The Evolution of Corporate Accounting Functions in the Era of Artificial Intelligence: A Conceptual Framework and Future Research Directions

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Abstract: *Now artificial intelligence is being used in all links of accounting recognition, measurement, recording and reporting, and is beginning to change the form and operation of accounting. The conceptual framework for the development of corporate accounting functions in the era of artificial intelligence presented in this paper is divided into three levels: At the level of technological embedding, intelligent algorithms can be used to replace the rules for recognition and measurement; automated processes will reduce the scope of the account recording function, and the accounting objective will be changed from historical accounting to real-time prediction. The Logic of data-driven systems will lead to an organised change in the path of information generation; the transformation of functional attributes will result in an organisation of knowledge components and migration of capabilities, and thus, the context of human-machine collaboration needs to be redefined, and the reserved domain of professional judgment will change. At the level of the future form, there will be a division of accounting control functions, an effect of dynamic in-process measurement on the assumption of the accounting period, and extended theoretical problems resulting from cross-organizational data integration. The above structure will be used to study the changes in function of the intelligent accounting system.*

Keywords: *Artificial Intelligence, Evolution of Accounting Functions, Data-driven Measurement, Human-machine Collaboration, Assumption of Accounting Period*

Introduction

The traditional accounting functions of enterprises are characterised by manual operation, periodic reporting and post-event accounting, and their theoretical foundation has long been the historical cost principle, the accounting period assumption and the stewardship responsibility orientation. Artificial intelligence is changing this structure, and now algorithms are being used to replace, assist in, or reconstruct the processes of recognition, measurement, recording and reporting; thus, functional attributes are being modified, the logic of information generation is being reformed, and the boundaries of professional judgment are shifting. Most of the previous studies have focused on the effect of specific applications and have not systematically mapped out the general trend and internal mechanism of functional evolution. The two purposes of building this framework are to show the spread of changes and to point out deficiencies in the current theory. Therefore, this paper takes the concept framework of the three levels of technological embedding, internal logic and morphological deduction, and then derives the following theoretical problems.

1. Deconstruction and Redefinition of Corporate Accounting Functions in the Context of Artificial Intelligence Technology Embedding

1.1 Potential Substitution of Accounting Recognition and Measurement Rules by Intelligent Algorithms

Intelligent algorithms have begun to learn patterns and rules independently in the first stage of accounting recognition. Auditors used to have to determine by themselves whether something met the recognition conditions based on ownership and the time it occurred, etc.; now, algorithms can automatically find such indicators in the transaction data. A deep neural network can be trained to automatically extract association rules from contract text and delivery data, determine the performance obligations and revenue recognition time of a company, and thus, accountants will not have to conduct

case-by-case analysis. In addition to altering the rules, the recognition criteria have also been changed to a computable probability threshold and the classification boundaries have been set so that there is a high degree of consistency and repeatability in the recognition process.

At the level of measurement rules, an algorithm is used to decide whether to use fair value or historical cost. Continuously collect information from all sides of the market, calculate the parameters of the discounted expected cash flow model for assets and liabilities in real time, and thus do not need to manually determine the fair value of these items at a particular time. A recurrent neural network can be used to determine whether there has been a prolonged decline in the earnings of a group of assets and issue an early warning of impairment; thus, it can solve the problem of fixed measurement at the end of an accounting period. Algorithmic intervention has changed the basis of measurement from "manual deduction according to accounting standards" to "data-driven model construction", and as a result, the scope of professional judgment that was once covered by accounting standards is gradually being determined by the loss functions and optimisation goals of algorithms.

1.2 Boundary Contraction of the Account Recording Function in Automated Processing Flows

The first type of the traditional function of account recording is to organise the chain of classification of transactions, debit-credit determination and book registration. Optical Character Recognition and Natural Language Processing technology can be used in the intelligent accounting system to directly map the key fields of the original document to the standard chart of accounts, and rule engines can be employed to automatically determine the direction of debit and credit. To avoid the problem of manual record-keeping, smart contracts will be employed; when a certain condition is met, such as the completion of an electronic signature or a change in logistics status, accounting vouchers will be automatically generated, and the general ledger and subsidiary ledgers will also be updated at the same time. Therefore, the process of account recording has changed from being an independent work that requires professional knowledge to an automatic operation in the background of business process execution.

As a result of this functional reduction, the number of intervention points for accountants in the process of account recording has been greatly reduced, and their focus has shifted upstream to the design of rules and downstream to the detection of anomalies. The preset account mapping logic and journal entry generation rules in the intelligent system are now considered material control items, and the "review" behaviour in the traditional sense can only conduct sampling tests on the output results of the system. The boundary of the account recording function has gradually moved back to the narrow domain of rule configuration and threshold setting, and a large number of routine recording operations have been covered by algorithms. The designers and operators of the accounting information system will replace the bookkeepers and take the lead in ensuring the quality of record-keeping; thus, the accounting function has been moved from the operational level to the system governance level.

1.3 The Change in Accounting Goals from Traditional Accounting to Real-Time Forecasting

The first purpose of historical accounting is to record the details of past business activities accurately and provide reliable, complete and traceable data over time. With the development of artificial intelligence, real-time stream processing in accounting information systems has begun to attract the attention of researchers, accountants and other professionals, and is now being actively explored for accounting data that are collected at the time of a transaction. More importantly, the trained and generated prediction engines can be used to analyze the historical bookkeeping data and make rolling forecasts of the future trends in revenue, abnormal fluctuations of expenses and net cash flow. It can help the company make internal decisions and has also been used to spread forward-looking information in its external financial statements. For example, the prediction from the expected credit loss model is used to replace the actual loss model[1].

As the goals of accounting have changed, so too have the demands for information from all sides; people are now more interested in the future prospects than in past performance. Therefore, for real-time forecasting, the accounting data should have frequent timestamps and often-changing attributes, so the traditional concept of an accounting period has been replaced by a continuous time window. Now, the accuracy and interpretability of the prediction model are regarded as new measures of the performance of accounting, and the former demand for exact correspondence with the source document has lost its favour. The accounting system is no longer just used to record what has happened in the past; now it can also provide various data to help people make decisions in the future. The

purpose of recognition and measurement in accounting has changed from showing the scope of management to helping people make decisions on how to allocate resources, and as a result, the entire theoretical foundation of the accounting system has been altered.

2. The Internal Logic of the Evolution of Corporate Accounting Functions and the Construction of a Conceptual Model

2.1 Hierarchical Transition of the Accounting Information Generation Path under the Data-driven Mechanism

The old mode of production for accounting information is a linear hierarchy of "source document-accounting voucher-ledger-report", and at all these links, manual identification, classification and summarisation are needed. Based on the above method, we will use a data-driven way to obtain the raw transaction data directly at the feature extraction stage; then, an autoencoder and a neural network will be used to generate intermediate representation vectors, and finally, at the output layer, multi-dimensional accounting information products will be obtained. The model will return the whole solution at once and does not need to save it step by step. The flow of information will no longer be organised according to the fixed chart of accounts at each level; instead, aggregation paths will be built dynamically based on the intrinsic correlation structure of the data. With the flattening of the hierarchy, the form of production for accounting information has changed from "rule-driven sequential processing" to "data-driven parallel computing"[2].

The first reason for the change in hierarchy is that accounting information carriers are more abstract and transferable. Based on the above data, the same raw transaction record can be used for all kinds of accounting at the same time, such as revenue recognition, cost allocation, cash flow classification and tax reporting, and many separate intermediate vouchers do not need to be created. All kinds of historical accounting data can be used to train machine learning models, find a common feature space automatically, and then reuse and prune the information generation path. Control activities that previously had to be done manually in the traditional hierarchy, such as checking the account balance and reconciling subsidiary ledgers with the general ledger, are now covered by consistency constraints in the loss function of the model. Compression and organisation of the information generation path are employed to reduce the response time of the accounting system and improve the level of consistency among all parts of the accounting information.

2.2 The Reorganization of Knowledge Components and the Migration of Capabilities in the Transformation of Functional Attributes

The three kinds of attributes for the accounting function are operational attributes, rule attributes and judgment attributes. After the intervention of artificial intelligence, all operational attributes will be managed by the algorithmic execution layer, and the rule attributes will be gradually moved from the explicit knowledge base of the accountant to computable logical expressions or decision tree structures. Therefore, the knowledge components of an accountant can be divided; the rules of bookkeeping, the correspondence relationships among accounts and reports, and the logic of report preparation are all separated into independent feature-mapping modules, rule-inference engines and anomaly-detection subroutines. Modular encapsulation of knowledge components moves the foundation for the capability of accounting functions from "individual experience" to an "algorithmic component library", and the role of the accountant is to select components, organise invocation sequences and interpret the output results.

Migration of capabilities is the transfer of codifiable knowledge in accounting functions to an algorithmic system, and the remaining uncodifiable tacit knowledge is kept at the human-machine interface in the form of constraints or priority weights. Deep reinforcement learning models can learn strategy networks based on successful and unsuccessful bookkeeping cases in accounting that have some context dependence, such as inter-period accruals and deferrals, revenue and cost matching, identification of asset impairment indicators, etc., and thus achieve some transfer of accounting judgment capabilities. Although this migration will not eliminate the need for people, a distributed cognition system will be established; that is to say, algorithms will be employed to handle the frequent occurrence of high-volume, rule-consistent accounting tasks, and the time of accountants will be freed up for dealing with complex, irregular and unstructured cases. The restructuring of the division of knowledge and the migration of capabilities will form a new division of labour in accounting; together,

people will provide principles and anomaly handling, and algorithms will provide scale and consistent execution[3].

2.3 Definition of the Reserved Domain for Accounting Professional Judgment in the Context of Human-Machine Collaborative Decision-Making

Previously, the scope of judgement for accounting professionals included the choice of accounting policies, adjustments to accounting estimates, assessment of whether there was substance over form in material transactions, and making disclosure judgments on uncertain circumstances. A Bayesian network can be used to model the distribution of financial report results under different choices of accounting policies and show the quantitative effect of selecting a particular policy. The first four goals of accounting professional judgement are to achieve faithful representation, prudence, comparability and relevance; generally speaking, optimisation by algorithm only aims to find an optimum for a single loss function or a weighted combination of them. The incomplete quantifiability of the objective function is the boundary condition for the reserved domain of professional judgment; that is to say, when the objective function of an accounting problem cannot be fully expressed as a computable combination of indicators, the final decision-making power should be in the hands of people.

The second reason for defining a reserved domain is the interpretability of algorithm output. Deep neural networks can find many patterns in the transaction data, but due to the large number of nonlinear internal parameters and activation functions, it is difficult to determine the reasons for a particular accounting judgment. For serious problems that may result in a restatement of the financial report or legal disputes, the judgments of accounting professionals should be traceable, and the chain of evidence in the decision-making process needs to be auditable. Algorithmic systems are black boxes and do not meet this requirement; therefore, it is reasonable to have a person in charge of handling high-risk cases. In the Construction of the Framework for Human-Machine Collaboration in Decision-Making, the reserved domain of accounting professional judgment should be set up in a reversed manner; that is, "default algorithm assistance and exceptional human intervention" should be used. Most of the standardised judgement tasks need to be handled independently by the system, and control will only be returned to the accountant when the prediction confidence is low or there are serious inconsistencies among the objective functions. The way of defining the reserved domain above is efficient and reasonably controlled; therefore, it will provide a stable basis for the professional judgment function of the intelligent accounting system.

3. Morphological Deduction of Future Accounting Functions and Directions for Theoretical Research

3.1 Distribution of Accounting Control Functions in an Autonomous Accounting System

The purpose of the autonomous accounting system is to find transaction events, automatically record them in the accounting system, produce financial statements, correct errors, etc.; thus, the traditional centralized accounting control function has been divided into several independent intelligent modules. The sub-control goals of the corresponding modules are to verify the legality of the transaction, confirm the consistency of the measurement and check for completeness in the report output; these modules will be realised as microservices on the edge computing unit of the business event node. The accounting department or the general ledger system do not need to be solely responsible for control now; at various times, algorithmic agents have been introduced to create a distributed topology for "control as a service". Although the organisation has achieved good integration of control activities with business operations in terms of both time and space, and has reduced control latency to almost zero, serious problems of inter-module coordination and maintenance of global consistency have also arisen[4].

Distributed Reconfiguration has created new research problems in the theoretical system of accounting control. The old control theory assumes that the central controller has all the information at a certain time and then issues commands; however, in an autonomous accounting environment, only local data can be obtained from each module, so a unified state of the distributed ledger needs to be built via consensus algorithms or smart contracts. The accounting control function has been changed from "supervision and correction" to "protocol design and verification"; that is to say, communication protocols, exception handling logic and state conflict arbitration rules among modules are now in advance. In the future, more resilience tests will be carried out on the distributed accounting control

system, quantitative models of trust transfer among modules will be developed, and after the fragmentation of control functions, audit trail paths will be reconstructed. The problems above cannot be solved by the traditional accounting control system alone, so we will use analytical tools from the theory of distributed systems and game theory.

3.2 Analysis of the Impact of the In-Process Dynamic Measurement Mode on the Accounting Period Assumption

The dynamic measurement mode of in-process measurement has a continuous timestamp, so as soon as a transaction occurs, it can be promptly identified and measured, and the system will constantly update the previous estimates with the new information in the data stream. The original idea of a "cut-off date" was to use the accounting period assumption, but it can no longer be applied in this way; therefore, estimated values such as the fair value of assets and liabilities and expected credit losses are no longer adjusted at the end of the period but are continuously updated in real time after every triggering event. Continuous measurement refers to the fact that the recognition of profit or loss is no longer limited to a specific month or quarter, but takes the form of a continuous curve over time. Users of the financial report can select any time period to get the accumulated data, and the reporting period will be a user-defined sliding window rather than a fixed period set by the company.

As it will affect the basis of the accounting period, accounting theory will need to amend the matching principle for revenues and expenses and the fundamental logic of the accrual basis. In the in-process dynamic measurement mode, the matching relationship will no longer be based on the manual allocation of common costs in different periods; instead, the consumption of long-term assets will be automatically mapped to the actual benefit time point via time series decomposition algorithms. A state-space model in the accounting information system can continuously track the expected gains and outstanding costs of unfinished business, and at any given time, a dynamic distribution method can be employed for this period instead of the allocation method. In the future, research will be carried out on how to compare the methods of analysing financial statements in continuous time, how to develop earnings indicators that are not based on the period assumption, and what is the impact mechanism of high-frequency fluctuations in real-time measurement data on the decisions of information users.

3.3 Extended Theoretical Problems of Accounting Functions in Cross-organizational Data Integration

Cross-organizational data integration is the joint collection and analysis of risk information by many different organisations through the sharing of raw transaction data or other intermediate accounting data. Smart contracts and blockchain technology can be employed to automatically collect and cross-verify procurement, production, delivery and settlement data from all enterprises in the supply chain, so the scope of accounting will be expanded from a single legal entity to cover the entire value chain. The general structure above is that the company's own accounting system will no longer be the sole source of information on the credit risk and asset ownership of counterparties; instead, the verified status information of these counterparties will be directly obtained from consensus data. Functional expansion can be seen in the change of accounting systems from "recording the company's own transactions" to "coordinating interest relationships among various parties", and the process of recognition and measurement needs to meet the reporting demands of all these parties at the same time.

The extended form has many theoretical problems that are not addressed in the traditional consolidated financial statements. The first problem of cross-organizational data integration is the conflict between data ownership and verifiability; although people want to keep their business secrets, accounting information needs to be auditable and traceable back to the original data. Although there have been some achievements in the field of privacy-preserving computation technology, such as zero-knowledge proofs and homomorphic encryption, their computational overhead and the requirement for real-time performance in accounting have not been fully met. The other is the inconsistency coordination of multi-entity measurement rules. The enterprises use different accounting standards and have various revenue recognition periods, so rule mapping and conflict resolution need to be carried out in the integrated system. In the future, research will be carried out on the Design of trust anchors for cross-organizational accounting information, the development of distributed algorithms for multi-entity joint impairment testing, and the reconstruction of dimensions for accounting information quality in integrated environments (e.g., new metrics for cross-entity comparability).

Conclusion

With the development of artificial intelligence in recent years, the function of corporate accounting has gone from process automation to rule automation and is now moving towards judgment reconstruction. As shown in the concept framework of this paper, the replacement of recognition and measurement rules with intelligent algorithms has transformed professional judgment into loss functions and probability boundaries; boundary contraction of the account recording function indicates that accounting work has moved from the operational level to the system governance level; and the change in accounting objectives to real-time prediction has redefined the main attributes of information quality. Alterations to the hierarchy of the information generation path, modular organisation of knowledge components, and the reverse configuration principle of the reserved domain in human-machine collaboration can all be considered parts of the inner logic of functional evolution. The future direction of the development of the accounting function will be as follows: First, an autonomous accounting system will be introduced to distribute the topology of control functions, and the required change will be from "supervision and correction" to "protocol design". Second, the mode of in-process dynamic measurement will not be limited by the concept of an accounting period, and the report will be based on continuous-time systems. Thirdly, we will collect data from all links in the accounting chain to cover the whole process, and new problems in theory will arise, such as data ownership, rule coordination and trust mechanisms. The following studies will focus on the resilience test of distributed control systems, earnings measurement indicators without the period assumption, and metrics for cross-entity comparability.

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