

# **HYPERBOLIC BROWSER FOR ERP ACCOUNTING SYSTEM PEDAGOGY AND CURRICULUM MANAGEMENT**

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## **ABSTRACT**

This study introduces the application of a hyperbolic browser for (1) classroom pedagogy and (2) curriculum administration of university accounting programs. A key pedagogy benefit for students is a tool which provides information visualization of accounting processes and facilitates the development of information acquisition skills. This approach gives faculty organizational coursework knowledge management control. The hyperbolic browser can also be adapted to knowledge management of academic accounting department curriculum.

**Key words:** Hyperbolic browser, ERP, Curriculum, Knowledge Management.

**Data availability:** Data / Javascript program code is available upon request.

## **INTRODUCTION**

**T**his is a developmental work of incorporating hyperbolic browsers in a knowledge management accounting systems and curriculum framework in university education. The study will work through the development theoretically and by way of example. Hyperbolic browsers can benefit academics in two respects: curriculum management; and information visualization of accounting in the classroom. Every accounting department faces issues of curriculum management. Over time, the accounting information/curriculum has become more complex. With increasing complexity comes a greater difficulty of administration with respect to coverage and control. A means to the end of better administration is application of knowledge management (Swanson and Hepner, 2011) in which hyperbolic browsers can be used as the information organizer. The motivation is efficiency within administration and the generation of well-defined documentation.

Information visualization is an issue in classroom accounting education. Instructors know accounting cycles and information systems but must convey them to students who many times cannot see the forest for the trees. Hyperbolic browsers give a big-picture overview and facilitate the mapping of transactions through an accounting system and accounting cycle. This mapping feature is of particular instructive value for ERP systems which are used in all top firms and most middle level firms. Due to the complexity of ERP, knowledge management then becomes a useful means to administer ERP and its application to various educational competencies (i.e., as evidenced by learning objectives). A substantive issue is: How does one navigate within the specific (detail) transactions in regards to the general (overall) reporting? One answer is information visualization with hyperbolic browsers. Hyperbolic browsers bring to the table the capability of making a graphic presentation of the ERP conduct of business (e.g., Microsoft Dynamics GP) and then following through the numbers to the financial statements.

The remaining sections of the development cover: a literature review of relevant information visualization including hyperbolic background, an ERP curriculum hyperbolic example, a classroom design formulation, and conclusions with future directions.

## LITERATURE OVERVIEW

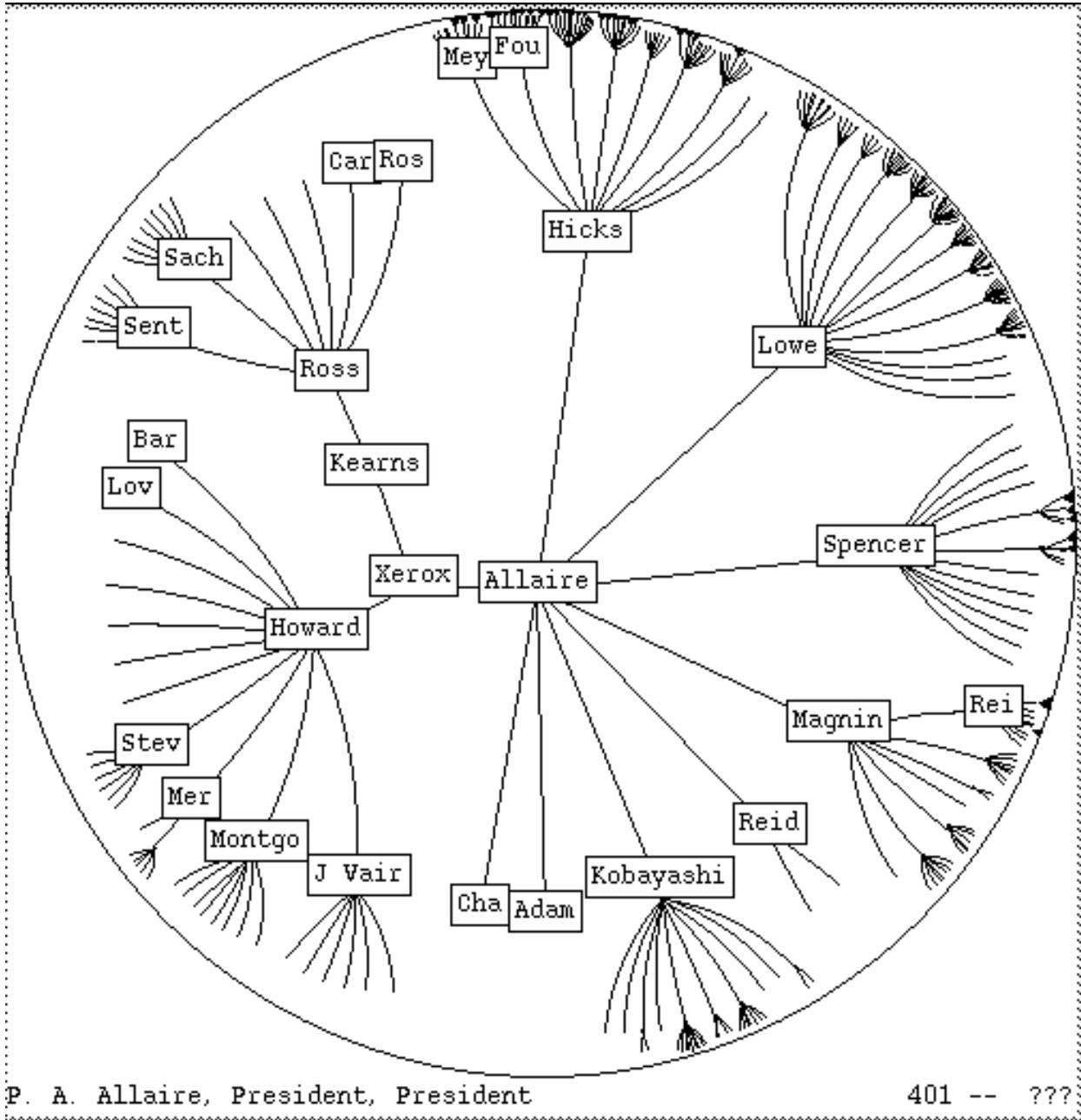
The literature overview has two areas of discussion. One addresses the idea of information visualization and the other specifically addresses knowledge management in accounting pedagogy.

### Information Visualization

Two approaches to information visualization are discussed here. One is the approach commonly known as mind mapping. Wikipedia (Wikipedia, 2012) has a list of freeware mind map software at their web site [http://en.wikipedia.org/wiki/List\\_of\\_concept\\_and\\_mind\\_mapping\\_software](http://en.wikipedia.org/wiki/List_of_concept_and_mind_mapping_software). Mind mapping is generic and not a rigorous graphical methodology, but it does enhance student learning (Farrand et al., 2002). The Wikipedia site has several example pictures, and it is possible to make a graphic organization of any particular accounting system with one of the software packages. Note that individual users' preferences may affect whether one of the freeware programs meets a need or not.

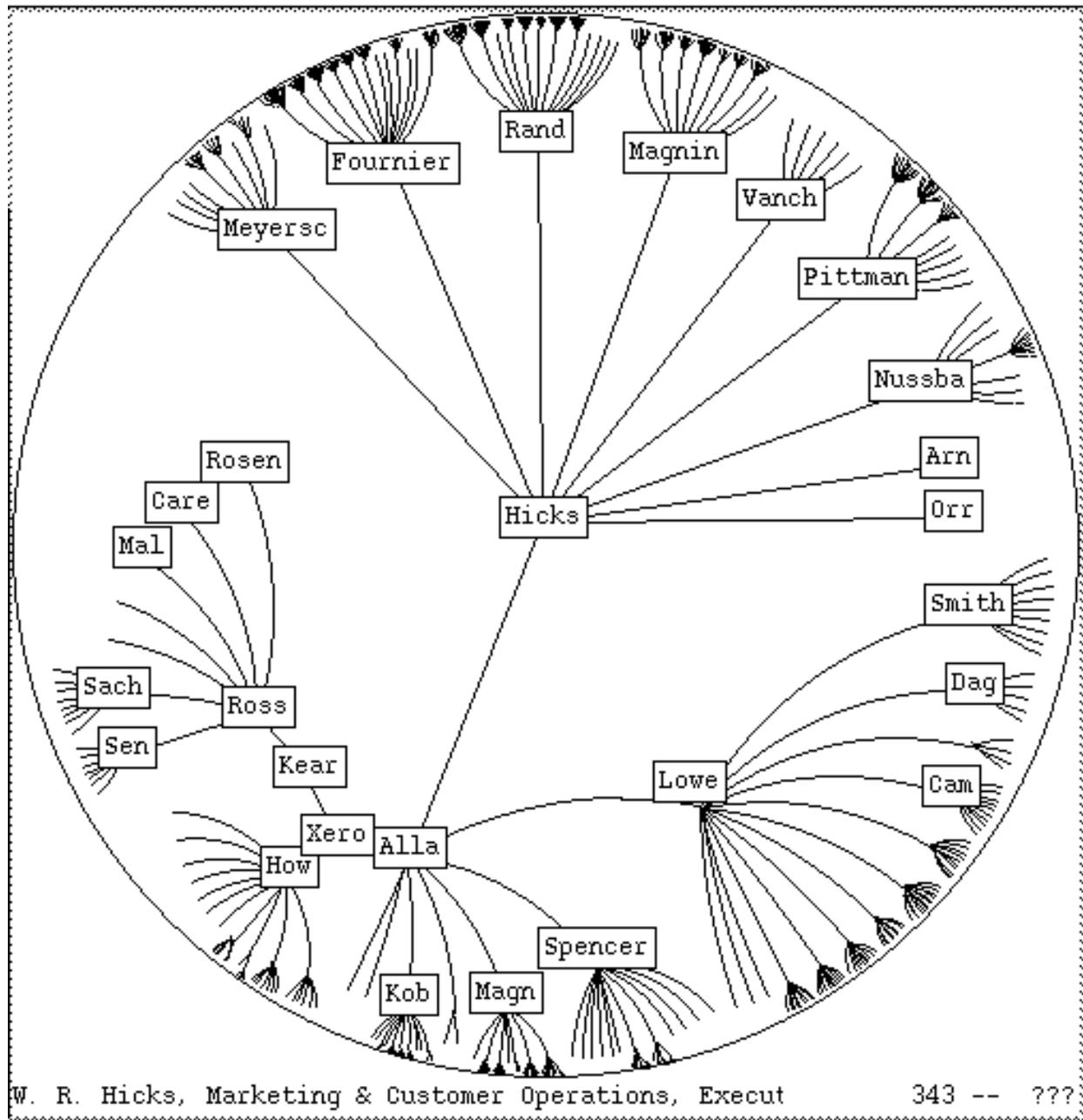
The second alternative, which is utilized in the following analyses and examples, uses a hyperbolic browser methodology. Hyperbolic browsers are best defined by their purpose and application to facilitate the database navigation of hyperbolic space of data trees (Swanson, 2010). An axiom postulates that as the database becomes larger, the advantage of a hyperbolic browser becomes greater. This axiom is particularly applicable to large ERP accounting systems. In hierarchical databases of accounting information, as the number of nodes of tree structures grow, the visualization of the information becomes more difficult to comprehend for students. Similarly, curriculum management become challenging to manage with large/highly detailed programs. The hyperbolic tree permits the viewer to focus upon the immediate links and nodes while the other information is deliberately placed out of focus at the extremities (Lamping and Rao, 1996a). Figures 1A and 1B demonstrates a hyperbolic tree example series based upon the Poincare disk model (Wikipedia, 2010). This example is an organizational chart. Figure 1A places the president in the center and then navigates in Figure 1B to show the upper section of the organizational chart in greater detail. The miniscule attributes of the reduced view toward the edge change perspective if a particular node near an edge was brought to the center, because it becomes a larger size making it understandable to the user.

**FIGURE 1A**  
**Hyperbolic Browser Diagram Transitions (Lamping et al., 1995)**



The advantage of a hyperbolic browser in curriculum knowledge management and ERP course work centers around features that accomplish the mapping of a hierarchical tree structure into a hyperbolic presentation. Allen (2002) focuses on two hyperbolic browser features from Lamping and Rao (1996a):

**FIGURE 1B**  
**Hyperbolic Browser Diagram Transitions (Lamping et al., 1995)**



1. The nodes or components of the tree diminish in size the farther away they are from the center of the display.
2. The number of nodes or components grows exponentially from parent to child.”

These features work to the advantage of hyperbolic browsers over hierarchy browsers. The principal advantages are that navigation is more effective and hyperbolic browsers display up to 10 times as many nodes than hierarchy browsers (Lamping and Rao, 1996b).

With respect to mapping the accounting curriculum in general or mapping ERP accounting as it would apply to specific classwork problems, the hyperbolic browser focuses on the key issues, and its information visualization facilitates navigation between data items. With that general characteristic in mind, the specific next step is an appropriately constructed ontology of accounting that can be theoretically represented with a hyperbolic browser. This activity can be accomplished as is shown in general terms by a paper (Eklund et al., 2002) which presents a hyperbolic browser tool representing ontologies in general terms, which means that it can be done specifically for accounting applications. The next section develops an example design knowledge management system of an accounting ERP curriculum. The following section also discusses ERP systems at the value-chain level and gives a hyperbolic browser illustration of a cash conversion cycle set of transactions. The same system design process which would be done for any other information technology project will apply to a hyperbolic browser application.

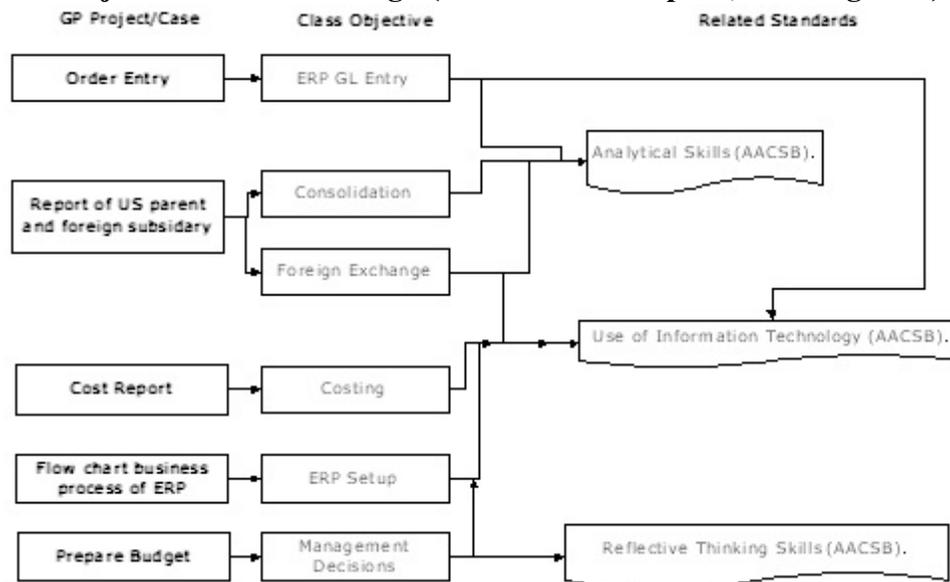
**HYPERBOLIC BROWSER APPLICATION DEVELOPMENT**

This section provides: 1) a theoretical basis in the literature for the application of knowledge management to accounting curriculum with ERP coursework in particular and 2) a hyperbolic browser information visualization example of a cash conversion cycle.

**Curriculum Program Knowledge Management**

Knowledge management has to be based upon an information structure. In this situation, ontology<sup>1</sup> provides the framework. In practice, academic curriculum is developed on an *ad hoc* basis where faculty responds to the latest development (e.g. ASC coding or IFRS) with a modification of existing courses. Only when there is a demand for a systematic approach (e.g., AACSB

**FIGURE 2**  
**ERP Project Curriculum Design (Swanson and Hepner, 2011 Figure 3)**



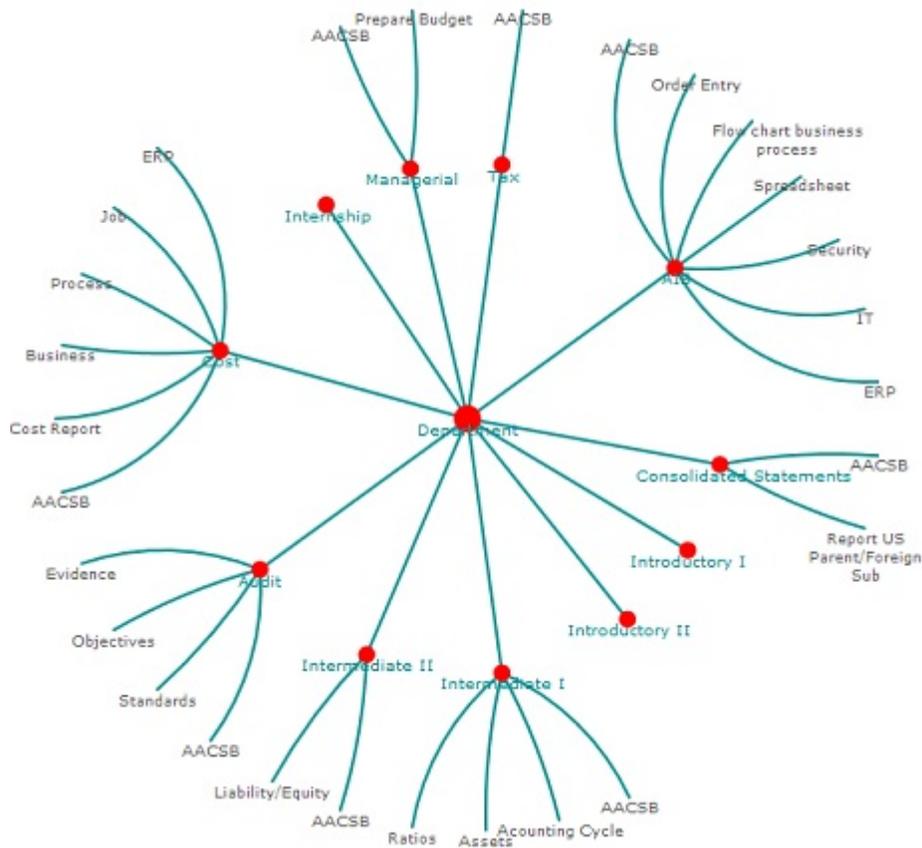
<sup>1</sup>Ontology is a branch of philosophical science whose objective is the study of structures and their characteristics in every area of reality.

accreditation) is there a systems type activity. In a system design, one looks to flowchart the process and to identify the attributes which must be reported. In order to be efficient and successful, accounting departments should periodically review their curriculum. Knowledge management is ideally suited to the task within the concept of an ontological framework.

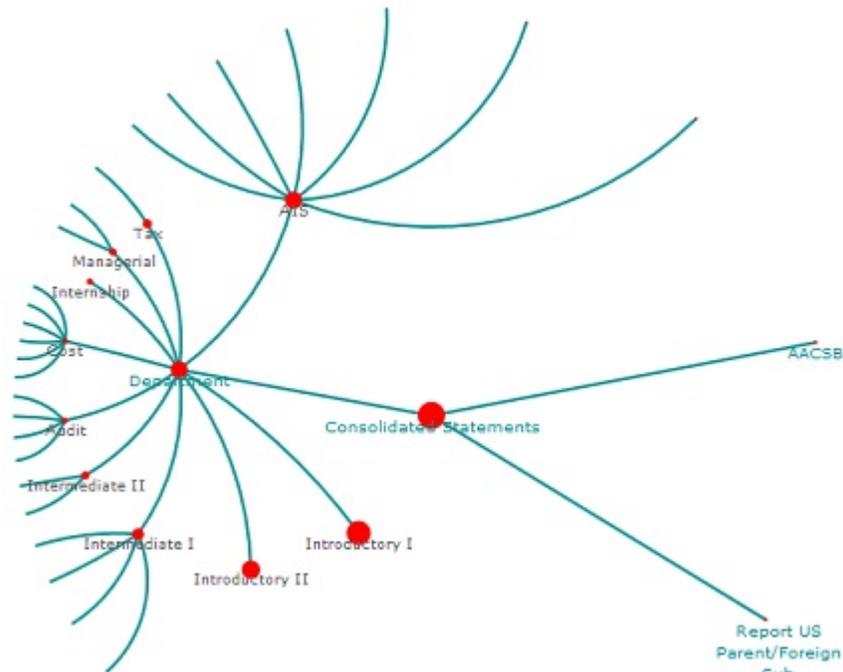
The work of Swanson and Hepner (2011) shows a flow chart design (see their Figure 3, this works' Figure 2) for an ERP accounting curriculum example. Once the curriculum ontology and knowledge management characteristics have been formulated, then the department needs an information management system to run the program. That is where the hyperbolic browser enters the picture.

It is a fairly simple matter to translate Figure 2 into a hyperbolic browser information visualization system as in Figure 3. This knowledge management program setup and the classroom example in the next section were created from Javascript code particularly modified for these situations. Generic code may be downloaded from the internet. This example is a demonstration of the nature of multiple learning objective aspects from Figure 2 which can be addressed with a knowledge management design to administrate a curriculum.

**FIGURE 3**  
**Accounting Department Curriculum Map as Portrayed with a Hyperbolic Browser**  
**Part 1: Department Starting Position**



**FIGURE 3, continued**  
**Part 2: Consolidated Statements**



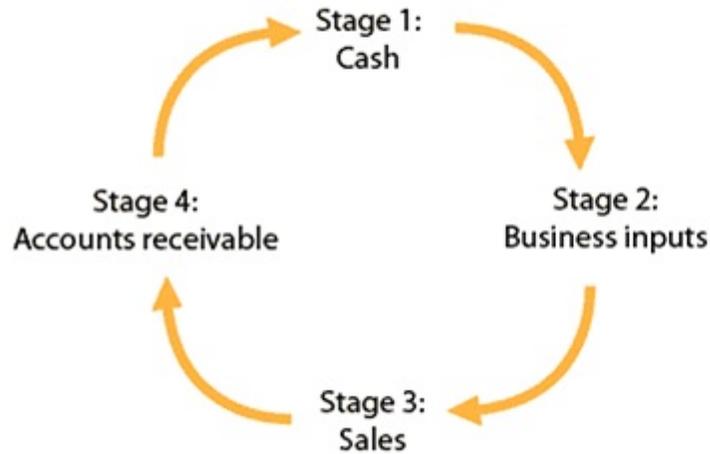
Let's suppose a new chair of an accounting department is asked: What are the ERP objectives of a particular class (e.g. consolidated statements)? Utilizing a curriculum information system with a hyperbolic browser, the chair would start at the department control point which would be at the center of the system. See Figure 3 Part I. Then, move to the class name. See Figure 3 Part II. The ERP project objectives for the class are detailed.

### **Hyperbolic Browser Classwork Application Development**

Prior research (Swanson and Freeze, 2009) describes the financial reporting Generally Accepted Accounting Principles (GAAP) in terms of ontology. The research shows how the financial statement structured outputs, which are the result of firm transactions based on a value chain model, can be fitted into an ontological theory specification. Accounting is the processing and reporting of entity economic information that will facilitate decision making and is to be conducted under GAAP. The highly organized nature of GAAP codification fits a knowledge management project mode. Other analysis (Swanson and Hepner, 2011) demonstrates that, within accounting course work, general ledger and financial accounting can be structured in terms of ontologies. The following development is consistent with the incorporation of ontologies into hyperbolic browsers.

A defining feature of this work is the visualization of accounting in a hyperbolic browser. The development also provides a theoretical basis for the synergistic combination of ERP and a hyperbolic browser. In the current study, an operating cycle (Weygandt, 2011) (illustrated in Figure 4) is presented within the ERP context of a simple firm as a value chain diagrammed in Figure 5.

**FIGURE 4**  
**Cash Conversion Cycle Diagram**




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**FIGURE 5**  
**Example of Value Chain of Simple Manufacturing Company**

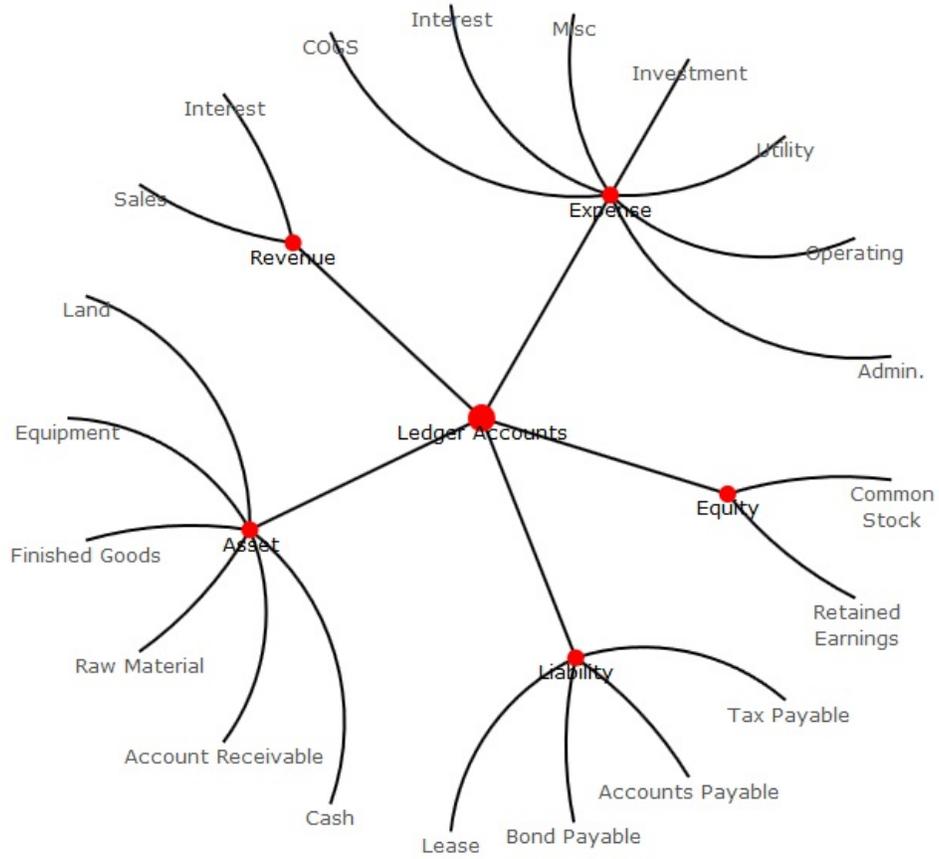


The accounting cash conversion cycle example (shown in Figure 4) is described first with the traditional journal entries and then illustrated in terms of a hyperbolic browser (See Figure 6). In the classroom, one presentation strategy is to work through the traditional journal entries on a blackboard (or whiteboard) and then demonstrate them with a hyperbolic browser on a computer projection system. Another presentation strategy is to put the traditional journal entry on a blackboard, and then open two versions of the hyperbolic browser on the computer overhead where the instructor runs them side-by-side with one showing the debit information and the other showing the credit information. The second approach is taken here. For each stage, the data is loaded only once into the browser and then the instructor would move node to node demonstrating the values in the respective chart of account line items.

The stage 1 transaction is represented with the following journal entry of supply of cash from stockholders. See Figure 7 for a side by side view of both the Cash and Stockholders' Equity Accounts.

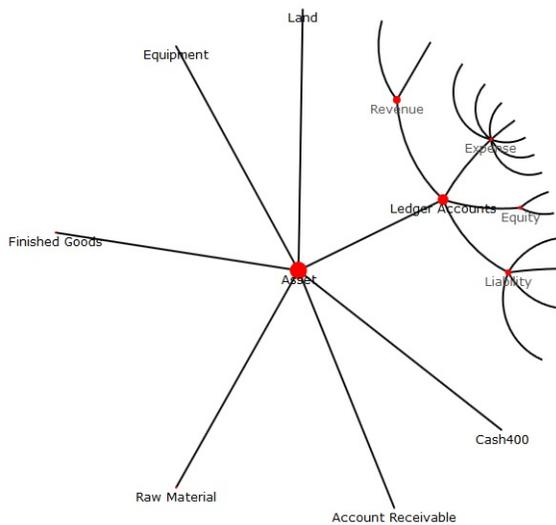
	<u>Debit</u>	<u>Credit</u>
Cash	400	
Stockholders' Equity		400

**FIGURE 6**  
**Chart of Accounts Hyperbolic Browser**

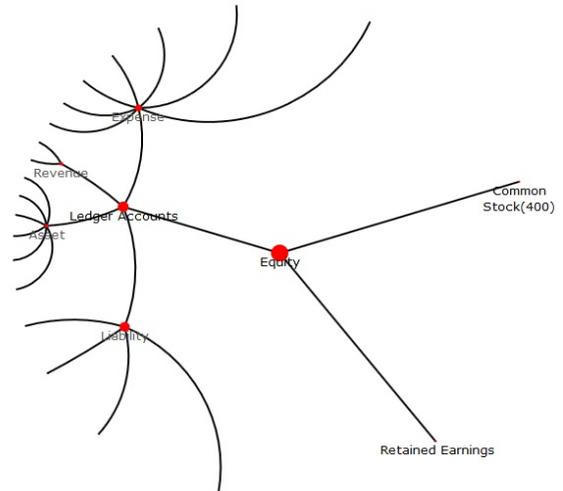


**FIGURE 7a and 7b**  
**Information Visualization of Stage 1 Journal Entry in a Split-screen Mode**

**Debit Cash (Fig 7a)**



**Credit Equity (Fig 7b)**



Material Acquisition

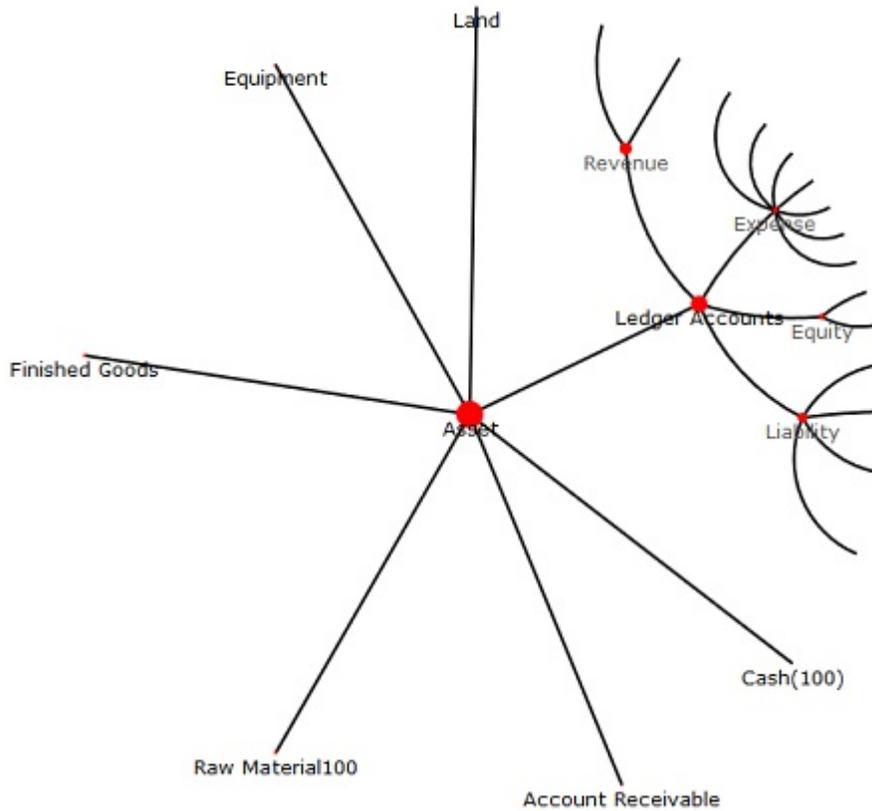
	<u>Debit</u>	<u>Credit</u>
Raw Material	100	
Cash		100

Product Manufacturing

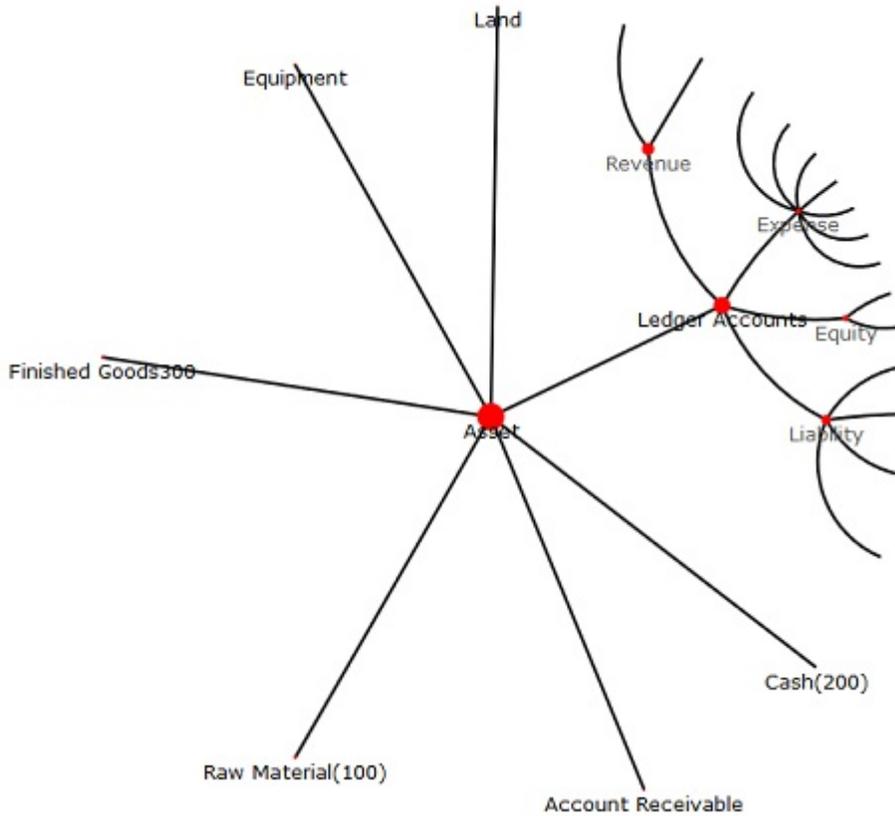
	<u>Debit</u>	<u>Credit</u>
Finished Goods	300	
Raw Material		100
Cash		200

The stage 2 transaction is represented with the following journal entry of the ERP system creating valued-added product of the purchase of raw material and its transformation into finished goods. For the hyperbolic browser presentation, see Figure 8 for material acquisition and Figure 9 for manufacturing.

**FIGURE 8**  
**Debit Raw Materials and Credit Cash**



**FIGURE 9**  
**Debit Finished Goods / Credit Materials and Cash**



The stage 3 transaction is the revenue recognition. See Figure 10.

	<u>Debit</u>	<u>Credit</u>
Accounts Receivable	800	
Sales		800
COGS	300	
Finished Goods		300

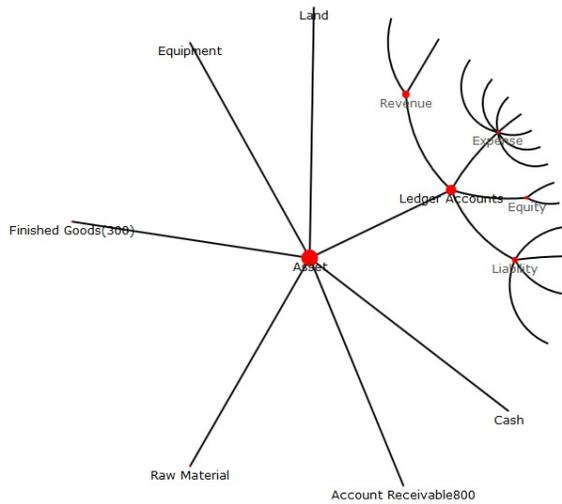
The stage 4 transaction is the cash payment of the accounts receivable. See Figure 11.

	Debit	Credit
Cash	800	
Accounts Receivable		800

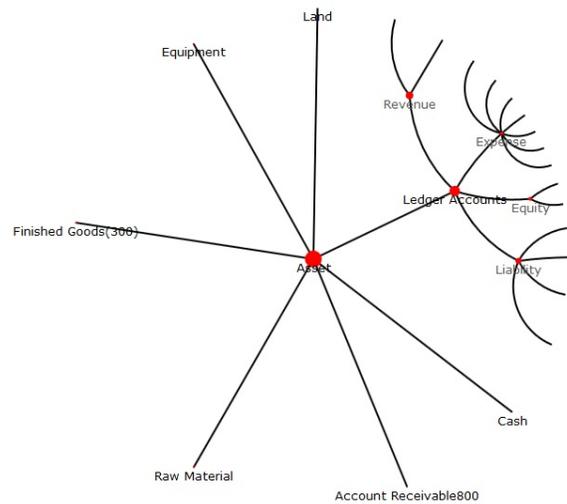
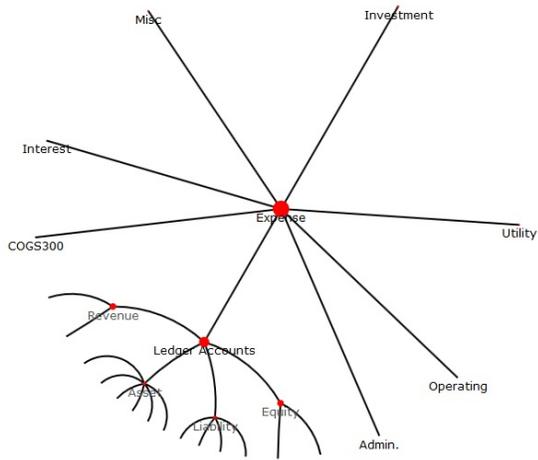
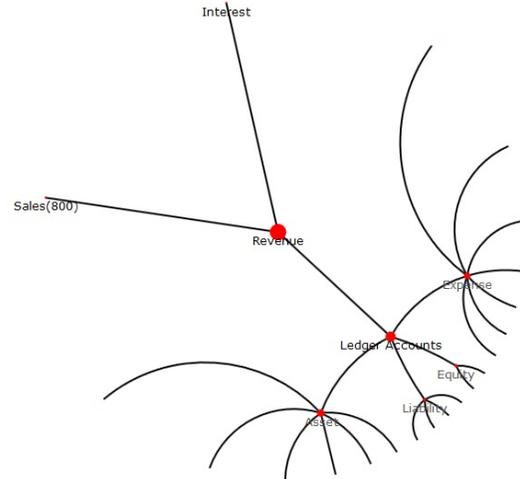
This classroom information visualization example shows how to implement hyperbolic browser in the classroom with aforementioned journal entries. The movement from node to node with a hyperbolic browser would facilitate a “hands-on” effect. The hyperbolic browser example can be expanded to include additional nodes of learning objectives and accounting competencies. Similarly, auditors and management could use this application to trace information from node to

**FIGURE 10a and 10b**  
**Information Visualization of Stage 3 Journal Entry in a Split-screen Mode**

**Debit AR and COGS (Fig 10a)**



**Credit Sales and Finish. Goods (Fig 10b)**

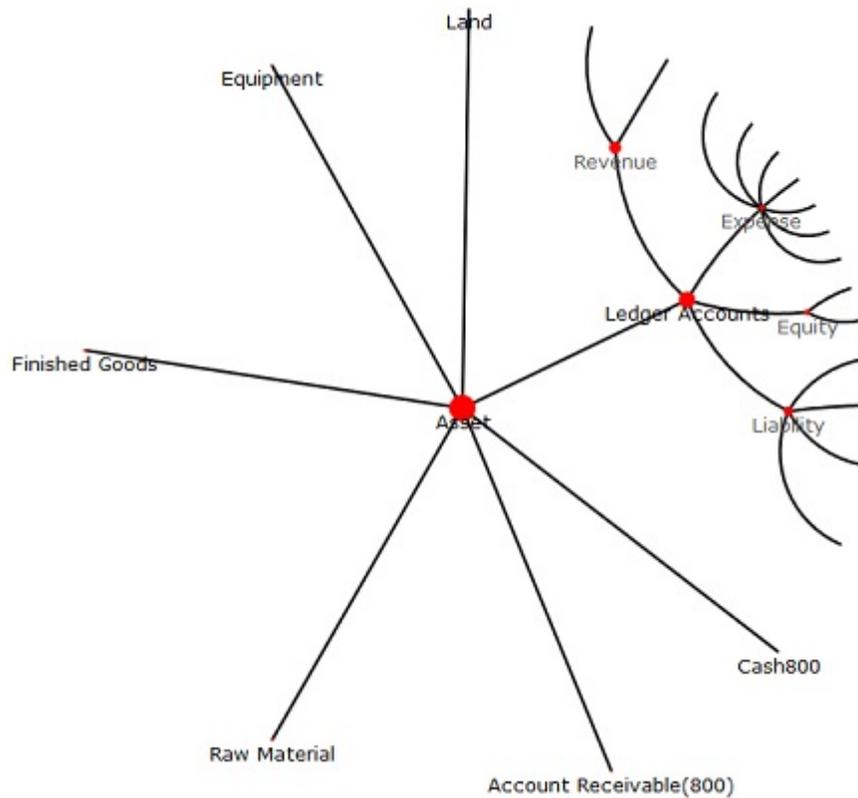


node in an ERP system. Also, the curriculum knowledge management function can be utilized to reference the documentation for accreditation purposes, etc.

**CONCLUSIONS AND FUTURE DIRECTIONS**

This study demonstrates (theoretically) and represents (by way of example) two aspects of how accounting education can benefit from the use of a hyperbolic browser. These applications are:

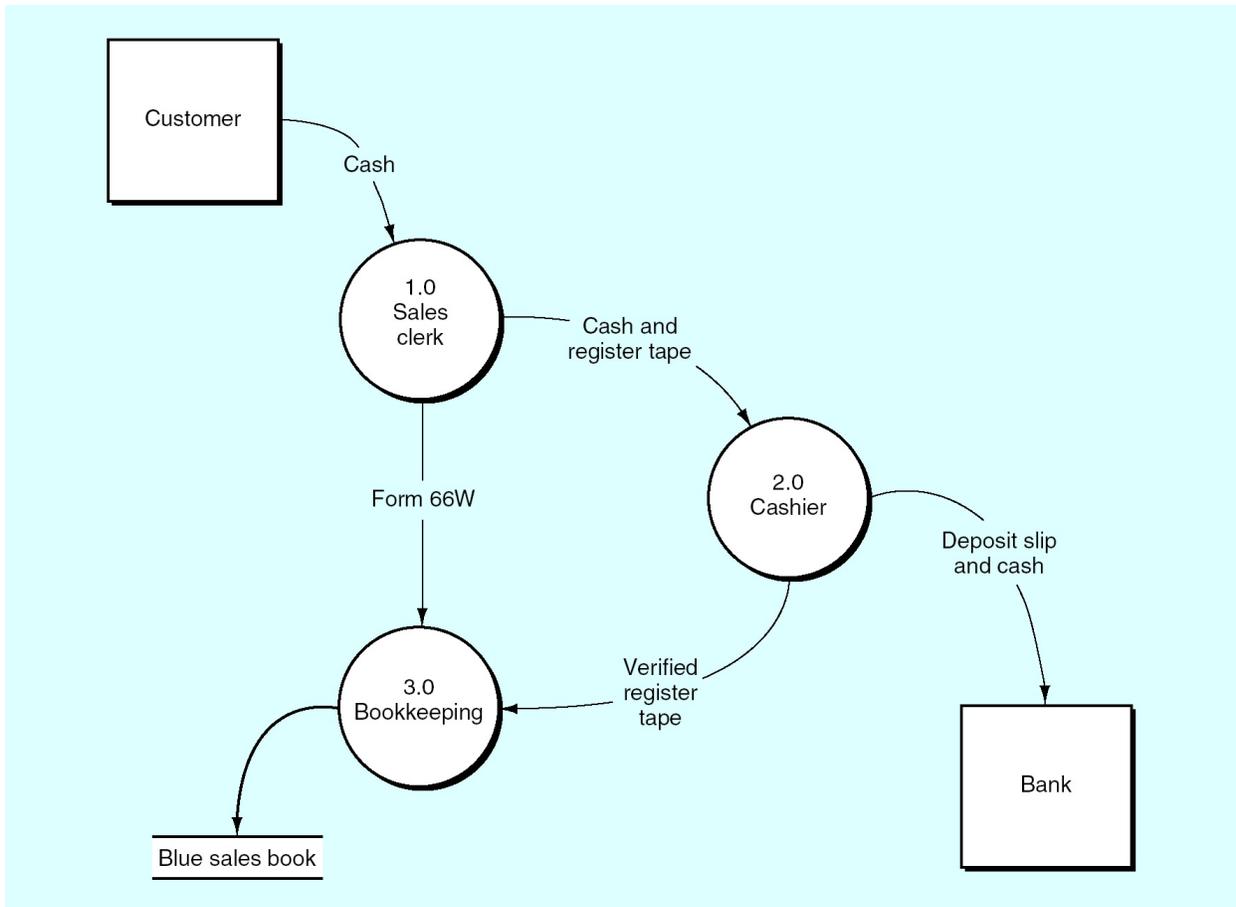
**FIGURE 11**  
**Debit Cash and Credit Accounts Receivable**



1) curriculum management and 2) information visualization of accounting systems and transactions. The work discusses how ERP accounting information systems and knowledge management can function with a hyperbolic browser. A positive aspect of this synergy is a mapping mechanism that permits navigation from node to node of business processes and facilitates the view of large ERP information systems in a way in which users can visualize the value chain and financial statement reports with more clarity. The navigation between nodes could also be a significant benefit to curriculum knowledge management. For those that want to experiment on their own, the original web source used in this study is: <http://philogb.github.io/jit/static/v20/Jit/Examples/Hypertree/example1.code.html>.

Accounting information system courses use data flow diagrams. See figure 12 (Gelinas et. al., 2011) for a basic example. As the data flow diagrams become more complex, students may lose the big picture, and this issue could be addressed by a “focus + context” (Herman et. al., 2000) type hyperbolic browser approach. However, contrasted with the tree structure of the present work, data flow diagrams have multi-node networks (See Figure 12). Future research could investigate how to incorporate hyperbolic-browser information visualization approaches to do multi-node network accounting data flow diagrams.

**FIGURE 12**  
**Data Flow Diagram**



Every idea has benefits and costs. The organization and information visualization can bring efficiency and clarity. A negative aspect is the cost to superimpose the hyperbolic browser on the accounting information system. JavaScript computer code used in this study does facilitate the hyperbolic information visualization, but does not directly link with ERP systems. Future research can further investigate how to link ERP systems to hyperbolic browsers. From a usage perspective, future research could also compare access times, ease of use, etc. of existing curriculum management systems with hyperbolic browsers. There is also the opportunity to do student performance comparisons between the traditional instructional method and a hyperbolic browser-enhanced instructional approach.

## REFERENCES

- Allen, M. 2002. The Hype Over Hyperbolic Browsers. *Online*.
- Eklund, P., N. Roberts, and S. Green. 2002. OntoRama: Browsing RDF Ontologies Using a Hyperbolic-Style. *First International Symposium on Cyber Worlds*. IEEE Computer Society.
- Farrand, P., F. Hussain, and E. Hennessy. 2002. The Efficacy of the 'Mind Map' Study Technique. *Medical Education* 426-431.
- Gelinas, U., R. Dull, and P. Wheeler. 2011. *Powerpoint Supplement for Accounting Information Systems 9e* (Stamford, CT: Centage Learning).
- Herman I., G. Melançon, and M. Marshall. 2000. Graph Visualization and Navigation in Information Visualization: A Survey. *IEEE Transactions on Visualization and Computer Graphics* (Vol. 6, No. 1) 24-43.
- Lamping, J., and R. Rao. 1996a. Visualizing Large Trees Using the Hyperbolic Browser. *Proceedings of the Conference on Human Factors in Computing Systems*. [<http://dl.acm.org/citation.cfm?id=257089.257389&coll=DL&dl=GUIDE>].
- \_\_\_\_\_, and \_\_\_\_\_. 1996b. The Hyperbolic Browser : A Focus+Context Technique for Visualizing Large Hierarchies. *Journal of Visual Languages and Computing* 33-55.
- \_\_\_\_\_, \_\_\_\_\_, and P. Pirolli. 1995. A Focus+Context Technique Based on Hyperbolic Geometry for Visualizing Large Hierachies. *ACM Conference Human Factors in Computing Systems* 401-408.
- Swanson, Z. 2010. ERP and Financial Statement Rendering with a Hyperbolic Browser. *American Accounting Association Annual Meeting*.
- \_\_\_\_\_, and M. Hepner. 2011. Knowledge Management ERP Curriculum Design/Mapping. *Decision Sciences Journal of Innovative Education* 209-226.
- \_\_\_\_\_, and R. Freeze. 2009 GAAP Codification: An Ontological Perspective. [www.ssrn.com \(http://ssrn.com/abstract=1262059\)](http://ssrn.com/abstract=1262059).
- Weygandt J., P. Kimmel, and D. Kieso. 2011 *Financial Accounting*. (Hoboken, NJ: Wiley & Sons, Inc.).
- Wikipedia. 2012 *List\_of\_concept-\_and\_mind-mapping\_software*. [http://en.wikipedia.org/wiki/List\\_of\\_concept-\\_and\\_mind-mapping\\_software](http://en.wikipedia.org/wiki/List_of_concept-_and_mind-mapping_software) (accessed 2012).
- \_\_\_\_\_. 2010. *Poincare disk model*. (March 20). [http://en.wikipedia.org/wiki/Poincar%C3%A9\\_disc\\_model](http://en.wikipedia.org/wiki/Poincar%C3%A9_disc_model) (accessed March 20, 2010).