

# THE NEED FOR REA MODELING IN TEACHING ACCOUNTING INFORMATION SYSTEM SUBJECT

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## Abstract

The paper discussed potential benefits of teaching Resource-Event-Agent (REA) modeling in accounting information system undergraduate subject. The increasing need of non accounting decisions which depend more and more to accounting data have seriously questioned the relevancy of traditional accounting system to provide them with multi view of data. Traditional accounting system that relies heavily on accounting artifacts such as special journal, ledgers, debit-credit equality and chart of account to provide nowadays tend to be isolated from the entire enterprise value chain analysis. The semantic based REA helps accounting profession to play more significant role in providing multidimensional of economic transaction. Having known the potential benefit of using REA framework for storing accounting information, the paper found that REA framework is a valuable topic for teaching in AIS subject.

However, to get full acceptance of REA teaching in mainstream AIS curriculum still faces many hurdles. Such factors like very steep learning curves, time commitment from AIS instructors and continuing REA theory development toward its maturity level are primary factors for which REA modeling supporters have to deal with. It is believed however, relentless effort would bring about REA topic being accepted as integrated part of AIS curriculum in undergraduate.

**Kata kunci** : *Resource-Event-Agent, Accounting Information System subject, Data Modeling and Design, Duality, Control, Responsibility.*

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## 1. Introduction

The teaching in Accounting Information System (AIS) has been long becoming conversant with traditional accounting. The latter is still widely accepted as mainstream ideas, be it among educators, practitioners, and theoreticians, with its emphasize on accounting artifacts such as special journals, general ledger, and double-entry accounts (debit-credit-account constellation). Focusing economic activities based on chart of account is more than simply the core of file-oriented and structured bookkeeping systems to most accounting faculty. It has become *the way* to teach accounting principles, something that creates high barrier in finding the competing alternatives.

Meanwhile, the increasing move toward semantic modeling, widespread adoption of object-oriented modeling and technology, and the demand upon enterprise application integration offered greater role for accounting profession to actively

provide enterprise with information containing strategic value for enterprise decision making. This had challenged accounting theorists not only to improve accounting information quality, but also to make the information available for non accounting decision such that accounting data are understandable and manageable in their most primitive level.

This paper attempts to bring in REA modeling teaching in AIS curricula, particularly for accounting higher educations. It will be structured as follow: The introduction will discuss the REA as a potential alternative of storing and recording accounting information within accounting system. The second section talks about the drawback of legacy debit credit account, continued with the third and fourth part which will be discussing basic understanding of REA framework consecutively. This paper will also be talking about the hurdles the REA proponents should deal with to expand the topic since its inception back in 1979. Conclusion part will end the

paper coupled with potential future research opportunities.

## 2. Traditional Model

Since its introduction, many scholars and practitioners had questioned the inability of accounting systems to facilitate non-financial decisions [2-4]. This has led to what is considered to be a state of crisis in accounting system. Many had criticized some of the identified downside of conservative system [7]:

1. Its dimensions are limited. Most accounting measurements are expressed in monetary terms, a practice that precludes maintenance and use of productivity, performance, reliability, and other multidimensional data.
2. Its classification schemes are not always appropriate. The chart of accounts for a particular enterprise represents all of the categories into which information concerning economic affairs may be placed. This will often lead to data being left out or classified in a manner that hides its nature from non-accountants.
3. Its aggregation level for stored information is too high. Accounting data by wide variety of decision makers, each needing differing amounts of quantity, aggregation, and focus depending upon their personalities, decision styles and conceptual structures. Therefore, information concerning economic events and objects should be kept in as elementary a form as possible to be aggregated by the eventual user.
4. Its degree of integration with the other functional areas of an enterprise is too restricted. Information concerning the same set of phenomena will often be maintained separately by accountants and non-accountants, thus leading to inconsistency plus information gaps and overlaps.
5. Double entry mechanism in posting economic transactions into account with debit-credit balance principle tends to ignore the need to view data as an integrated part of organization's value chain. This reduces the ability to provide a comprehensive analysis on the organization current and future state.

Most of the researches aimed to correcting the weaknesses mentioned above had been concentrating on *database approaches* that assume that organizations manage their data as a centrally-controlled resource to be shared among a wide range of users with highly diverse needs [8].

## 3. REA Model

To be able to provide a flexible view for diverse users, accounting data must be structured into their primitive level. Resource-Event-Agent (REA) framework emerges to respond this need. REA modeling was introduced by McCarthy in 1982, extending Chen's Entity Relationship Diagram (ERD) to depict accounting data in the primitive level [5]. REA model is applied primarily during database analysis and design phase, guided by relational database approach.

Furthermore, an important feature of E-R based REA is its emphasis on the *semantic expressiveness* of the corporate data model, which is the degree to which elements in the final enterprise schema correspond to or capture the meaning of elements in the modeled corporate reality [6-7]. It suffices the need to express accounting data into a more readable form through certain economic activity logic without being confined in traditional accounting artifacts such as general ledger and embedded procedural aspects of conventional accounting.

Figure 1 illustrates the entities and relationships of an REA model.

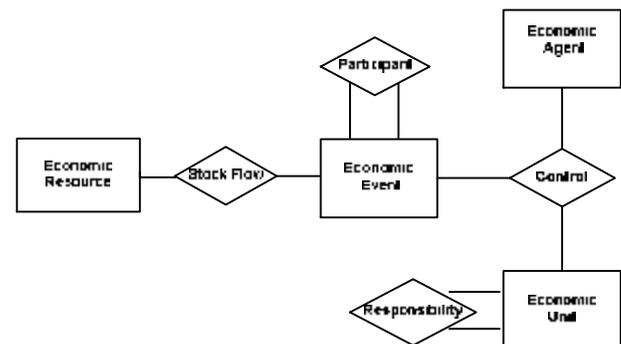


Figure 1 Basic REA Framework [7]

The REA encompasses three primitive entities related to accounting economic transaction and one subset primitive entities based on generalization rule [10]. *Economic Resources* are those things that have economic value to the organization, from which the organization acquires and uses. Cash, Inventory, and Equipment are included in the resources entity. *Economic Events* are the various business activities about which management wants to collect information for planning or control purpose. *Economic Agents* are people and organization that participate in events and about whom information is desired for planning, control and evaluation purposes. *Economic Units* are subset of agent which is inside participants in enterprise [5].

There are four different types of relationships in the REA model [1,5]. *Stock-flow* (including inflow and outflow) relationships denote events

which increase or decrease economic resources. *Duality* relationships associate the dual parts of a single economic exchange, i.e., what is given up is linked to what is taken in. An example would be a cash receipt that is linked to inventory replenishment. The *control* relationship is a ternary connection between an inside agent, an outside agent, and an economic event. For example, a purchase typically involves a buyer (inside agent) and a vendor (outside agent). Often, however, this ternary relationship is divided into two binary ones; this is a common implementation compromise that makes the model easier to understand and implement. *Responsibility* relationships were also defined by McCarthy [5] for REA. A responsibility relationship indicates that higher level units control and are accountable for the activities of subordinates.

Though REA stems from relational database, REA modeling works differently from relational database in such that REA starts top-down and is highly semantic expressiveness as opposed to relational database's *normalization* rule which is bottom-up approach. Working on relational database model with high ingredients of conventional accounting frameworks was a procedure choked with major problems [9].

#### 4. REA Basic Pattern

The basic REA framework can be extended as displayed in figure 2.

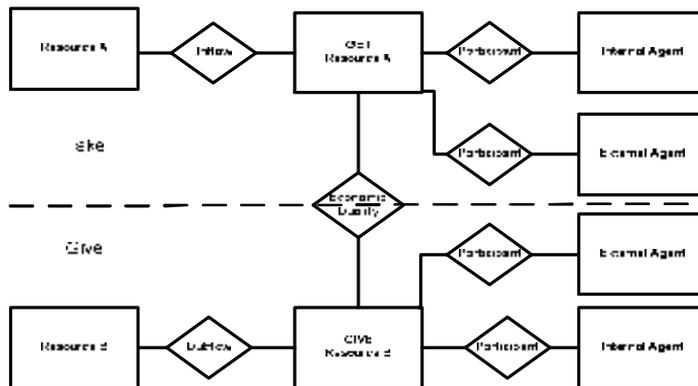


Figure 2 Basic REA Expansions

To integrate with enterprise wide information system, REA drawing must satisfy five rules [10]:

1. Every event must be linked to at least one resource.
2. Every event must be linked to two agents who participate in that event.
3. Every event that involves the disposition of a resource must be linked to an event that involves the acquisition of a resource.(This

reflects the economic duality underlying ‘give-to-get’ economic exchanges)

4. Every resource must be linked to at least one event that increments that resource and to at least one event that decrements that resource.
5. If a specific event can be linked to more than one other type of event, but cannot be linked simultaneously to all of those other events, then the minimum cardinality between that focal event and every other event with which it may be associated must be 0.

From the perspective of business, REA is a pattern of transformation between organization and business partner wherein it gives up control of some resource of value (the “give” notion in half of the exchange below the dotted line) in exchange for another resource of perceived greater value (the “take” notion in half of the exchange above the dotted line) [9]. The simple example on revenue cycle is illustrated in figure 3.

#### 5. Retrieve Information from a Database

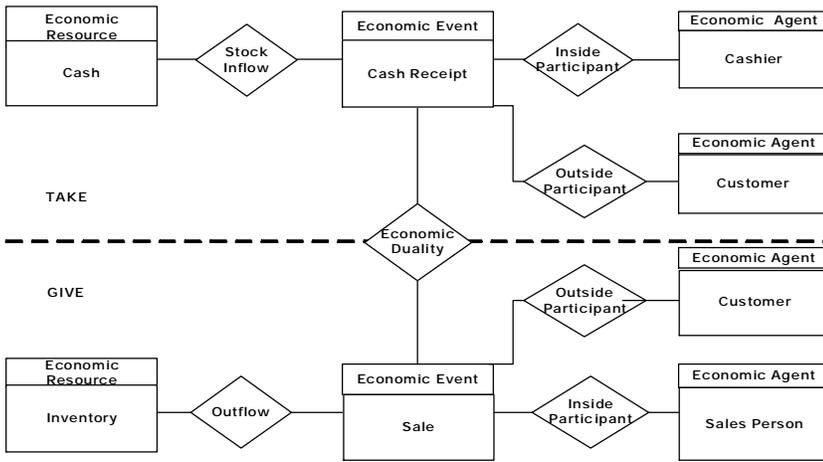
The absence of conventional accounting artifacts does not mean that REA can not present accounting report as such. In fact, relational database based on REA model makes possible management to view accounting report from different angles for different purposes through data query language. The followings are how REA accommodate accounting profession to generate information:

##### 5.1 Query Logic and Cardinalities

Accountant as data modeler needs to understand the underlying business processes before he or she draw REA. Good understanding on business processes helps data modeler to assign cardinalities on each side of REA relationships and write appropriate query to extract the output desired that are relevant with current business practice.

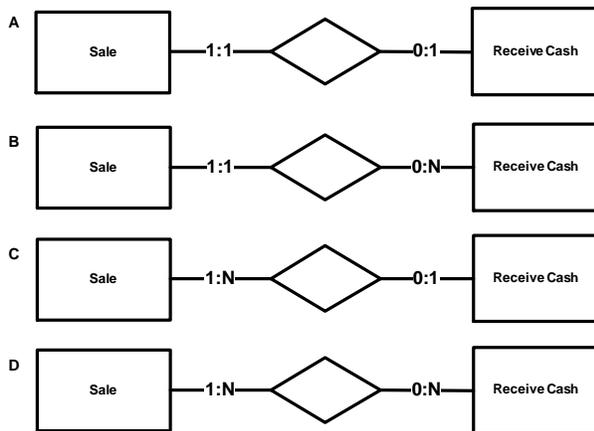
E-R principle adopted by REA model should be relevant with current operation of the organization being modeled. Figure 4 demonstrates example of four different business processes that are represented into four different relationships and cardinalities, even though involving two same entities, Sales and Receive Cash.

Figure 4a (one-to-one relationship) denotes a business practice whose business policy of not allowing customer to make installment payment and only allow customer to make separate payment for each transaction. This practice is a typical revenue cycle for retail sales. Figure 4b (one-to-many relationship) indicates that the seller allows



**Figure 3 Partial REA for Revenue Cycle**

customer to make installment payment for one transaction beside full payment. This relationship normally depicts a business that sell item for credit card. Figure 4c (many-to-one relationship) shows a business that does not permit installment payment but allows its customer to make several purchase under one payment. This reflects the purchase of non durable goods. Figure 4d (many-to-many relationship) represent business that allow customer either to pay in installment basis or one time payment. The figure also indicates that the business allow customer to make several purchases.



**Figure 4 Different Types of Relationship**

It can be seen that a primitive REA data model provides enterprise to understand its basic business process from many perspectives and open incentive to conduct business process reengineering for non value added events. For example, REA model for revenue cycle can exclude billing process – be it billing entity or print invoice – since the business process as seen from REA viewpoint does not directly increase or decrease any economic resource nor commitment to future economic exchange. Thus, billing process can be eliminated with the help of information technology.

**5.2 Journal**

The information normally found in a journal is contained in the tables used to record data about events. For example, each row in the Sales event table contains information about particular sales transaction. Hence, the sales journal can be produced by writing a query that displays the appropriate entries in the sales table for a given period.

**5.3 Ledger**

If in traditional AIS ledgers were master files that contain cumulative information about specific accounts, in REA, resource and agent entities contain permanent information that is carried over from one fiscal year to the next. Each of the resources accounts is affected by increment and decrement events: cash is received and paid, equipment is purchased and disposed/used, inventory is manufactured and sold.

**5.4 External and Internal Report**

Combination of query languages and knowledge about the structure of financial statement are required to produce financial as desired. Additionally, management should understand the meaning of each individual accounts reflected in REA entities.

**6. Conclusion**

REA framework for accounting model modeling provides a potential benefits in integrating accounting resources to enterprise wide resources. The use of E-R diagram, semantic modeling and compliance to relational database provide a clearer way to understand the organization’s value chain. REA modeling accommodates enterprise to use multidimensional view of accounting data for not only accounting decision, but also non accounting decision. Hence, REA framework is worth teaching within AIS subject at least as a balancing topic from the long established traditional accounting system which relies heavily on artifacts such as ledger and chart of account.

It must be mentioned however that full acceptance of conceptual modeling ideas in AIS still faces many hurdles. The learning curves for REA instruction are very steep, as it might take more than a year through the AIS course before the normal accounting faculty member feels familiar enough with the material to use it in a completely integrated fashion. Such a time commitment is difficult for

many in AIS, especially those who must also cover courses in the traditional parts of the curriculum. Relentless effort would make possible REA topic being accepted as integrated part of AIS curriculum in undergraduate.

The paper has briefly explained that understanding business process is an important element to be able creating REA. Since the paper does not provide extensive discussion regarding the relationship between cardinality and query logic, future research may offer research topics discussing about business process and cardinality and query logic.

Another issue worth considering is the future research for the REA development itself. There are entities not included as Resources, Event and Agent that are deserved to present. Commitments to pay or to get resources such as Account Receivable and Account Payable needs attention as they represents the commitment to acquire resources or to give up resources. Matching such as depreciation and service consumption is another topic worth to be sought for the solution. Such events are clearly affecting the resources of the company and the significant monetary item also draws company's attention to handle.

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