

Relevance of data mining for accounting: social implications

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Abstract

Purpose – *The purpose of this paper is to show that in a time of globality, companies operate in a business environment in which high speed dictates mutual interactions and, at the same time, requires a radically different approach to data collection, storage, and processing based on an integrated view of the data.*

Design/methodology/approach – *The author believes that frauds in the corporate environment after the fall of the Berlin Wall have to be investigated through the similarity of models under which citizens are subjugated by means of financial machination by the ruling political and economic elites.*

Findings – *The innovativeness of data mining techniques is reflected primarily in the radical turn away from the retrospective data access that used to be typical of decision support systems, toward prospective and proactive information delivery. Data mining is a technique offering undeniable benefits by improving the quality of life and making one's life easier, and bringing more order and responsibility into the behavior of institutions. But on the other hand, data mining poses numerous questions relating to privacy, legality and ethics. The trouble is that there is a permanent threat of using data mining applications beyond the limits of its original purposes.*

Practical implications – *The New Economy, whose driving force is new information and communication technologies (ICTs), requires new accounting practice which directs the measuring system to a pattern which connects the value concept and the action that will generate future profit.*

Originality/value – *The paper is a plea for proactive company actions aimed at strengthening control mechanisms and internal controls. The future will bring a growing demand for forensic accounting services.*

Keywords *Accounting information, Data collection, Fraud, Ethics, Information exchange*

Paper type *Research paper*

Introduction

For social analysts, the high-profile financial scandals that have so spectacularly announced the entry of our civilization into the third millennium and shaken the corporate world represent a huge challenge, not only for testing the “grand theories”, but also for a questioning of their own identity in the sense of whether they want to be “social engineers” or “social critics”; the fact is that in ambivalent situations there are no undecideds. On the other hand, even though accounting is basically a technical field, it cannot avoid its share of responsibility for a system in whose creation it is itself a participant. Accountants cannot be considered, warns Tony Tiker, author of *Paper Prophets* (1985), harmless book keepers, but primarily arbitrators in the social conflict, architects of unequal exchange, instruments of alienation, and accomplices in the expropriation of millions of other people. Fortunately, money is not only a means of subjugation, but also of emancipation. Rapid development of information and communication technologies (ICTs) has created a technical infrastructure enabling an upswing of social audit on the virtual highways, and has made material prerequisites for the realization of the demands for openness and transparency of financial statements in the corporate sector (Gallhofer and Haslam, 2003; Crowther, 2004; Crowther and Mraović, 2005).

At the same time, there has been a development of new specialized areas within both the IT branch and business information technology, as well as in the area of accounting, and they have converged. Data mining is a sophisticated tool for analyzing data, allowing the application of a new organization of data in accounting, by taking a new, synthetic approach to data, which has a number of practical uses and applications both in the private and public sector. This is a story about the social implications of data mining in accounting, where the author uses fraud detection as a material through which she wants to elaborate her thesis that a change of power centers is at work in electronically-operated global capitalism, where financial information systems and methods of constructing knowledge in accounting are the agents of social change.

The author will begin the paper by delimiting the basic terms in alternative information systems, accounting and data mining, followed by a section on fraud detection and the issue of accounting standards, with a special focus on the difficulties that conventional accounting practice is faced with. This will be followed by a section on the role of data mining tools in the Post-Enron era. At the end, the author will discuss some ethical issues regarding the construction of knowledge that inevitably arise in the technical environment.

Towards alternative information systems

Information systems and networking increase human potential for organisation and integration in that they link nodal points all over the planet, while at the same time disconnecting and excluding whole regions, countries and societies. Hence networks are both inclusive and exclusive, enabling a whole range of reciprocal relationships.

The concept “informational society” is much wider than the concept of “network society”. Castells (2000) makes an analytical distinction between the concept of “information society” and “informational society”. The former represents a type of society in which information has a function to communicate knowledge, and as such, it constitutes the cultural history of mankind, and the latter represents a distinctive form of social organisation in which data production, processing and transmission are major sources of wealth and power. In that context, the question is raised of the role of information systems: who does the information serve?

The advance in information systems, and particularly the development of network architecture, has allowed the creation of more user-friendly structures and technological environments, and has increased their availability not only for the organization but for the individual users outside it. In distributed or networked organizations, distance is no longer an obstacle to their effectiveness (Wild, 1990; Gates and Hemingway, 1999). Network technologies allow the design of an information system which offers three main benefits to the organization:

1. resource sharing between users on the network by many devices and locations;
2. greater organization, standardization and consistency on the network within the organizational environment; and
3. integration of disparate components and resources, in which the network allows the organization to be administered and managed with greater control (Elliott and Starkings, 1998).

However, together with the authority to control the systems comes the responsibility to support them (Parker and Case, 1993; Wysocki and DeMichiell, 1997).

Many authors draw attention to the fact that conscious decisions, which are less guided by ethical motives and more by political consequences, lie behind information design and the choice of language for data implementation. Hence the two issues emerge as the crucial ones:

1. the role of human activity when handling information and information systems; and
2. the role of the chosen representation language, and the relationship between the author and the program language user.



Unlike the early stage of the information society, when it was believed that more information reduces uncertainty, an increasing number of authors today (Best and Kellner, 1991; Baudrillard, 2001; Macintosh, 2002; Mraović, 2003, 2005) claim that an abundance of information increases it. We live in an era of excessive and meaningless information in which the rule of the world of sign constantly leads to new types of uncertainty. The way of designing information systems is without any doubt an essential issue, especially as to what extent and at what level the activity of human participants is accepted. Information systems are important tools of organizational culture, which will definitely give new shapes to e-democracy. Their power should be mirrored in actions of social realities, rather than in revealing or giving sense to a previously existing reality (Hosking, 2002). The purpose of constructing a new conceptual model of the information system is to provide end users with reliable, accurate and timely information which will empower them to make informed judgements and sensible decisions.

Hence the necessity of open system solutions, because, as Strassmann (1997) emphasizes, monolithic responses reduce adaptability to changing conditions. Monopoly solutions can eliminate diversity and reduce an organization's technical capacity in making thoughtful choices. A conceptual model of alternative information systems is based on a large number of tools and techniques, whose purpose is to stress the importance of human systems end-users. The common feature of all these approaches is that they recognize the fact that business systems involve human agency which makes the process of system development less predictable. Shaping the results desired takes place through discursively constructed social realities which are under the constant influence of change and development because, as Bakhtin (1989) recognized, speech is not something given and final, it is the living word which constantly transforms through the interactions of collocutors. The new technologies have finally made transparent the fact that meanings are not stable and that they are always in motion.

However, the reason why it is so difficult for new ideas to make a way into practice is their incongruence with the world's deeply held images and previously adopted values. It is the inertia of deeply entrenched mental models, and not the inability of people or their ignorance, as Senge *et al.* (1999) believes, that is the main factor obstructing change. Hence, an important question of managing emotional energies based on the subconscious mind is raised (De Fleur and Ball-Rokeach, 1982; Turkle, 1990; Arnold, 1991; Penrose, 1995; Sjöstrand, 1997).

Knowledge construction: datum, information, knowledge, acting

The main difficulty with "knowledge management" nowadays arises, according to Senge (1999), from the incapacity inherent to the Western way of thinking to make a difference between the notions of information and knowledge, which consequentially leads to the separation of knowledge from acting. Information is a datum with relevance for the recipient (Bateson, 1979), which represents the active role of a human being when converting data into information:

Data is the raw material for producing information. Data processing is concerned with the screening, collation, arranging, summarizing and reporting of that data. The output is information – data or facts processed such that they are now meaningful and relevant to the recipient's needs (Watts, 1996, p. 138).

For the purpose of this paper the author uses a technical definition of the term data, whereby it comprises facts, numbers or text that can be processed by a computer. It includes: i. operational or transactional data such as sales, costs, inventory, payroll and accounting; ii. non-operational data, such as forecast data and macro-economic data; iii. meta data or data about data itself, such as a logical database design and data dictionary definitions.

Unlike the intellectual orientations related to the term knowledge, such as "accumulated information", Senge, following in the footsteps of Searle (1992), defines knowledge as "the capacity for effective action" (Senge *et al.*, 1999, p. 421). "Knowing about..." represents information. However, in order for information to materialize into knowledge, people have to be capable of interpreting it, generating meaningful options for action and implementing the action expected to produce the desired results. That necessarily opens up the issue of the concept of



designing an infrastructure to expand knowledge. Polanyi's (1966) notion of "tacit knowledge" is important because, as pointed out by Nonaka and Takeuchi (1995), it allows a difference to be made between "explicit" and "tacit knowledge" which lies at the core of a "knowledge creating company". "Explicit knowledge" is scholastic knowledge expressed by language and numbers; it can be broken down into separate parts, codified, transmitted and analyzed.

However, a critical factor for the effectiveness of change initiative is "tacit knowledge", i.e. the mental models of people that are developed within practicing communities. Here we are dealing with continuous, gradual and unconscious adoption of new patterns of thinking, beliefs and actions. It is on the new mental models with an integrated capacity to appreciate different perceptions of the world and the supporting infrastructure for community building that the capacity of an organization to transform potential benefits into actual gains will depend. Thus, knowledge is an effective work that changes the behavior of the actors involved and consequentially leads to new organizational practices.

Accounting data problems

Interpretation of accounts is a detailed explanation of the financial performance of an entity incorporating the information contained within a set of financial accounts (Dyson, 2004, p. 248).

Although the legislation regulating the writing of accounting financial statements is primarily oriented to shareholders, there are a huge number of stakeholders who are vitally interested in knowing if a company is stable, if its dividends show a fair yield, and if it is as profitable as it could have been expected. Parker (1994) divides stakeholders into three groups: primary stakeholders are the shareholders, who have an ownership interest in the company; secondary stakeholders (e.g. loan creditors, employees, business contacts and tax collectors), with a financial but not an ownership interest in the company; and tertiary stakeholders, who have no direct financial interest but who are affected by the way in which the company's resources are managed.

All of them want a "true account" of operations, including key items such as revenues, net income and liabilities, but what they actually get is an interpretation of them. This includes the application of analytical and explanatory rules in combination with knowledge, experience and common sense (Marshall, 1994). To understand a financial report it is important to notice the difference between records in which data are simply stored and reports dealing with information. Since the preparation of accounts for publication and their distribution to the members is the statutory responsibility of a company director, it is important for the company to also prepare supporting schedules from which it can be seen exactly what files the information has been drawn from and the process of translating data into information can be monitored (Woolf, 1997).

Regardless of whether the issues concern the company's competitiveness, its profitability, its ability to pay taxes, loan interest or dividends or to settle debts, the common denominator that these liabilities can be reduced to is the question: Does the company have enough cash to conduct business with? A part of the answer to these questions can be obtained from the profit and loss account, the balance sheet or the cash flow statement, but such information is neither appropriate nor sufficient to base a realistic assessment of the company's profit or liquidity position, nor do such sources refer to its future prospects. Therefore, it is necessary to collect as much data and information as possible from a wide range of internal and external sources. They have to be submitted to further procedures and calculations that will show the connection between all the information available to us.

The main difficulty with financial accounts lies in the fact that they are usually prepared for a past period, where accounting data problems can, according to Dyson (2004), be grouped around three major groups of samples:

1. *Absolute*. Data in the financial accounts have been presented as absolute amounts and limited to quantitative matters.
2. *Contextual*. Data cannot be analyzed in isolation, but only in a comparative perspective, which opens up the issue of the criteria for collecting the historical data. It is difficult to show



a trend without considering a three-year period, but on the other hand, if the analyzed period exceeds five years, there is a risk that the data will be old and thus less reliable.

3. *Structural*. Since the financial accounts, even when very detailed, contain a limited quantity of information, they frequently require arbitrary assessments on relevant issues, such as bad debts, depreciation and stock valuation.

Executives and accountants

There is often a discord between executives and accountants as to what are acceptable and what are unacceptable accounting methods, because the latter prefer a priori cost reduction, and the former have a need for a more “aggressive” type of reporting, more favorably depicting the financial standing of a corporation, to make the company appear more reliable when granting loans or concluding long-term contracts. The difference is that executives are expected to be able to handle uncertainties and take risks, whereas the accountants’ job is to avoid risks. Selection of an accounting method or “cooking the figures” is too important a decision to be left to the accountants alone. The executives are the people familiar with the business strategy and corporate policy as a whole and with the attendant circumstances affecting the business, and this, Tracey (1994) holds decisively, is where their responsibility for the “form” of a financial report comes from.

Conventional accounting practice, in which measurements become tools for breaking down our understanding, is hardly likely to solve the dilemma about the evaluation of results, and when these methods fail to forecast accurately the way the world behaves, accountants and economists clear the mathematics in their models. This syndrome of assessing progress by separate looking at formal metrics can finally lead, in the heads of corporate leaders, to separation of the value concept from the action that will generate future profit.

Kofman (1992) draws the attention of executives to:

Managing by numbers is like trying to coach a team by looking at what is on the scoreboard rather than how the action is unfolding on the field (in Senge *et al.*, 1999, p. 564).

Any kind of remedy to get back to reality, believes Johnson (1992), requires thorough consideration of basic premises of the accounting profession and actions, which directs the measuring system to a “pattern which connects” where quality, learning and performance are facets of the same practical action.

Data mining: key for proactive, knowledge-driven decisions

A data miner pioneer: where’s the data?

Dr Usama Fayyad is a data mining pioneer who began working in the field in 1989. He started in NASA’s Jet Propulsion Laboratory, compiling data on astronomical phenomena such as volcanoes, star systems, etc. Then he worked for Microsoft research, and after leaving Microsoft he established digiMine to deal with the issues of data mining and data warehousing. Dr Fayyad describes the complexity of activities connected with data mining as follows. If you for example work in a telecommunication company and want to find records on cell phone frauds, based on today’s databases you will get no answers to these questions, because the interface interaction has been designed so as to address problems where the target is known, and the database is commanded to retrieve a result. However, if we do not have an exact target description, today we are lost in the database. Therefore, as Dr Fayyad emphasized, it is important to differentiate between the capacity to store data and capacity to access it efficiently. The big question today is: Where’s the data? Dr Fayyad says he realized that “you cannot mine if you can’t have access to the data. And you can’t have the right data unless you ensure that there’s a successful data warehouse . . . Hence, digiMine begins from the other end, asking the client what data needs to be mined and how to apply the algorithms. From there, digiMine sets up the data warehouse and the technology to grab the data from a variety of formats. The customer installs their software, which they maintain and run from their data center” (Segal, 2002, from <http://itmanagement.earthweb.com/06/11/2002/>).

In a time of globality, companies operate in a business environment in which high speed dictates mutual interactions and, at the same time, requires a radically different approach to data collection, storage, and processing based on an integrated view of the data.



Technological development has allowed, on the one hand, an explosion of information, and on the other hand an increasing gap between the powerful relational and Online analytical processing (OLAP) technologies for navigating large data warehouses and the capacity of end-users who effectively analyze and act based on the information contained in these warehouses. Data warehousing is defined as a process of centralized data management and its retrieval. Hence, a new technological leap should have been focused on finding the ways to structure and prioritize information (Cabena and Hadjnia *et al.*, 1997; Hand *et al.*, 2001; Tan *et al.*, 2006; Shmueli *et al.*, 2006).

Data mining, sometimes called data or knowledge discovery, is a tool for analyzing data by finding correlations or patterns among fields in a large relational database based on open-ended user queries. Just like the old seekers for a gold vein in the mines of a promised land, or pirates wandering the open seas in search of sunken galleys, these post-modern cyber miners have the intention to help clients dig out the hidden treasure on virtual highways throughout this ever smaller planet of ours.

Data mining supports data analysis software, and the process consists of five major operational phases:

1. extracting, transforming and loading transactional data into the data warehouse system;
2. storing and managing it;
3. allowing data access;
4. analyzing data; and
5. presenting data in a visual form.

Thus you get summary information allowing you to view detailed transactional data that can also be used to increase revenue or cut costs, or both (Adriaans and Zantinge, 1996; Thearling, 2003; Alexander, 2005; Webopedia.com, 2007a, 2007b).

Unlike large-scale information technology that has been developing separate transaction and analytical systems, data mining provides a link between the two systems. Although data mining has a huge scope of uses and applications, and is available for systems of all sizes, it is primarily utilized by companies with a strong consumer focus, such as retail, financial, communication and marketing organizations, which have the goal of identifying customers' buying patterns (Wikipedia.org, 2007a):

The power to know

The American SAS Institute is one of the leading producers of software owing its success, according to the opinion of managing board, first and foremost to investing a high percentage of the revenue in research and development, care for employees and a well-organized user network of local, regional, and international scales. SAS ENTERPRISE MINER module (SEMMA) is focused on the model development aspects of data mining, in which you realize the return on investment (ROI), where Enterprise Miner automates the deployment phase. SEMMA is an acronym for sample, explore, modify, model, assess, which relies on the basic assumption that a well-formulated research problem and assembly of qualitatively representative sources of data are critical for the entire success of any data mining project. When utilizing this software users can manipulate their data so as to: 1. reveal groups of customers with distinctive ordering patterns; 2. include information such as the grouping of customers and significant subgroups; 3. implement new variables; 4. narrow down the variables to the most significant ones; 5. select buyers according to the retention rate (SAS Institute, from www.sas.com).

The visual analysis platform for data mining

Eudaptics is one of the first predictive analytics companies in Europe with the task to help clients to increase revenues and reduce marketing costs. This company develops and distributes the data mining software Eudaptics Viscovery® which is successfully applied in a number of business fields, including non-profit organizations. Eudaptics makes it easier for its clients to understand their customers, to define target groups and predict future actions. CUSTOMERS SAY: "The software supports the treatment of the data so cleverly that one can immediately concentrate on the contents and dependencies . . . long-term visions, visualization options, and results which one also understands as a non-statistician . . . It is now possible to receive



information on a mere button press that enables us to approach our customers according to their needs. This is particularly crucial in the highly competitive mobile telecommunication market...” (Eudaptics/Viscovery®, from www.eudaptics.com).

Data mining techniques emerged as a result of long processes of development and evolution in areas such as statistics, artificial intelligence and machine learning. They have not only pointed to quantifiable business benefits, but also made a qualitative revolutionary step forward in the sense that they enabled new ways of formulating business queries, where answers are obtained accurately and quickly. The innovativeness of these tools is reflected primarily in the radical turn away from the retrospective data access that used to be typical of decision support systems, toward prospective and proactive information delivery. The old business questions of the type “What was our revenue in the past period?”, which were typical of collection and storage of data in the period from the 1960s to 1990s, have changed into a new pattern of questions saying: “What will our revenue be in the coming period and why?” (Dillon, 1998; Cahlink, 2000; Han and Kamber, 2001)?

Data mining tools contribute to efforts for wide integrations of data by being supported by a strong and mature technological infrastructure made up of three core components:

1. massive data collection;
2. powerful multiprocessor computers; and
3. data mining algorithms.

The advantage of these techniques lies in the fact that they can be implemented on the existing software and hardware platforms, and can also be integrated with new products and systems. The size of technological infrastructure required by data mining applications depends on the size of the database and query complexity. These advanced techniques are based on a full integration of a Data Mining Server with the data warehouse and OLAP Server (On-line analytic processing Server), which enables direct application of users' business models to the data warehouse. The Advanced Analysis Server gives a user a proactive analysis that not only provides the organization a future prospect, but ensures continuous mining of the best practices, and their implementation in future operational decisions (Oracle (Wikipedia.org, 2007c); Sybase, 2007; IBM Red Brick Warehouse, 2007).

If the two critical factors for successful data mining are fulfilled, i.e. a large, well-integrated data warehouse and a well-defined understanding of the business process, then the possibilities of data mining tools are endless, and Thearling (2003) sums them up as follows:

- the extraction of hidden predictive information from large databases;
- forecasting future trends and behavior;
- support in making proactive, knowledge-driven decisions;
- increasing the value of existing information resources;
- identifying hidden patterns in one's own and the competitor's market activities, so that companies can focus their efforts on the most profitable customers and prospects, and design targeted strategies to achieve these goals, which represents a huge progress compared with the conventional statistical techniques of random choice. That way the management is enabled to economize its business experience, and to build a model that can be applied to the prospect data based on data stored in the company's database, by continuous monitoring of internal and external data; and
- leveraging the knowledge about customers enables a company to apply a segmentation of desirable attributes to a general business database, which produces prioritized lists of prospects by region, reduces costs and improves the value of customer relationships.

Although they were primarily designed to search for valuable business information, data mining tools have a wide range of applications because they enable automated detection of previously unknown patterns and identification of seemingly unrelated products, events and situations. Patterns of discovering problems covered by these tools also include forecasting bankruptcy, discovering fraudulent credit card transactions, establishing anomalous data,



and fraud detection in the business community. On the pages below the author will concentrate on the latter problem.

Fraud detection and the issue of accounting standards

ENRON – the end of an era

Chronology. Enron was a high-profile American corporation that was originally a natural gas supplier, and then turned into one of the largest energy trade companies in the world; it incorporated in its activities the traffic with other products and services – such as fast internet connections and advertising space. Aggressive business strategies caused an instantaneous increase of company turnover from \$40 billion in 1999 to 101 billion in 2000. Wall Street provided full support to that company. The value of its shares rose by autumn 2000 from 15 to 90 dollars. Before the end of 2001 this energy giant collapsed and destroyed millions of shareholders and its own employees; it dragged down with it an auditing company, Arthur Andersen, and led to a number of court proceedings throughout the world in the countries with which the corporation had contracts. In January 2002 Enron's shares were not worth even a dollar, and on the New York stock market this company's shares were taken off the list of shares traded on Wall Street. *What happened?* Those who sided with Enron based their arguments on a theory that the company was only doing what it was legally permitted to do. US accounting principles allowed keeping certain items, known as "special purpose entities" (SPEs), from being disclosed in the balance sheet. Making use of this, the company managed to hide enormous losses by not entering them into the balance sheet, but entering them in the complicated chain of partner branch offices, thus hiding them from the investors and ensuring high fees for its executives. *Questions:* Who protects the shareholders from rapacious executives? How credible is a company and the people engaged in auditing and control? *Lessons learned.* The demise of Enron offered corporate America very unpleasant evidence of deficient control and protection of public investments, which inevitably opened up the process of long-expected reform of accounting regulations (Voice of America, from www.voanews.com/24/01/2002/; Dyson, 2004).

The basic characteristic of the present is that society organised according to simulations, codes and models replaces production as the organising principle of society (Macintosh, 2002). This creates a need to observe and analyze phenomena that constitute our life and interests primarily in accordance with their textual properties and semiotic content, from which follows the "linguistic turn" that happened in many social sciences and humanities. Power analyzes are now transferred to the discursive level, and attention is paid to language itself and to studying how it works and how it is used. In knowledge-based societies, the rule of technocratic apparatuses takes place primarily through the use of information devices and telecommunication media. Hand in hand with this epistemological switch, there have been significant changes in ontological assumptions regarding the very nature of Being. The simulation order is characterized by an emphasis on the non-material sign realm over the material commodity realm. Individual and masses should be understood as sign systems. *Homo semioticus* replaced *homo economicus* (Macintosh, 2002, p. 65):

- In the simulation order, contemporary accounting and finance circulate in their own realm, insulated from material work economy and production. Simulation caused the development of accounting signs and self-referential accounting models that transact without any foundation; in other words, the sign has no relation and bears no resemblance to reality.
- The accounting sign now precedes and even creates the referent it once purported to represent through the "sign value". It is its own simulation and creates circular relations with other accounting signs, and its basic function is to create and sustain a hyperreal financial economy on global finance markets.
- In the financial realm thus constructed, the analyst's forecasting model, the company's investment decision model and the investor's valuation model circulate simultaneously, referring to each other, but they lack any relation to a real referent such as cash flow or "true" income.
- Consequently, neither investors nor analysts know how earnings relate to cash flows and value. Through this mirage of the referent, the sign attempts to mislead and parades itself as the reality principle of meaning (Baudrillard, 2001, p. 95). Earnings create a simulated



reality of their own, and Macintosh provocatively concludes that official reported earnings are important because they provide transactions with an element of “reality” in the realm of self-referential models.

Difficulties that conventional accounting practice faces

Like Odysseus, who sailed the seas deceiving mermaids in order to find the way home, corporate leaders too navigate the international business seas in constant search of new sources of profit, whereby the old dilemma to “cheat or fail”, with all the nice marketing stories about ethics, is still as topical as ever. Yet the question that imposes itself is: what can impel corporate leaders, who have made it to the top because they were successful, to get into a whirl of activities that turns them into a text-book example of failure? Why do accountants, as practitioners in a professional field whose image is based on credibility and reliability, accept the role of accomplice in corporate misbehavior? One of my theses is that frauds in the corporate environment after the fall of the Berlin Wall have to be investigated through the similarity of models under which citizens are subjugated by means of financial machination by the ruling political and economic elites.

Like art collectors, companies nowadays collect “friends in high positions”. In 2000 Global Crossing outdid even Enron in the total of its donations to political campaigns (Borras, 2002), while in another part of the world, in Aeroflot, Russia's International Airline, after a “businessman” took over a controlling interest in 1995, the politics of those turbulent times was also a lightning rod for alleged business sidetracks and illegal currency operations (Russie.net, 2007). It is obvious that it is not simple to reduce the preparation of financial information to mere arithmetical value-neutral operations (Puxty and Tinker, 1995; Puxty, 1999).

Are there more accounting scandals nowadays than before, or are we simply living in a time when they have become more apparent? - this question was raised by Dyson (2004) in his brilliant book *Accounting for Non-Accounting Students*. Addressing primarily managers, but also all others who have interest in familiarizing themselves with the financial state of a company, he identified several causes that can get accounting into trouble today. First, the New Economy, whose driving force is new information and communication technologies (ICTs), brings new types of products and services which conventional accounting techniques do not know or are not compatible with; secondl, pressures of competitors force growth as an imperative of success, and a company has to be made as attractive to investors as possible, forcing executives to overstate company revenues; thirdl, flexibility of accounting standards sometimes gets both managers and accountants involved in suspicious transactions.

When analyzing accounting scandals, you need to have a clear picture of whether they concern an alleged embezzlement in the sense of fraudulent activities, such as the accusation in the case of the British company Independent Insurance, where the company decreased the scope of its liabilities in the statements for the period 1997 to 2001 (The Serious Fraud Office, 2005), or whether they concern questionable accounting practices for the purpose of what the management calls “closing the gap” to meet revenue and profit goals. Xerox Company was called to account on several occasions for “accounting maneuvers” by the Securities and Exchange Commission. A typical example is the SEC's complaint dated 2002 “when Xerox recorded revenue from copy machine leases – recognizing a sale in the period the lease contract was signed, instead of recognizing revenue ratably over the entire length of the contract”. Hence, in this case it is not the validity of revenue at issue, rather when it was recognized (Wikipedia.org, 2007b).

As competition gets more severe and cruel, and the ITCs industry begins to stumble, it is more likely that accounting policies will be adjusted so that a company can keep the appearance of high profitability. Once the options of fast earning by selling shares have been exhausted, increase in turnover has become a significant performance measure. As its accounting definition is rather flexible, companies have relatively easily transferred into the



profit and loss account certain incomes that it would have been wiser to keep in the balance sheet.

One of the essential questions is certainly that referring to the treatment of cash. Cash includes cash in hand, deposits repayable on demand and overdrafts. The question is: What is cash flow? According to the British standards, cash flow is defined as “increases or decreases in cash”, whereas in the international accounting standards cash flow has a wider meaning, as “cash and cash and cash equivalents” (Dyson, 2004, p. 298). There is obviously a difference, and not a small one, and no less difference in the implications.

Fairness – the basic principle of preparing financial statements

What a “true account” is depends on the one hand on affiliation with a certain cultural circle, and on the other on the setters of accounting standards, behind whom there is the political power of the big fish who can limit access to their capital markets. Implementation of international standards in accounting practice is of the utmost importance in a world in which subjugation is institutionalized by large international monetary institutions, because this is the way to ensure that the USA does not dictate the standards of writing financial statements to the rest of the world by means of the USA GAAP (generally accepted accounting principles). Since many countries are either too small or too poor to have their own accounting standards, international standards allow the comparisons of financial performance among companies in different countries to become more realistic and reliable. Here, however, we should be aware, warns Woolf (1997), that we must not be slaves to the “myth of objectivity”. Standards providing for uniform accounting treatment are useful, but that does not at all mean that they have been rid of subjectivity, or that interest fights have been eliminated.

Countries differ extensively in their methods of laying down the rules of the game. The USA uses a rule-book system when preparing accounts, implemented through the Securities and Exchange Commission. The SEC regulates a standard-setting process via a private sector board called the Financial Accounting Standards Board. The FASB puts accounting standards into operation. The UK applies a principle-approach accounting, following the “true and fair view rule” provided for by the Company Act. The Act contains only primary legislation, while detailed legislation is left up to the professional bodies. The threat of an American approach lies in the fact that if a particular action is not expressly covered by law, it can be interpreted as being permitted, and the more flexible British and European approach hides the trap, according to Dyson (2004), of not revealing data that should be revealed. Since 2003 the European Union has preferred the International Accounting Standards (IAS) rather than the national standards. This approach has been embraced by Australia and it is expected to be accepted by many other countries too.

The International Accounting Standards Committee Foundation was set up in March 2001 in the USA as the parent body of the International Accounting Standards Board, set up in April 2001 in London. The primary task of these institutions is to make financial statements more transparent and more comparable on a worldwide basis, where the convergence of current projects is aspired to.

The role of data mining tools in the post-Enron era

The case of Enron has definitely shown that giants are not untouchable and that they can go down. However, there is still a question whether this can represent a turnaround in companies’ behavior, or whether they simply operate in an environment like that of ancient Rome, where thefts were punished by cutting off a right hand, and while the masses were amused watching the public execution of punishment, the largest thefts were taking place.

In the Post-Enron era the statutory responsibility of auditors was strengthened, but they were granted more rights to request from corporations data that increased the transparency of their business. In the USA the 2002 Sarbanes-Oxley Act requires from companies comprehensive internal controls, top executives are personally liable for the financial statements of their companies, and penalties have been drastically increased. Even the work of auditors has become subject to stronger supervision, for which a new federal board



has been established. Also, the word "fraud" was explicitly included in the terms of American Accounting Standards when the Auditing Standards Board of the American Institute of Certified Public Accountants (AICPA) published, on 15 October 2002, a new auditing standard, generally known as SAS 99 (standard auditing statement), under the title "Consideration of Fraud in a Financial Statement Audit" (Abernethy, 2003). But despite the laws and accounting reforms, corporate fraud has been growing, and this is a trend of global proportions (Wolosky, 2004). According to the Association of the Certified Fraud Examiners, the amounts that the corporate sector in the USA steals from its employees and shareholders show an impressive upturn of \$400 million in 1996, \$600 million in 2002 and an estimated \$638 billion in 2005 (Schoen, 2006).

A global economic crime survey for 2005 carried out by PricewaterhouseCoopers (PwC) (2005) on a sample of over 3,600 senior executives from 34 countries shows that, compared with the year 2003, there has been:

- a 71 percent increase in the number of companies reporting cases of corruption and bribery;
- a 133 percent increase in the number reporting money laundering; and
- a 140 percent increase in the number reporting financial misrepresentation.

In the USA data mining is getting more important as a task since companies have been faced with the negative publicity created by high-profile fraud cases that caused damage to USA businesses. PwC, a company specializing in detection of potential or actual fraudulent activities in the business world, calls data mining the "DNA of forensic or investigative accountant" (Murphy, 2007). Their research has shown that although the Sarbanes-Oxley Act required companies to implement antifraud mechanisms that would enable them to discover in time "the smoking gun" in their vicinity, they have not done so despite the abundance of electronic data which they already have stored on their servers.

Utilizing "intelligent" computer applications, such as Oracle-based ones, the data mining professionals cooperate closely with company personnel in identifying high-risk areas by detecting unusual book-keeping, obscure facts, trends or inconsistencies in the financial statements (Golden *et al.*, 2006). We are dealing with supremely delicate work, and Bruce Dubinsky, one of the leading forensic accountants, advises: "Keep in mind that this area is chock full of landmines... Firms have to be fully committed. You have to make a commitment, and you have to train your staff properly" (Kahan, 2006). Analysts forecast that in the next five years the corporate scandals that have shocked the world in the past five years will gradually disappear and be replaced by proactive company actions aimed at strengthening control mechanisms and internal controls that will discourage, deter or discover fraudulent activity (Kahan, 2006). Since crime does not give up, it is obvious that the future will bring a growing demand for forensic accounting services. In spite of all the efforts and invested funds, most frauds are still discovered by accident.

This is one reason more for preventive measures requiring specialized skills in investigative areas, such as anti-money-laundering, purchase-price disputes, arbitrations, construction fraud, health care fraud, intellectual property theft, property insurance, casualty and general liability, litigation services, etc. Ruby Sharma, who handled a fraud investigation in the Big Four firm Ernst & Young in New York, believes that the collapse of Enron triggered a chain of events that will cause the regulatory authorities to strengthen their policies, guidelines, and regulations. The more detailed accounting standards and procedures get, the stricter and more detailed will be the investigations, so as to ensure a proper implementation of these regulations.

It is obvious that the accounting profession need reform, and this is where the main intention, initiative and action undertaken by the American SEC stems from in order to recognise once again the primary accountability of the profession towards the public interest (Hendrickson, 2001; Brillhoff, 2001; Tinker, 2000). Hendrickson (2001) points out the harmful consequences which economic power of the AICPA and major accounting firms have regarding the accounting profession and accounting education. As a matter of fact, they use their



economic power to establish domination over their surroundings by controlling the system of accounting education but also by the regulation of public accounting in order to protect and intensify their own private interests. Moreover, the greater their economic power, the smaller their concern for their own accountability as regards public interests. Hendrickson shows similarities with such authors who see the way out in a need to redesign the system of accounting education in such a way that would help this profession to regain its dignity. It is first and foremost related to the provision of relevant and reliable accounting reports, which is not only the essential prerequisite for functioning of the capitalist market, but also could contribute to the creation of the spirit of trust indispensable for functioning of the community.

Ethical issues related to knowledge construction in the technical environment

It is characteristic of the digital world that data in no sphere of human activity resides in a single physical location, but constantly circulates the virtual highways; this is because knowledge in a technological era has to be networked uninterruptedly, meaning that information from all areas of life is available to a huge number of people. If data mining is a search for a gold vein that will increase a company's profitability, discover inconsistencies in accounting practices, or enable citizens to dig out the best price of land for a family house, then we definitely have to keep digging. It is a technique offering undeniable benefits by improving the quality of life and making one's life easier, and bringing more order and responsibility into the behavior of institutions.

However, since things have started being considered in their long-term prospects, the same passions as those present in the debates on the implications of artificial intelligence are getting into full swing. The excitement of a positive attitude prevails in techno-enthusiasts; the very thought that computers might reveal new treatments for severe diseases or provide new insights into the nature of the universe really takes one's breath away. But on the other hand, data mining poses numerous questions relating to privacy, legality and ethics (Clark, 2003). Each time we participate in a telephone survey, fill in a credit form, visit a doctor, every web site we visit. . . it all goes into the databases. Pessimists would say: Is that not that scary? It may be an exaggerated attitude, but knowing a man gives one power over the man, and the possibilities of misuse are huge. This concerns primarily the privacy implications. The trouble is that there is a permanent threat of using data mining applications beyond the limits of its original purposes. Therefore it is particularly important, believes Seifert (2004), to define the extent and set boundaries in which government agencies can mix commercial data with government data. That way we inevitably encounter the status of scientific knowledge at a time when it seems that science is subordinated to the ruling forces more than ever, and, as Lyotard (1984) warned long ago, at risk of becoming the main stake together with the new technologies in their conflicts.

The potential of computer-driven technology and mind-broadening global communication are indisputable, but only, as Penrose (1995) points out, if they are used with sensitivity and understanding. The new technologies allow the expansion of our physical Selves and broaden our mental capacities and senses, but this does not exhaust the basic question: will they enhance genuine intelligence? Hence, the key task that our technological society faces is, according to Penrose, a search for the missing science of consciousness.

Although his book *Shadows of the Mind* is above all conceived as a radical critique of the strong Artificial Intelligence (AI) stance relying on the fundamental idea that the universe is merely a big computer, it gives us valuable insights in enlightening the concept of social agency in ICTs environments. The target of Penrose's critique is the immense trust of AI proponents in the idea of a society in which computer-controlled robots will have a "mind" exceeding human capacities, and as such will be able to solve the problems of this world induced by humanity. However, the issue can be considered from another viewpoint. It seems that our planet will ultimately be ruled by insentient machines. This is a stance with serious political implications, chiefly because of its strikingly operational attitude towards science; the physical world functions completely computationally, and physical objects are merely "patterns of information". Moreover, quantum theory tells us that material particles



are pure “waves” of information. Therefore, the persistence of “Self” has more to do with preserving patterns than with actual particles.

The concept of “artificial intelligence” implies that intelligent computational activity is possible, while genuine understanding and, of course, awareness are something which follows from the goals of AI. Penrose strongly opposes this with his standpoint that “intelligence” without understanding is an incorrect term and makes a clear distinction between genuine intelligence and genuine understanding and any entirely computationally simulated activity. His basic message is that there really is an aspect of “genuine understanding” which cannot be suitably simulated in any computational way. In other words, genuine mentality is something that belongs exclusively to man, that is, only human beings are capable of carrying out an activity exceeding any computational activity by using their consciousness, because non-computability is the basic feature of our conscious action and conscious mentality.

As Seifert (2004) pointed out, data mining techniques can help us reveal patterns and relationships, but they cannot tell us the true value or significance of these findings. These assessments still remain a prerogative of man and his willed action. In the end perhaps there is still hope for this small chaotic planet of ours. Therefore, let us be critical, but optimistic.

Conclusions

This is a story about the social implications of data mining in accounting, where the author uses fraud detection as a material through which she elaborates her thesis that a change of power centers is at work in electronically-operated global capitalism, where financial information systems and methods of constructing knowledge in accounting are the agents of social change. The author believes that frauds in the corporate environment after the fall of the Berlin Wall have to be investigated through the similarity of models under which citizens are subjugated by means of financial machination by the ruling political and economic elites.

It is characteristic of the digital world that data in no sphere of human activity resides in a single physical location, but constantly circulates the virtual highways; this is because knowledge in a technological era has to be networked uninterruptedly, meaning that information from all areas of life is available to a huge number of people. At the same time, there has been a development of new specialized areas within both the IT branch and business information technology, as well as in the area of accounting, and they have converged.

In a time of globality, companies operate in a business environment in which high speed dictates mutual interactions and, at the same time, requires a radically different approach to data collection, storage, and processing based on an integrated view of the data. Technological development has allowed, on the one hand, an explosion of information, and on the other hand an increasing gap between the powerful relational and On-line analytical processing (OLAP) technologies for navigating large data warehouses and the capacity of end-users who effectively analyze and act based on the information contained in these warehouses.

Data mining is getting more important as a task on a worldwide basis since companies have been faced with the negative publicity created by high-profile fraud cases that caused damage to the corporate sector. Utilizing “intelligent” computer applications, such as Oracle-based ones, the data mining professionals cooperate closely with company personnel in identifying high-risk areas by detecting unusual book-keeping, obscure facts, trends or inconsistencies in the financial statements. Analysts forecast that in the next five years the corporate scandals that have shocked the world in the past five years will gradually disappear and be replaced by proactive company actions aimed at strengthening control mechanisms and internal controls. Since crime does not give up, it is obvious that the future will bring a growing demand for forensic accounting services.

There is no doubt that the collapse of Enron triggered a chain of events that will cause the USA regulatory authorities to strengthen their policies, guidelines, and regulations. The more detailed accounting standards and procedures get, the stricter and more detailed will be the



investigations, so as to ensure a proper implementation of these regulations. It is obvious that the accounting profession needs reform, and this is where the main intention, initiative and action undertaken by the American SEC stems from in order to recognise once again the primary accountability of the profession towards the public interest

Data mining is a technique offering undeniable benefits by improving the quality of life and making one's life easier, and bringing more order and responsibility into the behavior of institutions. But on the other hand, data mining poses numerous questions relating to privacy, legality and ethics. The trouble is that there is a permanent threat of using data mining applications beyond the limits of its original purposes. "Knowing about..." represents information. However, in order for information to materialize into knowledge, people have to be capable of interpreting it, generating meaningful options for action and implementing the action expected to produce the desired results. As Seifert (2004) pointed out, data mining techniques can help us reveal patterns and relationships, but they cannot tell us the true value or significance of these findings. These assessments still remain a prerogative of man and his willed action. And this indeed is a good news.

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