industrial Upgrading: From the Perspective of Integrated Construction of Industry-Education Integration Bases. Project number: Hnjg2026-182.

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