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Automated Accounting System

Applicant

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Inventor

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Title of Invention

Method and System for Automated Accounting

Field of the Invention

The present invention relates to automated accounting systems and methods. Specifically, it pertains to an automated accounting system that leverages real-time **Triggers** (such as cyber-physical systems and API endpoints), **Routers**, and **Accounting Processing Libraries** (APL) to process and store transactions in a centralised **Single Source of Truth** (SSOT), which can then be reported based on **Business Reporting Schema** (BRS) to streamline accounting and reporting of organisations' state of affairs.

Background of the Invention

Financial reporting has long been a balance between timeliness and accuracy. Traditional methods often require a trade-off: faster reports may lack precision due to estimations, while more accurate reports take longer to prepare. For instance, "flash reports" generated shortly after month-end provide timely information but often rely on estimations and may omit certain transactions, leading to discrepancies between reported and actual performance. This gap can disadvantage organisations that seek a competitive edge through precise, real-time financial insights.

The bottleneck arises primarily from manual accounting processes concentrated around period-end closings. Accrual accounting practices necessitate adjustments to align cash flows with business activities, reflecting the true financial performance and position of the entity. These adjustments are typically manual and not cost-effective to perform more frequently, leading to a spike in accounting activities at month-end and delaying accurate reporting.

Additionally, labour inefficiencies plague the accounting profession. Highly educated accountants often spend significant time on repetitive, low-skill tasks such as data entry, account

reconciliation, and report formatting. This underutilisation of skilled professionals not only inflates costs but also contributes to job dissatisfaction and labour shortages. Moreover, the market does not compensate for these inefficiencies, leading to lower remuneration and a vicious cycle of diminished value in the profession.

Current technologies such as Robotic Process Automation (RPA), Artificial Intelligence (AI), and modular accounting software still present significant limitations in their application to fully automated accounting systems, particularly in meeting the rigorous demands of accounting standards and real-time data processing.

Robotic Process Automation (RPA) replicates human actions to automate tasks, but this approach often mirrors inefficient manual workflows rather than optimising processes for full automation. By relying on user interface interactions instead of more efficient methods like direct data access via APIs, RPA can slow down execution and be prone to failure with interface changes. Additionally, RPA tends to automate linear, task-based processes without rethinking how they could be done more efficiently, making it less scalable and effective for complex, real-time accounting workflows where speed, accuracy, and scalability are critical.

Artificial Intelligence (AI) holds promise for automating complex decision-making processes, but certain types of AI, particularly machine learning (ML) models like deep learning, pose challenges in explainability and compliance with accounting standards. These models often function as “black boxes”, making it difficult to trace or understand the basis for their decisions, which is a significant drawback in accounting, where auditability and traceability are essential. Additionally, since these models are trained on historical data, they can introduce bias if the data reflects outdated or incorrect practices, potentially leading to flawed accounting treatment. Machine learning models also struggle to adapt to new or revised accounting standards unless they are specifically retrained, which increases the risk of non-compliance.

Modular accounting software has emerged as a popular solution, offering the ability to integrate specialised applications for different accounting tasks, such as payroll, tax compliance, and financial reporting. These systems enable organisations to choose best-in-class solutions for specific needs. However, modularity often results in fragmented systems that are difficult to manage holistically. Data silos emerge when different modules do not communicate effectively, leading to issues with reconciliation, data integrity, and the maintenance of a single source of truth. This fragmentation complicates the workflow for accountants and can slow down the overall accounting process.

These existing technologies highlight a gap in the market for a comprehensive, fully automated accounting system that can handle real-time data processing, ensure compliance with international accounting standards, and maintain auditability across all transactions. Current systems either fall short of full automation, lack explainability, or create integration challenges that impede accounting efficiency. Therefore, there is a need for an integrated solution that optimises accounting processes from start to finish, automating data capture, classification, and reporting while maintaining the highest levels of accuracy, transparency, and compliance.

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Summary of the Invention

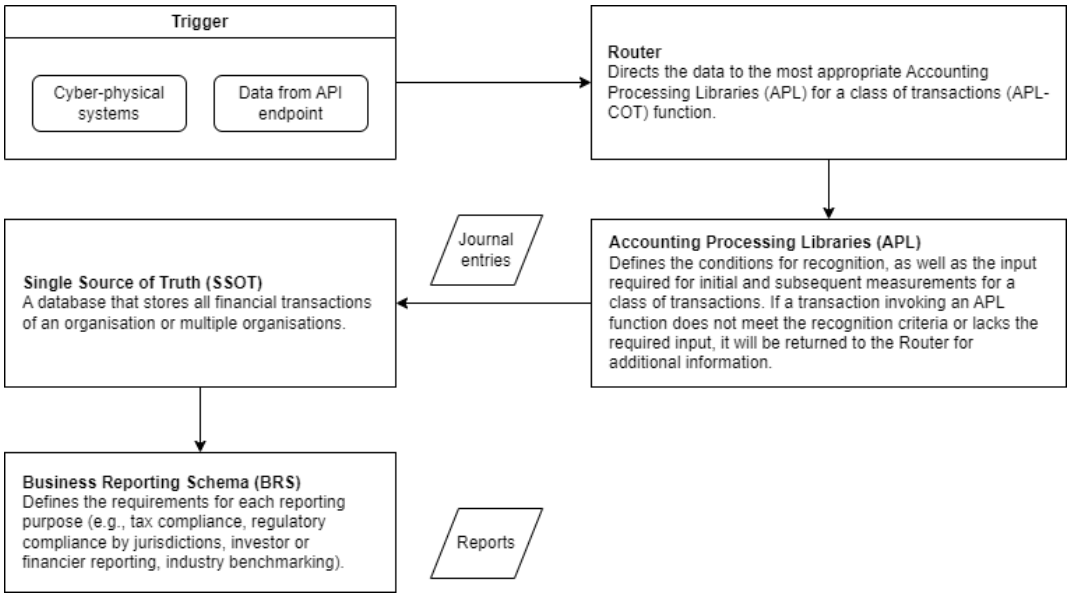

Figure 1: Summary of the workflow of the Invention

The invention presents an automated accounting system designed to overcome the limitations of traditional accounting methods. The system comprises:

1. Triggers

   Utilisation of Cyber-Physical Systems (CPS) and API endpoints to automatically initiate accounting processes upon the occurrence of specific events or transactions, eliminating manual data entry and enabling real-time transaction recording.

2. Router

   A mechanism that directs incoming data to the appropriate Accounting Processing Libraries (APL) based on predefined rules and conditions, supplemented by artificial intelligence for complex classifications. This ensures accurate and efficient data processing, reducing bottlenecks during period-end closings.

3. Accounting Processing Libraries (APL)

   Rule-based frameworks that define how specific classes of transactions are recognised, measured, and accounted for, producing journal entries for each processed transaction. This standardisation facilitates automation and compliance with accounting principles.

4. Single Source of Truth (SSOT)

A centralised repository that stores all validated transactions, eliminating data silos and ensuring consistency across the organisation. This unified ledger supports timely and accurate financial reporting.

5. Business Reporting Schema (BRS)

Tailored reporting parameters that automate the extraction and reporting of relevant data from the SSOT for specific purposes, facilitating compliance, stakeholder engagement, and seamless data exchange.

This system enhances both timeliness and accuracy of financial reporting, reduces manual intervention, and ensures that stakeholders receive reliable real-time data, thus meeting the increasing demands of modern business environments. By addressing the limitations of RPA, ML, and modular software, this invention provides a next-generation solution for accounting automation that is efficient, scalable, and compliant with evolving financial standards.

Detailed Description of the Invention

1. Triggers

Triggers are the starting points that initiate the accounting processes. These triggers consist of two main components:

1.1. CPS: CPS plays an increasingly important role in modern businesses. They capture real-time data from physical objects, such as intelligent sensors and cameras in inventory systems or machinery. For instance, when a device detects a shipment has been received or a machine has completed production, it automatically triggers the appropriate accounting process. The data captured, such as inventory updates, material usage, or equipment maintenance costs, is seamlessly transmitted to the accounting system.

1.2. API: API endpoints serve as digital gateways that enable systems and devices of different organisations to communicate and exchange data. They trigger accounting events when specific actions occur, such as a sales being recorded at point-of-sales terminals or in an e-commerce platforms, payments being received through a banking systems, employee expenses being submitted on a payroll system, among others.

These triggers eliminate the need for manual data entry, allowing accounting systems to record transactions in real-time as they happen. When transactions are accounted for immediately as they occur, it further streamlines the accounting process and removes the need for daily bookkeeping or period-end closing activities.

National and international standardisation of electronic transaction records would facilitate the implementation of Triggers by providing consistent formats and protocols for data exchange. This standardisation enhances interoperability between different systems and organisations, facilitating automation. Key examples include:

- Peppol (Pan-European Public Procurement Online): Peppol is an international network and set of standards that enable businesses and government entities to exchange electronic procurement documents, such as e-invoices and e-orders, across borders. By adopting Peppol standards, organisations can automate invoicing processes. Countries like Singapore, Australia, and New Zealand have adopted Peppol for e-invoicing. Businesses in these countries can send and receive invoices electronically in a standardised format, capable of triggering automatic recognition of payables and receivables in their respective accounting systems.
- Electronic Shipping Notices (Advance Shipping Notices): Standardised electronic shipping advice documents provide detailed information about upcoming deliveries. Buyers require suppliers to send Advance Shipping Notices (ASNs) using standardised EDI formats. When received, these ASNs trigger inventory updates and accounts payable processes in the buyers' accounting system.
- Bank Notifications (e.g., SWIFT MT910): Standardised bank messages notify businesses of financial transactions. For example, SWIFT MT910 is used internationally to advise account holders of credit entries. Upon receiving an MT910 notification, a business's accounting system can automatically update cash balances and recognise revenue.

2. Routers

The Router is a critical mechanism that directs data to the appropriate APL-COT for processing. As data flows into the system from various Triggers, the Router serves as the intermediary, ensuring that each transaction is classified and processed under the right set of rules.

The Router operates based on a set of predefined rules and conditions that determine how to classify and direct data into the correct COT based on characteristics of the incoming data, e.g. the Triggers, transaction type, etc.

2.1. Deterministic logics: The Router evaluates incoming data against a series of predefined conditions. For example, it checks the type of transaction, such as sales, purchases, or expenses, and applies the relevant APL-COT function. If a transaction falls under a specific category, the Router automatically routes it to the appropriate standards.

2.2. Fallback on machine learning, deep learning and natural language processing techniques: If the Router cannot determine the appropriate APL-COT based on the deterministic rules, it relies on ML models to assist in classifying the transaction. ML can analyse complex or uncommon transactions and suggest the appropriate accounting treatment. Over time, as similar transactions recur, ML-generated suggestions can be codified into new deterministic rules, making the system more comprehensive and accurate, after being verified by the Router provider.

2.3. Handling exceptions: When a transaction does not meet the criteria for recognition or lacks required input as defined by the relevant APL-COT, upon receipt of feedback from the relevant APL, the Router provides feedback to the Router provider. This ensures that missing or incomplete data is flagged, allowing users to address it promptly before processing resumes.

3. Accounting Processing Libraries (APL)

APL represents the framework of rules that dictate how specific classes of business transactions are recognised, measured, and accounted for within an automated accounting system. Unlike traditional principle-based accounting standards, APL is designed to be rule-based, making it more suitable for automation and digital processing.

Functions within an APL:

3.1. Recognition criteria: Each APL defines the recognition criteria for transactions. These are rule-based conditions that determine whether a transaction qualifies for recognition. For instance, revenue might be recognised only when certain conditions, such as the delivery of goods or services, are met. A sale transaction that invokes the APL will be rejected if the data provided lack the evidence of delivery.

3.2. Initial measurement: The APL also defines how the transaction should be measured or valued. The transaction amount in the incoming data may not always reflect the value at which the transaction should be measured. An example is liabilities carried at amortised cost, where discounting is required.

3.3. Subsequent measurement: Where a transaction impacts the future financial position or performance of the organisation, the APL defines how it will be measured over time. This ensures that the measurement reflects the pattern of usage or impact on financial statements. An example is the acquisition of long-term assets, which are depreciated over their useful life.

3.4. Fallback mechanism: If a transaction does not meet the recognition criteria or lacks necessary input, the APL will return it to the Router for additional information or processing. This ensures that incomplete or invalid data is addressed before it is fully processed, improving the accuracy of financial records.

The output of the APL is one or more sets of journal entries, which reflect the recognised and measured values of the transaction. These journal entries are passed on to SSOT.

4. Single Source of Truth (SSOT)

The SSOT is the central repository where all transactions of an organisation are stored. It acts as the definitive record for all accounting data, ensuring consistency, accuracy, and transparency across the entire organisation. In the context of automated accounting systems, the SSOT acts as the backbone of the organisation's information architecture—a unified ledger that serves as the source for all information and reporting needs.

In traditional modular accounting systems, data is often stored in multiple systems or departments, leading to data silos. These silos make it difficult to reconcile information and introduce discrepancies. The SSOT consolidates all data into one system, eliminating silos and ensuring consistency across the organisation.

Before journal entries can be stored in the SSOT, they must pass through the APL-SSOT validation process. This process ensures that entries meet all required data conditions, including the enforcement of double-entry accounting and the completion of all mandatory fields. Any imbalance in journal entries or missing required fields will result in the rejection of the entry, ensuring that only accurate and complete records are stored in the SSOT.

The principle of double-entry accounting—where every transaction has a dual effect on the accounting records—must be strictly enforced. If a journal entry does not adhere to this principle or fails to meet the data requirements, it will be rejected and sent back to the preceding APL for review. After that, the entry will be returned to the Router for reprocessing and completion before it can be resubmitted for validation.

5. Business Reporting Schema (BRS)

Each organisation requiring information from another organisation, or the organisation itself, publishes its specific-purpose BRS. In addition, a governmental or non-profit organisation representing the public interest will also publish a general-purpose BRS to ensure that essential public-facing reports are generated.

The BRS is similar to the disclosure requirements in traditional accounting standards, except it is tailored to each specific reporting purpose, rather than general use. An BRS defines the reporting parameters, such as reporting dimensions, scope, and level of aggregation (granularity). It generates machine-readable reports, allowing the data to be easily processed by regulatory bodies, investors, financing providers or other stakeholders. The output of an BRS may also serve as the incoming data that is parsed through the Trigger of another organisation, facilitating seamless data exchange between systems.

Upon subscribing to a BRS, the accounting system will extract the relevant data from the SSOT based on the BRS and push it to the information requester. This automation ensures that the right data is collected and reported at the required times, reducing the need for manual intervention.

Claims

1. A method for automating accounting processes, comprising:

    1.1. capturing transaction data from real-time triggers, including CPS and API endpoints, upon occurrence of specific events, to initiate automatic transaction recording;

    1.2. routing the captured transaction data to appropriate accounting processing libraries (APL) based on predefined rules, for classification and processing;

    1.3. processing the transaction data within the APL according to rule-based frameworks to generate journal entries that comply with accounting principles;

    1.4. storing the validated journal entries in a single source of truth (SSOT), ensuring data consistency and eliminating data silos across the organisation;

    1.5. generating business reports based on a predefined business reporting schema (BRS) by extracting relevant data from the SSOT for specific reporting purposes.

2. The method of claim 1, wherein the triggers include cyber-physical systems (CPS) that automatically capture transaction data from physical devices such as sensors and cameras.

3. The method of claim 1, wherein the triggers include API endpoints that capture digital transactions from external systems, such as point-of-sale terminals and banking systems.

4. The method of claim 1, further comprising a router that determines the appropriate APL for processing based on the type of transaction, applying deterministic rules or machine learning for complex classifications.

5. The method of claim 4, wherein the router applies machine learning, deep learning, or natural language processing techniques when deterministic rules cannot classify a transaction.

6. The method of claim 1, wherein the APL defines recognition and measurement rules for transactions, including initial and subsequent measurements, to ensure compliance with accounting standards.

7. The method of claim 1, wherein the SSOT enforces double-entry accounting and ensures all journal entries meet required data conditions before storing them in the central repository.

8. The method of claim 1, wherein the business reporting schema (BRS) defines specific reporting parameters, enabling automated extraction and reporting of relevant data from the SSOT.

9. A system for automating accounting processes, comprising:

    9.1. real-time triggers configured to capture transaction data upon occurrence of specific events;

    9.2. a router configured to direct captured transaction data to appropriate accounting processing libraries based on predefined rules;

    9.3. accounting processing libraries (APL) configured to process transactions, generate journal entries, and ensure compliance with accounting standards;

    9.4. a single source of truth (SSOT) configured to store validated journal entries, ensuring data consistency across the organisation;

    9.5. a business reporting schema (BRS) module configured to extract and report relevant data from the SSOT for specific reporting purposes.

10. The system of claim 9, wherein the triggers include cyber-physical systems (CPS) and API endpoints for capturing physical and digital transaction data, respectively.

11. The system of claim 9, wherein the router includes machine learning capabilities for handling complex transaction classifications when deterministic rules are insufficient.

12. The system of claim 9, wherein the SSOT enforces double-entry accounting principles and validates journal entries before storage.

13. The system of claim 9, wherein the business reporting schema (BRS) allows for machine-readable reports that facilitate data exchange with external systems and stakeholders.



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Abstract

The invention provides a method and system for automating accounting processes through real-time data capture, classification, processing, and reporting. The system utilises triggers such as cyber-physical systems and application programming interface endpoints to capture transaction data in real-time. A router directs the transaction data to accounting processing libraries (APL) based on predefined rules, including machine learning for complex classifications. The APL generates journal entries according to accounting standards, which are then stored in a centralised single source of truth (SSOT), ensuring data consistency and eliminating silos. A business reporting schema (BRS) extracts and reports relevant data from the SSOT for compliance, stakeholder engagement, and seamless data exchange. This system optimises the timeliness and accuracy of financial reporting, automating the end-to-end accounting process.