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Corporate Governance & Digital Entrepreneurship: Cloud Metadata Accounting

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

The aim of this paper is to introduce, describe, and evaluate new functionalities supported by digital entrepreneurship in Web-based cloud computing corporate governance environments, following a client-server ICT architecture. In particular, after the discussion of the rich in spatio-temporal functionalities nowadays digital entrepreneurship, an empirically-tested approach (i.e. an early stage methodology) has been used to analyze the performance of a digital "virtual" Web-based client-server accounting department. Also, the metadata concept was used to describe the structures for the primitive and implied data and the variously derived info-contents. In the proposed scheme five metadata structures were used in order to support the backbone of the methodology (i.e. "*data storage*" on the server site and "*data mining/information*" for client requests). Relevant statistics show a positive achievement of the proposed approach on a cost/benefit basis. The presented empirical spatio-temporal (4-d functionalities; space and time) corporate governance approach could be thought as an early indicator in digital entrepreneurship and, obviously, further research to enhance, validate and better document the achievements are needed. Finally, on a philosophical ethical basis, these cloud computing applications will reduce the need for manpower (really, a social problem), but at the same time, will release time for intellectual work.

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1. INTRODUCTION

The novel term '*Digital Entrepreneurship*', in the corporate governance domain, most commonly used to describe the process of establishing a new Internet-based service, utility, function, or product. *Digital Entrepreneurship* is referred not only to start-ups but also to the digital transformation of an existing classical business activity (accounting, logistics, management, etc.). Nowadays, the emergence of the cloud computing is transferring focus from classical linear technical regulatory barriers and limits (like salary cost, hardware, software, equipment, ICT eco-system, personnel skills, hours-of-business law restrictions, etc.) to some more complicated multi-dimension challenges servicing digital advantages (like space-location functionalities, time-temporal functionalities). This shift benefits digital entrepreneurs and reinforces new practices for corporate governance [1-3].

Obviously, *digital entrepreneurship* help matching better supply and demand for labor, goods and services, improves economic efficiency, productivity and income (salary), and offer opportunities to work from remote areas, at different hours, from the home, or on the go. It can play an important role in promoting gender equality and social and economic inclusion, stimulate local development, and contribute to sustainable development, especially when new technologies are combined with the availability of open and public data [4,5].

However, *digital entrepreneurship* still not using ICT cloud technologies to their fullest nowadays potential (e.g. spatio-temporal 3-d/position and 4-d/temporal position challenges) and scaling. So, additional digital divides could be emerged for instance in scaling: certain services (e.g. logistics, accounting, management) can only be supplied in company's branches or geographical locations that offer the required scale and density, and could support the required volume of transactions (e.g. certain types of logistical, accounting, transport and delivery services that need a sufficient base and scale as usually offered by company's headquarters)[6,7].

The scope and justification of the current article are to introduce and describe a digital "floating" (virtual) accounting department (Section 2) using state-of-the-art ICT cloud technologies with 4-d/temporal position functionalities. Relevant statistics (proposed methodology), show approximately 23% positive achievement on a cost/benefit basis (Section 3).

Obviously on an ethical basis, similar cloud computing client-server ICT applications will reduce the need for manpower, but at the same time will release time for more intellectual work.

2. CLOUD COMPUTING VIRTUAL ACCOUNTING DEPARTMENT

A Virtual Digital Spatio-Temporal Accounting department (VDS-TAd) is described as a Web-based client-server virtual WSN unit (Wireless Sensor Network, WSN) supported usually by just one (1) personnel and relatively strong hardware and software, responsible for remote cloud-based computing support of a number of accounting functionalities located in various places (spatial dimension) and for any time on request (temporal dimension). At the heart of the VDS-TAd is a wireless sensor network (WSN), which is actually a scale-free weighted network capable to reflect sufficiently the existing form of a classical accounting department but with a lot of dynamic characteristics to fully exploit the ICT functionalities (e.g. mobile – Android control) [8].

Cloud-based (Cloud) computing provides utility oriented ICT services usually on a "pay-per-use" basis [9,10]. "*The Cloud*" is actually a pool of resources, utilities and functions, used to support a development platform which can be reconfigured dynamically to adjust to a variable load for better performance and for optimum utilization. Usually, the *Cloud computing* users submit their requests for computing resources (e.g. RAM, CPU power, disk capacity, infrastructure hardware, infrastructure software, etc.) which are provisioned in the cloud platform without the users being aware of the involved details of the execution process.

The three more important entities involved in Web-based *Cloud computing* VDS-TAd, as a client-server application (in current terms: Windows app, Android app, iOS app), are [11-13]:

- The Wireless Sensor Network (WSN). A scale-free weighted network with full ICT (Internet) functionalities.
- The Server or Cloud Server (CS) or Cloud Service Provider (CSP). It is actually a pool

of resources in a data centre, which provides huge processing power and variety of services to the clients.
- The Clients. A number of registered virtual accounting departments who demand services from the VDS-TAd (Server/CS/CSP). The services may include classical accounting utilities, as well as personalized dynamic control, extra storage resources, new applications (apps), and mobile auditing processes.

In the proposed Web-based client-server VDS-TAd the *routing protocol* for the WSN part (i.e. the communication ability, control and rules) is very important so that the accounting data (1st level primitive data) can be transmitted to the receiver (i.e. the Server/CS/CSP) effectively and accurately [14-16]. In this field, the current article proposes for the *routing protocol* an energy-balanced routing method based on forwarding aware factors [17-19].

Also, a TCP optimization network is needed with spatial information functionality (i.e. ability to calculate derivative 2nd level data with coordinates – spatial reference metadata) in order to support spatio-temporal queries in a big data environment (primitive 1st level data) [20-24]. The proposed VDS-TAd is actually a spatio-temporal *Internet-of-Things* (IOT) application [25,26].

2.1 The Mathematical Model of VDS-Tad

Obviously, in the proposed client-server VDS-TAd, data confidentiality has to be maintained by ensuring that it is not gained by unauthorized users. The common method of masking data of customer record confidentiality is data anonymization. So, in the context of risks such as our case (accounting), research is being performed to better common anonymization techniques like k-anonymization with distributed anonymization [27] and control protocols with spatial correlation (WSN) functionality and self-adaptation [28-32].

The current article proposed the following mathematical model (algorithm) for the client-server VDS-TAd:

Step-I (1st level metadata): At the CLIENT/SERVER sites; for any spatio-temporal inquire from the client site, total available primitive accounting data (organized in primitive metadata structures at the server site: e.g. number of staff; payroll currency) will be identified at the server site for direct data mining.

Step-II (2nd level metadata): At the SERVER site; from the primitive the derivative accounting data were implied incorporating space and time coordinates from the client and prices for probability statistic indicators like *mean*, *median*, *min*, *max*, *standard deviation* (*SD*), *coefficient of variation* (CV ή relative standard deviation-RSD), *etc*. These 2nd level metadata structures could be regarded as functionalities with space (e.g. the valid VAT percentage at the particular state of the client; California, Arizona, Texas, etc.); and time (e.g. seasonal payroll bonuses, extra short-period promotion packages, etc.) dimensions.

Step-III (3rd level metadata): At the SERVER site; new derivative information (e.g. partial correlation information) were implied from the data nested at the 2nd level metadata structures; incorporating prices for probability theory indicators as 3rd level metadata structures (e.g. partial correlation) according to the submitted requests by the client. For instance, partial correlation information for decision making and accounting functionalities: payroll lists (PL); VAT reports (VR); etc.

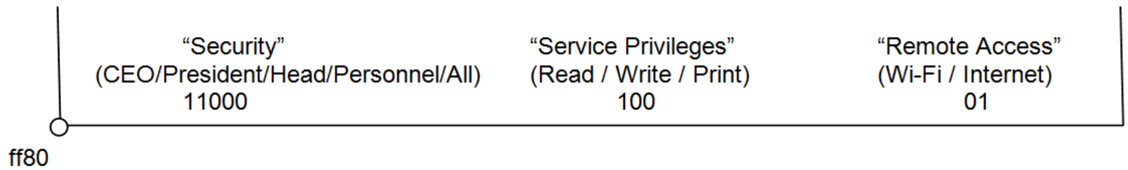
Step-IV (4th level metadata): At the CLIENT site; quality statistical tabular information were reported in predefined adaptive personalized ready-to-print pdf forms structured with a number of 4th levels metadata fields (e.g. simple Payroll Reports (sPR) useful in decision making). These forms were classified at the server site, using an extra 4th level metadata field, in categories like: "*Reports*", "*Lists*", "*Confidential data*", "*Confidential information*", "*Economic data*", "*Financial data*", etc.

Step-V (5th level metadata): At the CLIENT site; every category is related to an "*agent"*, which is actually a pointer to a 5th level metadata structure with inherent metadata fields as "security", "service privileges", and "remote access" mechanisms. Security access, service privileges, and remote access characteristics, as on/off (1/0) bit values, were assigned to the "security" and "service privileges" mechanisms according to the particular *client account credentials*; and to the "remote access" mechanism according to the Wi-Fi or internet availability.

An "*agent*" as a pointer (e.g. ff80 RAM memory address at the client site) is actually an autonomous entity, adaptive and asynchronous, offering ICT and IOT functionalities in a software routine.

For instance:

Reports	Agent.1→ff80
Lists	Agent.2→cc30
Confidential data	Agent.3→ab92
Confidential Information	Agent.4→cd68
…………………………..	………………..



The particular 01 digit-series (i.e. on/off functionality) derived from the corresponding client account credentials at the client site. The "*agent"* performs certain tasks on behalf of the client (remote request) and they could be used also for decision making with spatial functionality (GIS).

3. EMPIRICALLY-TESTED RESULTS & DISCUSSION

In order to perform an empirically-tested analysis fourteen (14) accounting departments were evaluated as sample data. Seven (7) of them were classical accounting departments with a number of staff in correlation with the involved budget. The rest seven (7) accounting departments were virtual departments with just one personnel for supervisor and support. These virtual departments were operated on a *cloud computing client-server* bases. For the statistical analysis, the MedCalc software (provided by MedCalc software bvba; https://www.MedCalc.org) was used.

Following Fig.1 (1st level metadata structures) displays, for the above sample primitive data (14 cases), the number of staff; the payroll cost; the currency; the equipment, hardware, software cost; the supported monthly budget; and a Boolean indicator pointing to the type of the accounting department (0 for classical accounting departments; 1 for virtual cloud computing departments). These numbers are actually the data-content for the 1st level metadata structures.

Following, Table 1 (2nd level metadata structures) displays some of the summary statistical derivative data as they were implied from the primitive data collected at the field and presented in Fig. 1.

Following, Fig. 2 (3rd level metadata structures) displays the partial correlation information as info-content for the 3rd level metadata field "partial correlation". This new derivative information is rich in accounting functionality (e.g. payroll lists/PL; VAT reports/VR; etc.) and could be used in decision making as well.

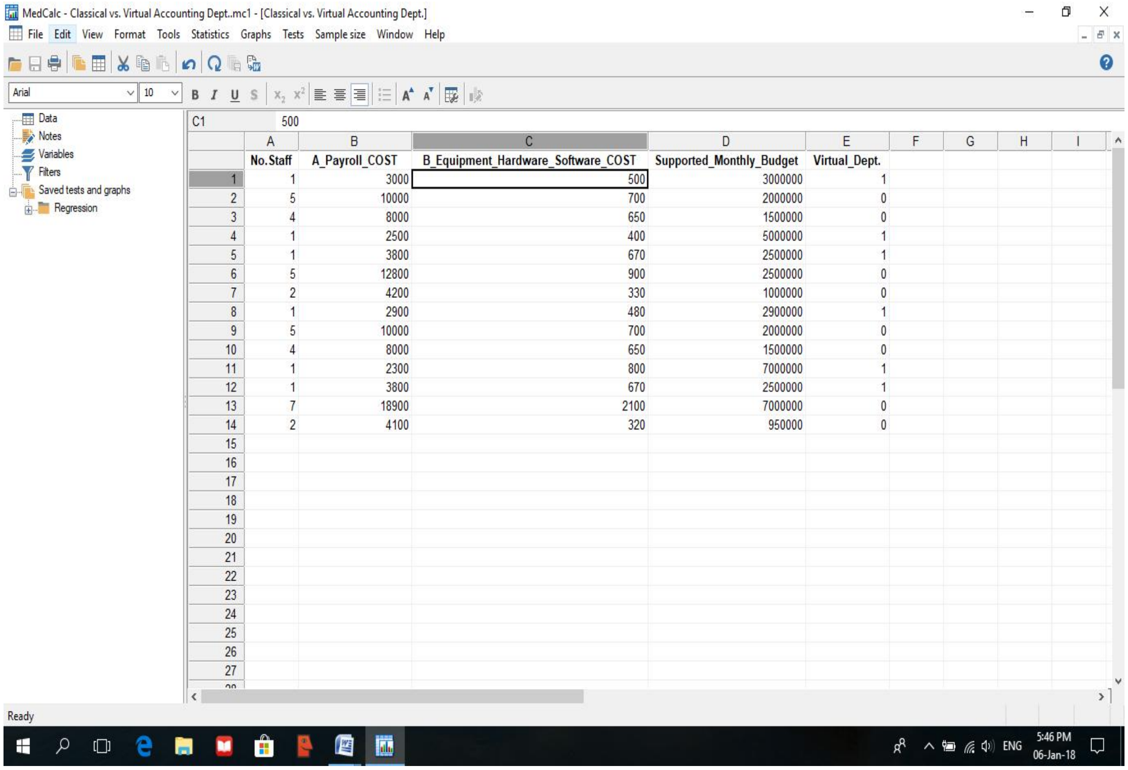
The info-content presented in Fig. 2 is derived from the primitive data collected at the field (and presented in Fig. 1) and the summary statistical derivative data presented in Table 1.

Finally, for comparative reasons (classical vs virtual accounting department), Table 2 displays the correlation (quality statistical tabular) information derived from the primitive data collected at the field (and presented in Fig. 1), the summary statistical derivative data presented in Table 1 and the partial correlation information presented in Fig. 2.

These info-contents were projected to 4th level metadata structures (as quality statistical information) and could be used for decision making at the client site.

3.1 Discussion

According to the quality statistical information provided by the above Table 2, it is obviously that the "*Supported Monthly Budget*" is totally independent of all costs involved in cloud computing virtual accounting departments running by just one (1) personnel. Hence, the biggest the company the more profitable the Web-based cloud computing accounting!



	A No.Staff	B A_Payroll_COST	C B_Equipment_Hardware_Software_COST	D Supported_Monthly_Budget	E Virtual_Dept.
1	1	3000	500	3000000	1
2	5	10000	700	2000000	0
3	4	8000	650	1500000	0
4	1	2500	400	5000000	1
5	1	3800	670	2500000	1
6	5	12800	900	2500000	0
7	2	4200	330	1000000	0
8	1	2900	480	2900000	1
9	5	10000	700	2000000	0
10	4	8000	650	1500000	0
11	1	2300	800	7000000	1
12	1	3800	670	2500000	1
13	7	18900	2100	7000000	0
14	2	4100	320	950000	0

Fig. 1. The sample primitive data (14 accounting departments) on the MedCalc software environment

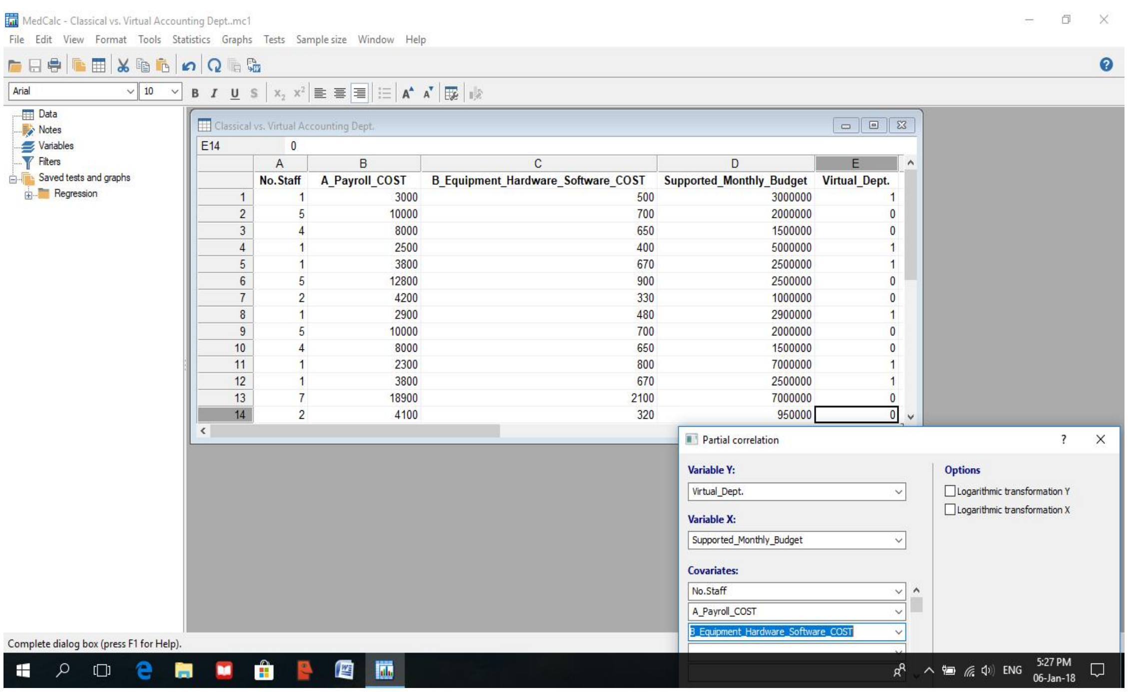


Fig. 2. Partial correlation information (3rd level metadata structures)

Table 1. Summary statistical derivative data (2nd level metadata structures)

	N	Minimum	Maximum	Mean	Median	SD	RSD	25 - 75 P
No. of staff	14	1	7	2.86	2	2.07	0.7246	1 to 5
Payroll cost	14	2,300.00	18,900	6,735.71	4,150	4,852.85	0.7205	3,000 to 10,000
Supported monthly budget	14	950,000	7,000,000	2953571.43	2500000	1989053.15	0.6734	1,500,000 to 3,000,000
Equipment, hardware, software cost	14	320	2,100	705.00	660	436.43	0.6191	480 to 700
Virtual department	14	0	1	0.43	0	0.51	1.1983	0 to 1

Table 2. Correlation table – quality statistical information (4th level metadata structures)

		No. of staff	Payroll cost	Supported monthly budget	Equipment, hardware, software cost	Virtual dept.
No. of staff	Correlation coefficient		0.963	0.040	0.683	-0.806
	Significance Level P		<0.001	0.8912	0.0071	0.0005
	n		14	14	14	14
Payroll COST	Correlation coefficient	0.963		0.182	0.823	-0.683
	Significance Level P	<0.0001		0.5326	0.0003	0.0071
	n	14		14	14	14
Supported monthly budget	Correlation coefficient	0.040	0.182		0.622	0.390
	Significance Level P	0.8912	0.5326		0.0174	0.1681
	n	14	14		14	14
Equipment, Hardware, Software COST	Correlation coefficient	0.683	0.823	0.622		-0.244
	Significance Level P	0.0071	0.0003	0.0174		0.4012
	n	14	14	14		14
Virtual department	Correlation coefficient	-0.806	-0.683	0.390	-0.244	
	Significance Level P	0.0005	0.0071	0.1681	0.4012	
	n	14	14	14	14	

Pearson correlation coefficient

On the other hand, the "*Supported Monthly Budget*" is totally dependent on all the costs and the number of personnel involved in classical accounting departments.

With a positive visa perspective, machines do the manual work and man has more time or performs mental work and the insurance system is saved since the systems do not need insurance or drafting. With a negative consideration, the inevitable job losses are always a social problem. But to be negative to the river that comes up against us is not constructive.

4. CONCLUSIONS

In this article, an empirically-tested approach (simple methodology) has been used to analyze the performance of a cloud computing accounting department using the client-server ICT architecture for developing applications. In the proposed approach the metadata structures concept was used to host (as context) the primitive, and derivative data, as well as the implied information.

Relevant statistics show an encouraging 23% positive achievement on a cost/benefit basis. The presented corporate governance approach offer reliable internal auditing functionalities and could be thought as an early indicator of digital entrepreneurship. Obviously, further research, to enhance, validate and better document the presented achievements and functionalities is needed.

The diffusion and influence of cloud technology are obvious in corporate governance, but a lack of competition can always slow down this technology's great functionalities. Finally, in this field (cloud computing virtual accounting) there is a need for barriers which may prevent digital entrepreneurs from challenging incumbents. Like the rest of the state-of-the-art Web-based applications, in the proposed approach virtual agents (i.e. software routines without any insurance or drafting cost) do the manual work and man has more time or performs mental work. In this domain and on a short-term basis, the inevitable job losses are always a social problem. But as has always been the case from ancient times in human activities: "*to be negative to the river that comes up against us is not constructive*".

COMPETING INTERESTS

Author has declared that no competing interests exist.

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