

Andreea C. BENDOVSCHI  
Bucharest University of Economics, Bucharest, Romania

# THE EVOLUTION OF ACCOUNTING INFORMATION SYSTEMS

Literature  
review

---

## Keywords

Accounting  
Cloud computing  
Evolution  
Real-time reporting

---

## JEL Classification

O31

---

## Abstract

*Technological evolution becomes more and more a daily reality for businesses and individuals who use information systems as for supporting their operational activities. This article focuses on the way technological evolution changes the accounting practices, starting from the analysis of the traditional model and trying to determine future trends and arising challenges to face. From data input to consolidation and reporting, accountants' function and operations are dissected in order to identify to what extent the development of new concepts, such as cloud computing, cloud accounting, real-time accounting or mobile accounting may affect the financial-accounting process, as well as the challenges that arise from the changing environment.*

## Introduction

Technology evolves rapidly as for responding to customers demand (Weiß and Leimeister, 2012). From a business perspective, more and more companies acknowledge the fact that technology may support process optimisation in terms of costs, lead time and involved resources. The actual market context is driving companies to continuously search for new ways to optimise their processes and increase their financial indicators (Christauskas and Miseviciene, 2012).

The company's efficiency is in direct relation with the objective and timely financial information provided by the accounting system, the main purpose of which is to collect and record information regarding transactions or events with economic impact upon the company, as well as to process and provide relevant, fair information to stakeholders (both internal and external) (Girdzijauskas, et al., 2008; Kundeliene, 2011). The accounting system is thus essential in providing reliable, relevant, significant and useful information for the users of financial data (Kalcinskaite, 2009).

From the deployment of basic accounting program or the use of large ERP systems (Enterprise Resource Planning), to the creation of World-Wide Web and development of web-based communication, technology increased its development in speed and implications. Today, concepts such as cloud computing, cloud accounting or real-time reporting are more and more a daily reality among companies. But as technology evolves at an incredible speed, it is necessary for companies to adapt their processes and practices to the new trends. However, that could not be possible without the decision factors to completely acknowledge the implications of the new technology, how it can be used to better manage their businesses and what challenges it also brings along.

The present study is based on the theoretical and empirical analysis of accounting process from the appearance of the first accounting information systems up to nowadays' services and techniques available for supporting the accounting function of a company.

The research comprised of analysing accounting operations, activities and practices as they followed the technological evolution for over than 20 years, focusing on a general level, applicable to companies of all sizes and business sectors. Although the geographic extent was limited to the European Union, the study may as well be considered globally applicable, considering the internationality of today's technology (e.g. cloud computing services may be used by a company in Japan while the server is physically located in the USA).

## Traditional practices and future trends

The accounting systems may be seen as aiming to support businesses in collecting, understanding and analysing the financial data (Chytilova et al., 2011).

The evolution of software accounting generation may be split, according toPhillips (2012) into three major categories:

- 90's era – marked by the apparition of the first accounting software programs under what is known as 'the Windows age'; applications were solid, but only supporting basic accounting operations.
- 00's era – 'integration' and 'SaaS' concepts took birth, bringing along more developed systems that would allow more complex accounting operations and data processing, as well as concurrent access to files and programs.
- 2010 – on-going – 'Mobile' accounting era, marked by real-time accounting, financial dashboards and other mobile applications supporting financial processing and reporting.

The same author outlines the evolution of communication – if the traditional accounting model was based on e-mail or .ftp files communication, the technological evolution now allows sharing and concurrent access to data, through virtual platforms provided by cloud computing technology.

Based on the types of accounting services available on the market, three major categories may be defined:

- On-premises accounting: a dedicated accounting software program is purchased by the company and installed using its own infrastructure. Investment in the software and hardware equipment is required for such programs.
- Hosted solutions: the logical access is remotely performed through the company's installed programs; however the data centre is physically located in a different place, managed by a dedicated third party. Infrastructure costs are reduced for the company, as hardware is administered and maintained by the service provider.
- Cloud computing: the service could prove even more cost efficient for companies, as the data is managed through virtual platforms, and administered by a dedicated third party, allowing multi-tenancy of services in order to split fixed infrastructure costs between companies.

Traditional accounting practices used to focus on bookkeeping and financial reporting, having as a final purpose the preparation and presentation of financial statements. The activities were driven by the need of financial information users (both internal and external) to gain a 'fair view' of the company. The objective was often

reached through the use of small, atomic systems meant to support the reporting; nevertheless, collection of documents, processing of data and operations, posting of journal entries, as well as consolidation and final reporting operations were mostly manual, and manual controls (reconciliations, validations, etc.) were performed as systems did not communicate through automated interfaces.

In early 1920s, the first outsourcing agreement was signed by British Petroleum with Accenture. Ever since, the accounting started changing its meaning within the companies, turning from the bookkeeping function to the management strategic and decision-making support function.

The technological evolution gave birth in the late 80s to ERP (*Enterprise Resource Planning*) systems, used to incorporate and connect various organisational functions (accounting, asset management, operations, procurement, human resources, etc.) (Ziemba and Oblak, 2013).

Ustasüleyman and Percin (2010) define the ERP systems as *'software packages enabling the integration of business processes throughout an organisation'*, while Salmeron and Lopez (2010) see the ERP system as *'a single software system allowing complete integration of information flow from all functional areas in companies by means of a single database, and accessible through a unified interface and communication channel'*.

The ERP systems became of common use among large companies who managed to reduce the process lead time and involved resources by automation of data transfer between ERP modules, processes within the ERP system, as well as validation and reconciliation controls. From an accounting perspective, the deployment of ERP systems represented a major change, offering support in bookkeeping (the operations performed through different modules would generate automated journal entries posting), processing and transfer of data (through automated interfaces between the ERP modules), as well as consolidation and reporting. This progress took the accountants one step away from the traditional accounting's bookkeeping practices, and one step closer towards today's role more close to management strategy and decision support.

Further on, as a consequence of the financial-economic crisis started in 2008, the role of accountants within the company changed drastically from bookkeeping and reporting to playing an active and essential role in the management strategy and decision-making process. Thus, it was technology's role to take in the traditional tasks and operations. More and more companies implemented automated controls for processing data, posting journal entries, consolidation and final reporting under the

financial statements and other internal management reports.

Soon after automating the accounting operations, technology evolved into also automating document collection and management, through development of concepts such as e-invoicing, e-archiving, e-payments, etc. (Burinskiene&Burinskas, 2010).

Technology proved once again responsive to the market's demand, and thus accounting software easily customisable for each client's particularities regarding the activity profile, accounting practices and chart of accounts, were built as for supporting the automation of accounting process. With the automation of the process, implementation of certain controls was also required as for ensuring the correctness and completeness of reported information.

Technology also took into account the need for robust, transparent processes, and it was only a matter of time until cloud computing, cloud accounting or real-time reporting concepts became a daily reality among companies of all sizes, activity sectors or region/state. The access to financial information previously physically limited to the company's premises (where the network and infrastructure would be located) was fairly improved through cloud computing to an extent where internet connection was the only condition users needed to respect in order to gain access to the financial programs and data. Cloud computing started spreading rapidly among companies, proving to be a great driver for process improvement and cost cutting even for small and medium-sized companies (Beckham, 2010).

Several definitions were assigned to cloud computing concept, all having in common a virtual machine accessed via internet. The official definition provided by the National Institute of Standards and Technology also outlines the main characteristics of cloud computing, defining the concept as *'a model that allows permanent, convenient, on-demand access to a joint network based on configurable computing resources, easily available with a minimum management effort or a minimum interaction with the service provider'*. Thus, cloud computing may be viewed as the partial or total externalisation of the IT function. Low, Chen and Wu (2011) base their definition of cloud computing on the comparison with e-mail and ERP programs, to which he adds ubiquitous resource sharing among users. Ambrust et al. (2010) outlines that cloud computing covers both software and hardware equipment used through the service providing companies.

Moreover, the high level of automation allowed information to be permanently updated as for allowing real-time accounting concept to develop. The concept is based on the idea of accounting being able to present a reliable and fair

image at any moment in time, and not once per week/month/year. Thus, events and transactions involving a company will affect the journals as soon as the according accounting entries were posted – and given the automation of systems, this may be a matter of minutes or even seconds from the moment when the event actually occurred.

In parallel with all the development, one other concept developed over the years stands to prove the change of accounting function's objective within companies: *business intelligence*. Defined by Glaser and Stone (2008) as '*IT platform and tools used to gather, provide access to and analyse data about organisation operations and activities*', business intelligence serves as a management decision support through the collection, analysis and presentation of relevant, reliable data. Business intelligence usually feeds the data analysis and reporting from a data warehouse, but the economic, technological and social progress has lately deployed a new demand: the real-time reporting. Thus, a new concept has emerged, *accounting intelligence*. The concept is similar to its ancestor, but involves the idea of supporting its output on data extracted directly from the accounting/ERP system, thus allowing real-time reporting.

Probably the most recent trend in terms of accounting is the *mobile reporting*. The concept is relatively new to the market, but considering the number of smartphone users as well as the highly evolved devices and systems, it is only a matter of time until financial information users, from management and employees to investors or business partners will be using the mobile reporting facility to stay informed about the real-time financial state of companies.

Nevertheless, all the rapid development brings along a series of challenges that all companies should be aware of and address when considering keeping up with the progress and ensuring the reliability and fairness of reported information at the same time. The next section focuses on the main challenges, as well as actions to be taken in order to address them.

### **Main challenges arising**

The evolution of accounting changes the way sensitive financial data is stored and managed. The trends follow a straight line driving towards sharing access and control to accounting data with internal and external teams, thus posing serious challenges in terms of the confidentiality, integrity and availability of data.

Although ERP systems were meant to support the robustness of the companies' operational and support processes, one issue that all organisations face is the need to integrate the system's techniques with the operational practices. The major market players (SAP, Oracle, etc.) offer customisable ERP software, adapting the

operations and parameters to the company's particularities (chart of accounts, cost centres, entities, operational flow, etc.). However, most companies do not ensure enough time or resources as for understanding the processes that need to be integrated with the new ERP system, and thus fail into deploying an efficient flow. Smaller companies that chose to implement ERP systems may not have enough financial and human resources for designing the new processes and ensuring a smooth integration of the new system, and thus fail to adapt the system to the operational way of business.

Looking further into the evolution of technology and accounting practices, CSA and ISACA associations' survey, the *Cloud Computing Maturity Study 2012*, outlines the main advantages and challenges cloud computing technology brings, as perceived by 252 participants from cloud computing technology users, service providers, consultants and integrators from 48 countries. On one hand, companies seem to be attracted by the opportunity of cost cutting, the agility and flexibility of the service, time to market and efficiency as well as by the increased productivity. On the other hand, the main drawback is the information security, but other challenges concern data control and ownership, legal and contractual aspects, regulatory compliance, audit and assurance, longevity of suppliers as well as disaster recovery.

The study clearly outlines that the technological evolution increases the flexibility and may support process optimisation, but also increases the risks concerning information security, ownership and control.

Ernst & Young's survey, *Global Information Security Survey 2012*, assesses the measures that companies take in order to address the risks posed by the use of cloud computing. The results show that the most consistent category (14.3%) do not take into consideration implementing any additional controls in order to address the challenges presented by the use of cloud computing technology. Others prefer to strengthen the logical security (logical access restriction, data encryption, etc.) or ensure responsibility and control is appropriately transferred to the service provider (through better contract management or internal/external audits of the cloud computing service provider controls).

One other challenge that the latest accounting and technological trends pose is that, with the real-time accounting, each transaction gets to affect all relevant journals and reports by the time it is processed, so there is no room for errors, validations and reconciliations before posting it. That is why, while some might appreciate this facility, it still raises some serious questions upon the feasibility of using such a system as well as its

objective to reflect fair and reliable image of the company at any time.

### Conclusions

Technology is rapidly evolving as for addressing the demand of a world of individuals and companies seeking to optimise their daily activities and processes. Also, accounting function has drastically changed its main purpose from bookkeeping and preparation of financial statements to supporting the managerial strategy decision making process. At the same time, the entire economic world evolves, so the time for decision making is only getting shorter and shorter. All these stand to support the fact that timely and qualitative information is a must for today's society to function at its normal parameters.

The article shows how technological and accounting progress supports the need of information as concepts such as real-time accounting and real-time reporting become less of a desideratum and more of a daily reality to companies of all sizes or economic profiles. But as the real-time information becomes a decision support for both internal and external users of financial data, a few questions arise: is the information truly reliable? Does it represent a fair image of the company's health? Is it secure?

Authors believe that these challenges need to be addressed both at an atomic level, by each company, as well as at a macro level, by authorities, service providers and other organisations. From a company's perspective, it is necessary to ensure sufficient controls are in place for supporting the reliability of data, leaving no room for mistakes, as well as supporting the confidentiality, integrity and availability of data. From a macro perspective, authorities should support the technological and economic development through continuously building, reviewing and updating standards, laws and regulations covering the new developed concepts. Where accounting or IT functions are partially or totally outsourced, the service providers also play an essential role in covering the risks, thus controls should be implemented to ensure the confidentiality, integrity, availability and reliability of financial data.

Future research should be focused on a detailed approach for identifying and addressing the challenges posed by the rapid development of technology and accounting. Besides the controls mentioned above, which should be detailed and analysed, authors believe that the public awareness is also a major step in mitigating the risks. Especially considering that the technological development often leaves individuals and companies unprepared as not all implications are acknowledged, and security breaches may thus arise, future work should also be designated to

understand the elasticity of public (both individuals and companies) to the technological and economic progress, as for identifying efficient ways to embrace the progress and address the involved risks at the same time.

### ACKNOWLEDGEMENT

„This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/138907 'Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical fields -EXCELIS', coordinator The Bucharest University of Economic Studies'.

### References

- [1] Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I., Zaharia, M. (2010), *A view of cloud computing*, Communication of the ACM, Vol. 53 No. 4;
- [2] Beckham, J. (2010), *Cloud Computing: What it is and How Your Small Business Can Benefit*, *Inzinerine Ekonomika-Engineering Economics*, 2012, 23(1), pp.14-21;
- [3] Burinskiene, A., Burinskas, A. (2010), *Investments into E-Business Technologies*, *Economics and Management* no. 15, pp. 86-892;
- [4] Christauskas, C., Miseviciene, R., (2012), *Cloud Computing Based Accounting for Small to Medium Sized Business*, *Inzinerine Ekonomika – Engineering Economics*, vol. 23, no 1., pp. 14-21;
- [5] Chytilova, E., Jurova, M., (2011), *The Mechanism of Universal Evaluation Inside Information Flows for Small and Medium-Sized Enterprises*, *Economics and Management*, 16, pp. 1039-1046;
- [6] CSA, ISACA (2012), *Cloud Computing Market Maturity Study*, available on-line at [http://www.isaca.org/Knowledge-Center/Research/Documents/WSCC-Security-Considerations-Cloud-Computing\\_whp\\_Eng\\_0912.pdf](http://www.isaca.org/Knowledge-Center/Research/Documents/WSCC-Security-Considerations-Cloud-Computing_whp_Eng_0912.pdf)
- [7] Ernst & Young(2012), *Global Information Security Survey 2012*, available online at: [http://www.ey.com/AU/en/Services/Advisory/Pulse\\_Nov\\_2012\\_Fighting-to-close-the-gap---2012-Global-Information-Security-Survey\\_article2?Finjan-Auth=JswAT5LjMreD664PaPu1iAtsmER87O2ZWC85jTF1MCBfIhiNXq17eb2m2Enh/+R xLGjRHLgKHg=](http://www.ey.com/AU/en/Services/Advisory/Pulse_Nov_2012_Fighting-to-close-the-gap---2012-Global-Information-Security-Survey_article2?Finjan-Auth=JswAT5LjMreD664PaPu1iAtsmER87O2ZWC85jTF1MCBfIhiNXq17eb2m2Enh/+R xLGjRHLgKHg=), accessed on the 13.02.2015;
- [8] Girdzijauskas, S., Cepinskis, J., Jurkonyte, E. (2008). *Transformations in Insurance Market: Modern Accounting Method of Insurance Tariffs*. *Transformations in Business and Economics*, 7(14), 143-153;

- [9] Glaser, J., Stone, J. (2008), *Effective use of Business Intelligence*, Healthcare Financial Management, pp. 62-70;
- [10] Kalcinskaite, R. (2009), *Management Accounting Elements in Small and Medium - Sized Enterprises*, Economics & Management, 14, 64-70;
- [11] Kundeliene, K. (2011), *Business Processes Accounting Quality Attributes Assessment: Empirical Research in Lithuanian Organizations*, Economics and Management, 16, 66-72;
- [12] Low, C., Chen, Y., Wu, M. (2011), *Understanding the determinants of cloud computing adoption*, Industrial Management & Data Systems, Vol. 111, pp. 1006-1023;
- [13] Phillips B.A (2012), *How cloud computing will change accounting forever*, available at: <http://accountantsonline.com/jobseekers/CloudComputing.pdf>, accessed on 16.09.2014;
- [14] Salmeron, J. & Lopez, C. (2010), *A Multicriteria Approach for Risks Assessment in ERP Maintenance*, The Journal of Systems and Software 83, pp.1941–1953;
- [15] Ustasüleyman, T. & Percin, S. (2010), *A Structural Model Suggestion About The Effect Of Critical Control (Success) Factors On Enterprise Resource Planning (Erp)Implementation Success*, Journal of the Faculty of Economic & Administrative Sciences, Marmara University June 2010, Vol. 28(1), pp. 293-312;
- [16] Weiß, F., Leimeister, J. M. (2012), *Consumerization. IT innovations from the consumer market as a challenge for corporate IT*, Business & Information Systems Engineering. 6, Vol. 4, pp. 363— 366;
- [17] Ziemba, E., Oblak, I. (2013), *Critical Success Factors for ERP Systems Implementation in Public Administration*, Interdisciplinary Journal of Information, Knowledge, and Management Vol. 8, pp. 1-19.

*Andreea C. Bendovschi*  
*Bucharest University of Economics, Bucharest, Romania*  
*Corresponding author – e-mail: andreea\_bendovschi@yahoo.com;*  
*mobile: +40 741 434 004/+44 07881 284 259*

*Andreea Bendovschi is a PhD student at the Bucharest University of Economics, Accounting and Management Information Systems Faculty, and has over three years of professional experience in IT audit and advisory, currently being part of the IT Audit team of Mazars, London (United Kingdom).*