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Towards A New Vision of AIS: Knowledge Processing System

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***Abstract*—**It is increasingly realized that AIS is no longer data processing system. Analyzing the current applications of IT in business processes especially in financial and accounting processes shows the dramatic change in AIS orientation into knowledge processing system. This shift raises the question of adequacy of AIS definition. The change in orientation fundamentally affects every area of AIS and should drive radical changes in accounting literatures. Yet, the extent research has largely ignored this phenomenon and existing definitions have provided little of value related to concepts, processes, and mechanism of AIS as knowledge processing system. New AIS has 3D engine that integrates innovatively valves of accounting, knowledge, and technology to match knowledge necessities of business. A key contribution of this paper is redefining AIS through integrating accounting processes, knowledge processes, and IT infrastructure that support applications of these two processes within the mechanism of new AIS. The proposed definition introduces a conceptual framework that fills some of the existing definitions gaps observable in accounting literature. Detailed components analysis technique has been used to explore the invisible capabilities of AIS as source of interorganizational knowledge. Each component in AIS has been re-examined according to very innovative approach to show the real transformations in mechanism of such system. The proposed definition should be of interest to faculty and practitioners of accounting who might be contemplating the value of integrating accounting, knowledge, and technology in the body of AIS. This paper suggests that future research on change of AIS orientation should include (1) expansion of accounting data uses to include the new interorganizational business knowledge usage, and (2) practical assessment that integrate case research, surveys, and cross-sectional field studies for the impact of change on AIS orientation.

***Index terms*-**Accounting,AIS**,** knowledge, Inter-organizational technologies, New processing cycle,

I. INTRODUCTION

Accounting has been for long defined as information science. Changing nature is a key feature of accounting. Accounting as a general knowledge body has many specialized disciplines. Accounting information system is an accounting discipline that is still in an early phase of its development. AIS arena encompasses technology, information systems, and accounting processes. The extended AIS arena, with its three dimensions, integrates both accounting and information systems through technology. The interdependency of technology and accounting can be seen in AIS. As a result of technological progress, accounting processes have changed dramatically. This understanding of AIS nature is obtained by searching the processes and mechanism. In this diagnostic, AIS is no longer the interest of the accounting community. In the accounting literature, two separate approaches are often recognized as being popular in defining AIS. According to the accounting approach, AIS has been defined as a set of accounting processes that will be managed to prepare financial statements. In contrast, a large number of literatures about the technology approach have appeared that explicitly refer to data processing and concepts in their context.

Does AIS need to be redefined? Conceptual framework in social science changes overtime, but this may happen very slowly and not always in the accounting disciplines. The lack of precise definition means there is a question mark about maturity of the scientific field. As accounting is matter, there is no agreed definition of AIS taking into account the philosophical cycle of knowledge. The emergence of a new technology, information systems, and communication applications led to the change in the applications of AIS. Example is the intensive use of information technology has speeded up enormously accounting processes and online financial reporting. It is argued that the interrelationships between technology and accounting process entailed a new definition of AIS to reflect advanced level of IT. AIS is by definition technology based and the complication may arise when the applications of technology change. In this case, the convergence landscape will change and the transition from the traditional definition to a new one will be urgent. Traditional definitions of AIS lack both systems and technology dynamics. According to information system's literatures, systems dynamics focuses on processes and flexibility inherent in such processes. Lacks of technology background has always removed dynamics from the traditional definitions of AIS. Another problem of the traditional definitions of AIS is lack of knowledge integration. A new definition of AIS, however, must be viewed as complementary and generally accepted as being unique to produce business knowledge. Various authors have tried to relate technology applications to accounting processes but the picture has come unclear and imperfect. In defining AIS, the accounting community needs to explain how technology components can be applied and used to support various accounting processes. The author thinks that a new definition must be

transformed from static to dynamic, from quantitative to qualitative, from simple to be complicated. The unique contribution of this paper is that introducing a new definition for AIS based on the above features (See Figure 1).

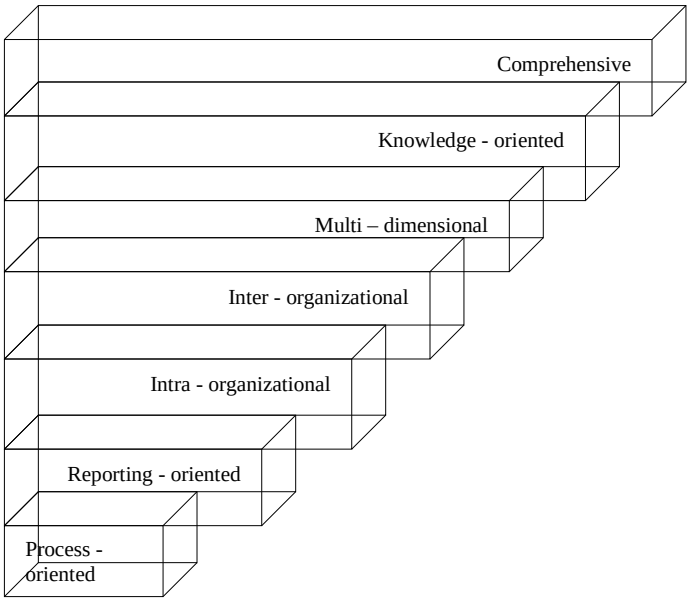

Figure 1. Transformation of AIS

II. RELATED WORK

There is no doubt that use of information technology has dramatically transformed the nature of accounting practices and AIS style of process. As a result, AIS has become critical to definition and practices. Despite the long history, there is relatively little existing research into theory of AIS. Much of the literatures have adopted data processing system view in an attempt to define AIS. Accountants are accustomed to thinking of AIS as a stable data processing system with vertical interest. The core of information systems area is traditionally thought of as accounting information systems integrating transactions processing, reporting, and decision support [17]. According to such philosophy, the primary aim of any AIS is to provide financial information to a variety of users (internal and external). In order to achieve that, the following objectives pursued, namely: to support the day-to-day operations (transactions processing); to support decision making by internal decision makers (information processing); and to fulfill the obligations relating to stewardship (legal obligations). Chenhall and Morris[6] have emphasized that accounting information systems have traditionally been viewed as having a narrow scope and focusing on events within organizations, providing only financial related information and having a historical orientation. Information technology has played and will play a major role in the development of accounting information systems by providing "the push that drives accounting activities" [6]. Accordingly, Mauldin and Ruchala [15] argued that the accounting community must expand their involvement with information systems beyond the traditional AIS emphasis on the flow, timing, and control of financial transactions. They must help design and develop effective AIS as technology causes changes across business and market environment. The effectiveness of AIS is obtained specifically by increasing the decision making process, and further by the availability of high-level enterprise data integration, accuracy and ease in accessing to data on the company's accounting information system, the timeliness of access to corporate data, and enhancing the quality of the corporate financial reporting [24]. AIS contribution to knowledge is derived from the fact that the automated AIS provide the systematic recording, processing, storing, and generating accounting information, and in the absence of AIS, information would be scattered, random, and hard to access, which would become a barrier to the growth of knowledge. Further, he assumes that the automated AIS could speed up information process and overcome traditional human weaknesses. As a result the system support the resources management [18]. According to Spremic and Jakovie [20], AIS may contribute towards efficiency, productivity, and competitiveness improvement of both inter-organizational and intra-organizational systems. To increase such contribution, AIS must change its focus from reporting product costs to reporting product quality, and from reporting historical sales to reporting market demands. Wilkinson [25] has adopted different approach to provide better understanding for the concept of AIS. This approach is based on elaboration of three words constitutes AIS. Accounting could be identified into three components: information system, language of business, and source of financial information. Information is a valuable data processing that provides a basis for making decisions, taking action and fulfilling legal obligations. Finally, system is an integrated entity, where the framework is focused on a set of objectives. The combination of the words Accounting Information System indicates an integrated framework within an entity such as a business firm that employs physical resources (i.e. materials, supplies, personnel, equipment, funds) to transform economic data into financial information for; (1) conducting the firm's operations and activities, and (2) providing information concerning the entity to variety of interested users. Accounting information system has been limited to preparing financial statements for legal purposes and producing historical accounting and financial information [12]. Intensive use of information technology has changed the mission of AIS from simple provision of formal and financial information to encompasses a broader range of information [16]. The accounting information system is continuously changing with the technological development, and because of such quality, AIS has been considered a dynamic system. Furthermore, AIS has been featured as adaptive system, because it is always keep changing to react and adapt, contributing to survive of the organization. However, inter-organizational technologies have radically transformed the nature and role of business and accounting information systems. The accountants add little incremental value to organizations with traditional accounting process [1]. Integrated process of inter-organizational AIS have altered the way AIS work and have added new role related to information, ideas, and knowledge sharing. In perceiving, recording, processing, and reporting financial information, the accounting information system has indisputably a central role, which requires the quick and efficient processing and forwarding of data. Informational support of AIS is indispensable to create and update knowledge [14]. A new role of AIS created a paradoxical situation about availability and usefulness of accounting information. Xu[29] emphasized that AIS as one of the most critical systems in the organizations has changed its way of capturing, processing, storing, and distributing information. Nowadays, more and more digital and on-line information is utilized in the accounting information systems. The evolution of database technology has enabled the implementation of new accounting process, which make it possible for AIS to capture information beyond the historical financial related data [16]. According to Caglio [5], the traditional view of AIS is being questioned by the diffusion of large, integrated, and inter-

organizational accounting information systems. The introduction of enterprise applications software together with the development of Internet technology has changed the boundaries of AIS processes, roles, and direction. For example, the most important impact of ERP has come from the phenomenon of hybridization of accounting processes through enabling the codification of many accounting practices. The other impacts have changed: (1) communication flows have become more intense and exchange of information more frequent with higher need of coordination, (2) redistribution of information flows, (3) re-allocation of the activities and responsibilities concerning accounting and non-accounting information flows, (4) the accountant's traditional role within AIS is declining, since accounting literacy through ERP has become easily transferable to non-accountants, (5) the direction of AIS in terms of it will be viewed as inter system rather than intra. According to Grande et al. [9], increasing investments in AIS will be the leverage for achieving a stronger, more flexible corporate culture to face continual changes in business environment. All the above designing critical aspects have facilitated the embodiment of new vision for AIS. Based on this idea, the current paper has developed a new vision for the structure, analysis, design, and availability of accounting information systems. Incorporating a number of innovative features, the proposed vision provides a set of new concepts, components, and structure that support the analysis of AIS in view of knowledge processing system. The changes in the nature and purpose of AIS, combined with the diffused technological and knowledge perspectives, suggest a need for a new organizing vision that provides a means for integrating extant AIS research and discovering the knowledge opportunities that differing definitions hold. Practicing accountants are being required to focus their attention on the design of AIS to add creative value to information and re-define the role of AIS. An integration of AIS research within sub-disciplines could also provide direction for a new vision practice.

TABLE 1: KNOWLEDGE VS. DATA AIS

Dimension	Knowledge Based AIS	Data Based AIS
Nature	✓ Knowledge System. ✓ Horizontal. ✓ Financial and non-financial. ✓ Relationships ✓ Inter. ✓ Integrated, cross-disciplinary, ad hoc, fluid, and collaborative. ✓ Success in expanding relationships.	✓ Information System ✓ Vertical ✓ Financial ✓ Visible and physical activities. ✓ Intra. ✓ None integrated, closed, restricted, and has boundaries of single businesses. ✓ Success in control.
Procedures	✓ Invisible flow of knowledge. ✓ Value Creation. ✓ Flexible, collaborative, and dynamic. ✓ Strategic. ✓ Comprehensive. ✓ Technical ✓ Centered on knowledge.	✓ Physical flow of resources ✓ Value Realization. ✓ Rigid, isolated, and static. ✓ Operational. ✓ Financial. ✓ Procedural ✓ Centered on data
Rules	✓ Focused on technology process. ✓ Supporting collaboration with business partners. ✓ Networking. ✓ Extracted from e-business model. ✓ Reporting value.	✓ Focused on accounting process. ✓ Supporting performance of recording and reporting process. ✓ Blocking ✓ Extracted from t-business model. ✓ Reporting cost.
Objectives	✓ Creating and sharing knowledge ✓ Value proposition matrix: balancing performance, behavior, and technology. ✓ Reporting Dynamic: Instant and online.	✓ Measuring profitability. ✓ Value proposition matrix: cost, time, and quality. ✓ Reporting Dynamic: Periodical.

.III. PROPOSED VISION FOR DEFINING AIS

New AIS is rooted in knowledge. Knowledge is rapidly becoming one of key resources and most critical asset. In evolutionary terms, AIS progressed from transactions recording, to book keeping, and thence to information system. Most traditional definitions of AIS have concentrated on accounting process as a better way to explain role of AIS. However, they often fail to make the crucial link between accounting, technology, and knowledge. In reviewing traditional definitions of AIS, it is not enough to consider data processing activities of systems, it is also necessary to embrace information processing cycle. Accordingly, it has become imperative, especially for accounting community to shift their attention from data to information and knowledge. At the heart of the new AIS definition lie knowledge concepts and processes. In this diagnostic, a large gap of technology is existed in definition of AIS in the accounting literature. There is an increasing sense that AIS processes has fundamentally transformed by the emergence of information technology and hyper competition. AIS designers must aware that knowledge processes cannot be simply designed on data processing systems. Though definitions vary, it is generally agreed that AIS is data processing system. The idea is that traditional definitions of AIS combine accounting processes as a form of data processing cycle to enable data to be processed. The challenges of converting traditional definition of AIS to a new one are considerable. The greatest problem for traditional AIS is undoubtedly technological, as well as isolation and practical. Inter-organizational AIS has as a result of the knowledge economy become a value adding infrastructure. Knowledge processing AIS has become the enabler of business. Accordingly, it is argued that AIS definition must be updated to more match knowledge necessities. As this entry has shown, concept of new AIS is still in a state of some flux. A proposed definition distinguishes three phases according to the integral components of the concept. This distinction has been most evident in information systems thinking where there is a very long tradition of interest in technology and knowledge. The interactions between components vary according to the industries.

NEW VISION OF A

Accounting is not a static phenomenon. An elaborate examination of accounting set forth many characteristics, above all continuity with changes. The ancient commercial record-keeping systems that were in the form of clay tablets have depicted simple features of the so-called accounting systems as it exists today. The archaeology of accounting demonstrates that the clay tokens have constituted the day-by-day accounting system and represent different layers of accounting thoughts and practices. Several innovations in accounting thoughts, tools, techniques, and practices have brought about a revolution in the nature and characteristics of accounting process. The invention of Double Entry System has formed the first revolution which has caused several changes and transformations in the design and concept of accounting process. The following are key designing advantages of DES: (1) Creating logical processes of accounting as one of the unique thinking system; (2) Creating a rational mechanism for computing accounting profit, which makes use of mathematical and management knowledge; (3) Inventing a mechanism of quantitative measurement of economic events; (4) Standardizing process of handling accounting data; (5) Establishing an empirical and non-monetary control; (6) Providing a framework where accounting data can be adjusted, arranged, grouped and re-grouped; (7) Establishing an arithmetical check on the accuracy of accounting books; (8) and establishing a social dimension in terms of recording of the social events like debt and ownership claims. The ancient role of accounting has been summarized in recording of receipts, obligations, purchases and rentals. Accordingly, accounting has been defined as set of principles and practices of systematically recording business transactions and presenting and reporting financial information. It would be apt to quote Peter Drucker who said "People usually consider accounting to be 'financial', but that is valid only for the past, going back 700 years that deals with assets, liabilities, and cash flows; it is only a small part of modern accounting. Most of accounting today deals with operations rather than with finance" [7]. Accordingly, there is a new transactional accounting that attempts to relate operations to their expected results. Indeed, accounting is being shaken to its very roots by reform movements aimed at moving it away from being financial and towards becoming operational. Accounting has become the most intellectually challenging area in the field of management, and the most turbulent one. The phenomenal growth of software and internet technologies stands as evidence of how information technology has transformed nature of accounting. However, reconceptualization of accounting processes has created inevitable dilemma of change as a problem or an opportunity. A new technological environment has forced to reformulate the theoretical basis of accounting. For example, a new procedural set of inter-organizational accounting information system reduces human judgment of accounting and provides new data model for processing and storing accounting process [23]. Several questions were raised regarding the extent of reality of accounting concepts and valuation methods [21]. In accordance with information system ideology, nature of accounting has totally changed due to disappearance of recording process. Communication of information is becoming a new role of accounting. Instead of being skilled bookkeeper, future accountant has to be skilled information communicator. As a result for dramatic transformations happened in the nature of accounting, a new style of accounting education has evolved. A new style of education integrating technology, connectivity, and creativity into the accounting curriculum to provide the accountant community with required skills and knowledge to seek, use, and communicate information in a very collaborative and creative way. Traditional accounting education programs need to be reformed to ensure that students acquire skills rather than memorize content and learn strategies to update knowledge and skills [28]. Accountant's community prestige and role in new era will much depend on the accountant's skills related to creative thinking, value creation, and knowledge updating.

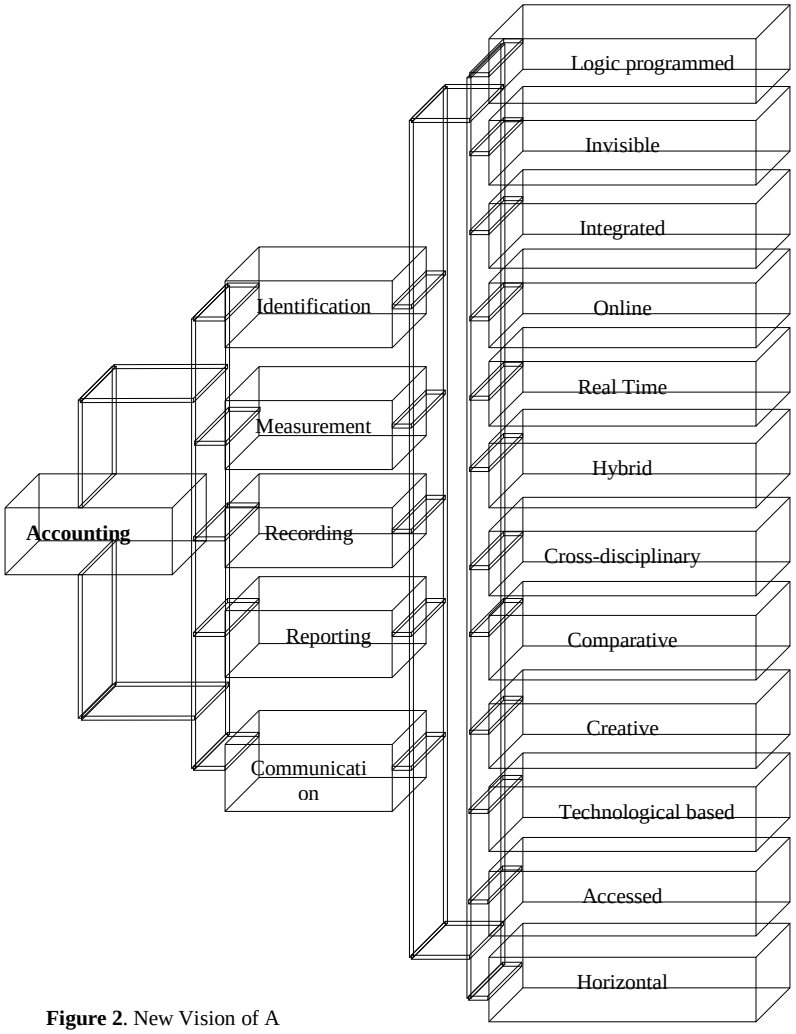

Figure 2. New Vision of A

NEW VISION OF I

Information is a new business asset. High quality data iscritical to success in the Information Age. Accounting is the most important and oldest information system where all processing hierarchies (analysis, measurement, recording, reporting, and dissemination) are deeply rooted in the accounting body [14]. Initially use of information technology was confined to automating and processing business

transactions. The new design approach for accounting process emphasizes integration of accounting process and use of information technology to create knowledge. Accordingly, new set of accounting process combines both routine and innovative that happen across multiple functional areas of business organizations. New information processing cycle is a knowledge engine consists of set of integrated processes and each process represents a distinct role in the purpose of knowledge creation. Information processing cycle entails the continual rekeying of data into various systems as they move through each stage of processing. Linkages between these processes within AIS and a cross its organizational boundaries are achieved by maintaining all relevant data in a shared database. With use of interorganizational technologies, single database can be integrated with other databases of stakeholders. Under new processing cycle of AIS, there are many concepts driven by different processes, goals, and purposes have been coined. Some of these concepts is simple and others new and aim to show how intensive use of information technology has transformed nature of AIS to be knowledge processing system (See Figure 3). The new processing cycle of AIS as knowledge engine combined the following concepts:

DATA: Data is a vital resource.Data or datum is an abstract concept and an individual piece in knowledge evolution. Data constitutes one of the primary forms of information and defined as very simple elements and their purpose still unclear, ambiguous, and with many degrees of freedom. According to Cook and Cook [7], data are defined as words and numbers taken out of context. Data does not carry meaning without context. EDP is the technology for processing data. The general forms for data are symbols, numbers, alphabets, facts, figures, values, and measurements. For example 34278723 are data.

INFORMATION: Information is defined as aggregated pieces of data. Information is data that has been translated into purposes specific forms involving data aggregates plus their formulas and procedures. However, data becomes information once context is added. MIS is the technology for processing information. For example placing the above numbers in a context make it information. Interpretation, re-organization, calculation, are key features of information. Information is classified into useful and useless according to the value of using such information.

KNOWLEDGE: Knowledge is vital to creating and sustaining competitive advantages. Knowledge is defined as application of data and information. However, the term of knowledge has been defined as purposeful coordination of action. Application of knowledge is the composite of two words namely knows how and why. Knowledge can be seen as recognition and accumulation of expertise and skills, when used efficiently with critical thinking results a creation in knowledge. Amount or quality of knowledge is judged by the success or failure in achieving its goals. DSS, ES, and AI are the technologies of knowledge. According to [20], a further distinguish feature between data, information, and knowledge is the method of transfer. Data and information can be transferred through information technologies but knowledge requires human involvement in addition to information technology both in the development of new knowledge and modifying existing knowledge [9].

WISDOM: The general definition of wisdom is accumulated knowledge that enable decision maker to evaluate understanding and making rational decisions that can lead to greater efficiency and value creation. According to Sternberg [22], wisdom is the application of intelligence and experience toward the attainment of a common good. Wisdom is the highest level of abstraction with vision, foresight and the ability to see beyond the horizon. Kirrane[13] defines wisdom as understanding how to use knowledge to make sound judgments and decisions. Wisdom is gained through experience over the long term

TRUST: Trust is one of key drivers to business survival in terms of increasing efficiency, value creation, and building business relationships. Trust creation is a business asset that emerges from behavior specifically from creating value. Trust is defined as an exercise in mutual value creation among parties who are unequal with respect to power, resources, and knowledge. According to Srinivasan[24], building trust is ongoing processes comprises technology, systems, people, and corporate culture that contribute to e-business success. Technology can help connect and harmonize stranded enterprise data, people, and processes. Building business trust is sustained through four core values: honesty, accountability, consideration of other's interests, and transparency. Trust and transparency are essential for any type of business collaboration.

SUCCESS: Success is defined as completing an objective or reaching a goal; achievement of an action within a specified period of time or within a specified parameter; positive consequence or outcome of an achieved accomplishment. Success is a long term AIS quality performance indicator. For example, AIS can be said to be successful if it is creating value and contributed to profit making [25]. Planning and building AIS vision and strategy is an engine of business success. Accounting literature argues that strategic success is considered an outcomes of AIS design [12]. However, adaptation to match business change is an integral part of AIS success requirements. Success of AIS entails matrix of knowledge, skills, and talent. Success based AIS have to be cultivate inner networks, customer centric, adaptability, opportunity focused, always finding a better way, and ability to knows business strengths and weakness. Increase in customer base, profits, market shares, and recognition of value contribution are clear indications of AIS success.

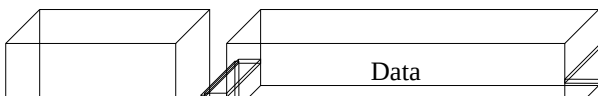

Figure 3. New Vision of I

NEW VISION of S

Historically, development of accounting information systems was directly correlated to the socio-technological organization. The dramatic changes were achieved as a result of the advanced knowledge and technology. The socio-technological approach is a new knowledge ideology to examine development of AIS. Accounting scholars agree that an important potential for developing accounting information systems lies in identifying the interrelationships between individuals, technology, legal, economic, and social customs. Tracing the changes in these dynamic relationships is very important as they impact accounting information systems development over the time. A changing technology has a

dynamic relationship between innovation and exploitation of technical possibilities (practices) and development of solution to the problems. Accordingly, the concept of accounting information system is considered as a turning point and adds another dimension to the complex role that accounting plays. A modern view of accounting information systems includes the use of information technology to provide useful information enabling business organizations to make rational decisions. Information systems and information technology are a new scientific field embraces a large number of heterogeneous components. According to the most of information systems literature, system is defined as set of interrelated components that functioning together to achieve system goals (See Figure 4). These interrelated components are summarized in people, hardware, software, communications networks, rules and procedures and data resources that stores, retrieves, transforms, and disseminates information in an organization [11]. All these dynamic components make AIS an ambiguous concept. Given its complexity and the ambiguity of some of its core concepts, there are different approaches focus on AIS fundamental concerns and assumptions. The current business literature lists more than nineteen foundations of AIS. These literatures depict area of AIS as the intersection of three main disciplines: exact science (including control theory, general systems theory, and statistics), technology (including computer science, electrical engineering) and social and behavioral sciences (including management theory, sociology, psycholinguistics, economics, etc.). A new class of IT infrastructure is incorporating business process via the Internet to both business and accounting information systems [21]. New AIS is acting as a bridge (or engine) between business model and business process to achieve profitability objectives. This mechanism has been called the vertical approach in designing AIS. Inter-organizational accounting system is integrated process based with strategic linkages and technological alliances. At the heart lie interorganizational process and strategic partnerships. Some companies for example have created a number of cross-functional processes that combine the functional knowledge to improve the flow of operations and customer services. The other companies have overlaid a horizontal process making partnerships to increase their market shares. Its involves re-architecting accounting information systems infrastructure interorganizationally, so that sharing, coordinating, and using business resources become almost instinctive and a part of performance. Interorganizational AIS are evolving to become the typical infrastructure for business industries [17].

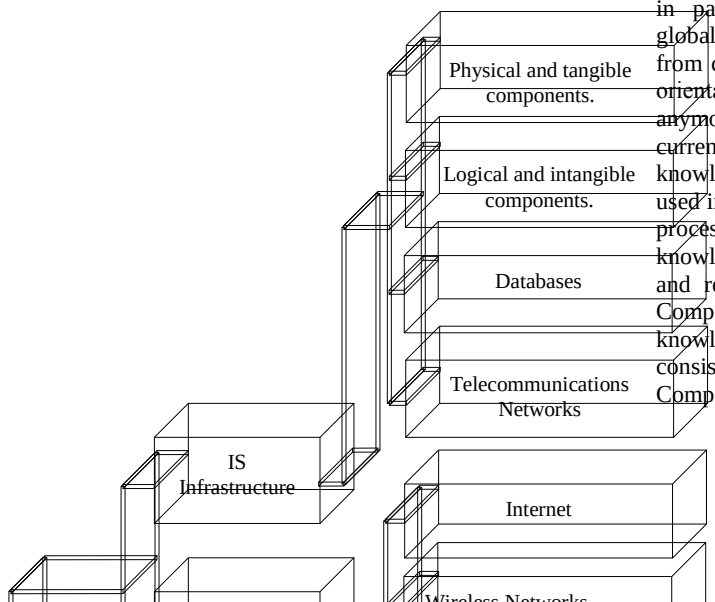

Figure 4. New Vision of S

VI. CONCLUSION

This paper contributes to the accounting literature in a generic way, by proposing a new vision for AIS. The proposed vision has several implications for the area of accounting in general and the area of AIS in particular. The rise of interorganizational technologies, the globalization of economy, and the radical change in business culture from competition to collaboration have imposed dramatic change in orientation of AIS. The old rules and applications of AIS don't apply anymore. Using comprehensive business approach it is argued that a current definition is no longer matching real applications of AIS as knowledge processing system. Structural content analysis has been used innovatively to introduce a new definition for AIS as knowledge processing system has 3D engine that integrates accounting, knowledge, and technology. Components of A have been analyzed and redefined in view of new features of horizontal accounting. Components of I have been mapped and extended to match knowledge necessities of businesses. New knowledge processes map consists of data, information, knowledge, wisdom, trust, and success. Components of S have been architected to combine information

systems infrastructure, ICT, information policy, human resources, and rules and procedures. Special focus is put on a new knowledge role of AIS in interorganizational business applications.The most important finding is that accounting is no longer data or information services activities, instead accounting is becoming a knowledge services that support survival of business organizations. However, another proposed finding is that AIS is no longer data processing system, but it has become knowledge processing system with mature architecture and dynamic infrastructure that support knowledge creation of business. The proposed vision of AIS suggests several directions for further research into transformations in nature of accounting and its practical systems. First, the accounting community must expand the uses of accounting data to include the interorganizational usage that related to knowledge creation. A logical extension of these new uses of accounting data would be urgent to show the dynamic relationship among areas of business. Second, a more practical assessment on new nature of accounting that integrate case research, surveys, and cross-functional field studies will be possible to support the proposed transformations in terms of concepts, processes, and new organizational roles.

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