

Introduction

Artificial Intelligence in Accounting and Auditing: Towards New Paradigms

Miklos A. Vasarhelyi and Alexander Kogan

This is the fourth volume of the AI & ES in Accounting and Auditing series. It encompasses fifteen articles, including this introduction, all original manuscripts, unlike the previous volumes which had a few reprints. The first volume was published in 1989, when AI/ES in Accounting was a new paradigm, and detractors claimed it not to be applicable to accounting and finance. Volumes 2 and 3 were published in 1994, and there was concern for the applicability of the paradigm in practice, and on the usage of the tools on a day to day basis. Three years are passed and the field has matured to acceptability and self-evaluations. A series of new technologies, akin or integral to AI/ES started to be used and are being progressively incorporated into the state-of-the-art. Soul searching and evaluation is progressing in the academic field to assess the emerging tools and where is the optimum domain of their applicability.

CPA firms continue slowly to use the technology both in internal audit matters as well as a tool for consulting and other services. International usage blossomed and for the first time we include an international-focused survey (Sanchez Tomas) and two internationally focused applications (Back et. and Sangster). The Sanchez Tomas article presents a rich bibliography with many international pieces, in particular from France and Spain.

The book is divided into five parts: the **first** encompasses two surveys of the literature that position the current state-of-the-art of the field. The **second** part of the book focuses on the maturing neural net paradigm. The **third** part of the book has two articles focusing on international applications. The Back et al article is placed in the third part of the book but also belongs to the merging neural network paradigm. The **fourth** part of the book focuses on audit applications, and the **fifth** part is a methodological section showing new focuses and methods that are progressively emerging and surrounding the field.

Following this introduction we present in Part I two surveys studies with some degree of overlap. The Sanchez study links several international studies to the literature. The domain is divided into: expert systems in accounting, expert systems in auditing, expert systems in cost and management accounting, expert system applications in the financial accounting domain, expert systems for financial statement analysis, and expert systems in financial planning and in financial analysis

The Yang & Vasarhelyi paper summarizes the current application of expert systems in accounting. The areas of emphasis covered are: (a) Auditing, (b) Taxation, (c) Financial Accounting, (d) Personal Financial Planning, and (e) Management Accounting. The focus is mainly on US research and applications.

Part II presents two papers using the neural network paradigm. The Back et. al. paper of the ensuing part can also be considering using this paradigm. The Cheh, Weinberg, and Yook paper examines the efficacy of the neural technology as an investment expert system and proposes a framework for evaluation. The O'Callaghan, Walker and Sale explores the differences between neural network and auditor assessments of internal control. The research uses the Committee of Sponsoring Organizations Integrated Framework for Internal Controls (COSO) as a basis for studying assessments of internal controls, in particular the resulting under and over reliance on internal controls.

Part III focuses on International applications with the Back, Iarjaia, Sere & Vanharanta. paper, and the Sangster paper. It should also be noted that the Sanchez paper also falls in this category but is mainly a survey. Back, Iarjaia, Sere & Vanharanta investigate the potential of neural networks for pre-processing data for competitive benchmarking. The study demonstrates how a large annual reports database on international pulp and paper companies can be pre-processed, i.e. classified with self-organizing maps that

is one form of neural networks. The test results are encouraging, and show that self-organizing maps are a viable tool for organizing large databases into clusters of companies having similar financial characteristics.

The Sangster deals bank risk. Faced with a widely diverse range of customers seeking finance for ventures of varying complexities and profiles, and a high level of losses as the result of defaulting borrowers, the need for an effective means of assessing commercial risk has become a major concern for banks. The paper describes the background to the need for commercial risk assessment, considers the relevance of financial ratio-based quantitative decision support models, and reports the development and structure of COMPASS, the Bank of Scotland's commercial risk assessment expert system, that has succeeded in capturing and modeling the inherent risk of the Bank of Scotland's lending process.

Part IV has three papers focusing on audit related issues. The Baldwin-Morgan paper attempts a comprehensive discussion of the applicability of expert systems to auditing and the impacts of expert systems on audit firms. The article interprets the environment of auditing and its readiness for expert systems development, illustrates the applicability of expert systems to a broad range of tasks associated with an independent audit of financial statements, and recounts the impacts of expert systems used for audit tasks.

The Dillard & Yuthas paper discusses issues of ethics vis-à-vis expert systems. The ethical issues raised with respect to expert systems (ES) are a microcosm of those to be addressed concerning the application of technology, especially computer technology. Previous research has focused on a limited subset of the ethical issues surrounding the development and use of audit ES. The issues subset must be expanded if the ethical implications surrounding ES are to be meaningfully addressed. Niebuhr's (1963) cathekontic ethics is enlisted to articulate more clearly the context within which audit expert systems are developed and implemented. Discourse ethics is then proposed as a way of exploring, and possibility resolving, ethical dilemmas. The integration of these two ethical structures at least partially transcends the dichotomies of teleological and deontological ethical theories that have been employed to date.

The Greenstein and Baldwin-Morgan paper describes the importance of the audit client engagement decision, the application of expert systems to that process as an example of audit process reengineering, a proposed expert system (ACE) to support audit client engagement decisions, the potential impacts of such a system, and the future of expert systems use as an audit process reengineering tool.

Part V brings together a series of diverse papers that illustrate the merging paradigms surrounding expert systems. Chen, McLeod, & O'Leary examine the need for the evolution of accounting databases. It postulates that it is necessary to evolve accounting databases that are structured based on resources, events and agents (REA), as is the case with all such enterprise models. The paper presents one approach to aid in the evolution of accounting databases. A number of "evolution" events are elicited as part of that evolution process. The actual tasks necessary to evolve those databases in through those events are summarized in SEAtool, a prototype system designed to assist in the evolution of REA accounting database systems.

McEacharn and Zebda discuss the usage of fuzzy logic in expert system research...Many of the problems faced by accountants and auditors are ill-defined and unstructured, problems which are especially well-suited for expert system application. The paper briefly describes the expert system environment within accounting and auditing, illustrate a major criticism in the design of these systems, and introduce a potential solution to the weakness.

McKee illustrate a trend in the literature where algorithms and methods are beginning to be developed as opposed to being imported from other fields. It extend a prior bankruptcy study by testing the model on a different sample of 202 public companies The results are improved and the question is raised: Was the change in model performance due to the variables employed or to the classification points selected for the variables?" A recursive partitioning algorithm ID3 is used to recalculate optimum classification points for the 202 company sample. This results in a second model using the same two ratios as the original model but employing a different classification rule and points. This research indicates that ID3 has been used to

develop a robust bankruptcy prediction model that is simple and consistent with the temporal continuity theory.

Swigger, Michaelsen and Trewin describe the development of an intelligent tool to enable tax specialists to manage and use data more effectively. An intelligent interface was developed for a tax data base, i.e., LEXIS. The interface was developed for two limited domains of expertise, i.e., worthless stock and casualty losses. The interface used an artificial intelligence technique that is similar to those used for acquiring knowledge from experts. This technique was used with the data base interface to facilitate access to tax information by tax students with little or no experience with a data base query language. The interface was developed to solve a critical interface problem existing between end-users and data bases: the difference between how users perceive the data and how the data is actually stored. The interface elicits information from the human user and then constructs and analyzes that knowledge with respect to the user's information needs and the data base being used. The interface creates a user 'model' of the information to be used in resolving ambiguities between the end-user's perception of the information and the computer's method of organizing the information.

In conclusion, Volume 4 of the series presents a series of original research studies of a more mature discipline, that now uses a series of complementary tools, drawn from many disciplines, to create / propose and enhance our ability to function intelligently. Two surveys show a growing field of research, rich in practical applications in all domains of accounting. Neural networks are now a major component of the area and are progressively being applied to more and more domains of knowledge. Studies are now dispersed among the different disciplines of accounting and international hubs are rapidly developing. Issues of computer sciences (interface design, databases), mathematics (computational algorithms) and statistics (fuzzy sets) merge to expand horizons and to flow towards new paradigms.

Miklos A. Vasarhelyi and Alexander Kogan,
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