PREDICTIONS REGARDING THE EVOLUTION OF ARCHIVING DOCUMENTS GENERATED BY BUSINESS ENTITIES

Narcisa TEODORESCU[1]

Ruxandra TEODORESCU[2]

Abstract

The documents of any organization are created, modified, distributed through various routes, archived, accessed, re-delivered, re-archived. Taking into account that during the last few years the legislative framework regulating the record, inventory, selection, maintenance and use of archives was issued, according to the European regulations the companies are faced with some problems related to knowledge of the legal regulations in effect regarding archiving documents; methods of registering, recording, archiving and accessing the documents; predicting the evolution of the amounts of documents to be archived; predicting the space necessary for storing the archive; supervision of the archive and handling of the archive. The purpose of this article is to support business entities in order to resolve these issues; to determine the amount of archive for a given time period (n), and to estimate the appropriate archiving space.

Key words: mathematical models; management; data estimation

JEL Classification: C6, C8, M1

1. Introduction

The documents used within an organization are key to that organization's functioning and success.

According to DEX, II-nd edition 1996, Univers Enciclopedic Ed., "*the document* represents a document that proves, records or predicts a fact, confers a right or confirms an obligation; a written or printed text, inscription or other proof used to acknowledge a real fact occurring in the present or the past".

The notion of document, from a record-keeping perspective, is interpreted very broadly. Thus, in the Special Historical Science Dictionary defines the term "document" in the

---

[1] Ph.D., Technical University of Civil Engineering, Bucharest
[2] Ph.D., University of Agronomical Science and Veterinary Medicine, Bucharest

record-keeping sense, as any source "on friable support, achieved by means of graphics, photography, sound recordings, cinematography or other images, which present an interest with respect to historical knowledge (Oprea 1995).

Recording a document marks its official existence and represents the birth certificate of each document. When the creator of documents creates a large number of documents, they are registered in each work department by registering with the general registry office the number assigned to it by the expeditor and the name of the department to which it is sent for registration and resolution („Legislație arhivistică", București 2001) .

As technologies develop and the archives of documents held and handled by business entities grow constantly, we estimate that, in the future, the documents will take new forms and will provide new options for communication. In this sense, in 2007, Law 135 on archiving documents in electronic format was issued. It is still difficult to apply this law, and the companies trying to implement information systems regarding documents management are faced with various technical, organization, legislative, management and attitude problems.

Therefore, given that a small number of companies faced with large archives and issues related to storing, handling and accessing thereof implemented information systems for management of documents, and given that within the organizations that already have such information systems there will continue to exist a large number of documents archived in hard copy, this article refers exclusively to *printed archive*.

The purpose of this article is to estimate the amount of archive to be generated by a business entity/company in a given future period (n), as well as the archiving space corresponding to such period, based on the existent amount of archive and the amount of activity forecasted for the next years.

The documents of an organization are not static. They are created, modified, distributed through various routes, archived, accessed, re-delivered, re-archived. Statistics show that the amount of documents transmitted by companies registered a continuous increase during the last years and that Romanian companies manage a significant amount of documents each year. The same trend was also registred at the European level.

Thus, the companies are both creators and owners of documents, and they are responsible for recording, inventorying, selecting and storing the documents subject to the legal provisions in effect.

Depending on the company size, the scope of business, number of employees, the companies are faced in the medium and long term with various levels of difficulty related to the storage, keeping and handling of the document archive.

Taking into account that during the last few years the legislative framework regulating the record, inventory, selection, maintenance and use of archives was issued, employers are faced with problems related to the following aspects:

- knowledge of the legal regulations in effect regarding archiving documents

- methods of registering, recording, archiving and accessing the documents that "enter" or "exit" the company

- predicting the evolution of the amounts of documents to be archived by the company

- predicting the space necessary for storing the archive

- supervision of the archive (destruction of the types of documents for which the term provided by law for keeping them expired, the appropriate maintenance of the other types of documents)

- handling of the archive

The purpose of this work is to support business entities, both Romanian and European, in order to resolve the aforementioned issues; to determine the amount of archive for a given time period (n), and, most importantly, to estimate the appropriate archiving space.

2. Legislative issues regarding archiving records

2.1. Romanian Legislative Framework

- Law 16/1996 (Law of National Archives)

- Law 358/2002 for the amendment and supplementation of Law of National Archives 16/1996

- Emergency Ordinance no. 39/2006 on the amendment and supplementation of Law of National Archives 16/1996

- Instructions regarding the archiving activity of creators and owners of documents, as approved by the management of National Archives by Resolution Minutes no. 217 of May 23, 1996.

- Regulation regarding the organization and functioning of the Committee for the certification of archive personnel, as approved by the management of National Archives by Resolution Minutes no. 219 of June 3, 1996.

- Law 135/2007 on the documents archiving in electronic format

2.2. Legal provisions on archives

Based on the provisions of Law 16 of April 2, 1996 – Law of National Archives, as subsequently amended, the National Archive Fund of Romania was established, consisting of the following types of documents: official and private acts, diplomatic and consular acts, memoirs, manuscripts, proclamations, callings, billboards, plans, sketches, maps, films rolls and other similar pieces of evidence, seal matrixes, as well as photo, video, audio and information recordings having historical value, made in Romania or by Romanian creators abroad.

Therefore, any natural or legal person who creates, owns and maintains documents of the kind listed above, is named creator or owner of documents and is responsible under the law for recording, inventorying, selecting, maintaining and using the documents.

The creators and owners of documents have the obligation to register and keep the record of all documents *entered*, of the ones *drafted for internal use*, as well as of *the ones that exit*.

The creators and owners of documents have the obligation to maintain the documents created or owned under appropriate conditions, insuring the same for damage, alteration, theft or trading under terms other than the ones provided under the law.

On an annual basis, the documents are compiled in archive units, as per the problems and maintenance terms set under the nomenclature of the archiving documents, made by each creator for his/her own documents.

The legal persons who are creators and owners of documents have the obligation to maintain the same in spaces specially fitted for the archive. The new constructions of creators and owners of archive will be approved by the National Archives or the county directorates of the National Archives, as the case may be, provided that they have appropriate space for maintaining the documents.

The archive storage facilities will be equipped, depending on the format and medium of documents, with appropriate means for maintaining and protecting the same, as well as with means, installations and systems for fire prevention and extinction.

The documents with practical value, on the basis of which natural and legal persons are issued copies, certificates and excerpts, will be kept by business entities at their office, under appropriate conditions. The business entities have the obligation to hold and use the spaces for archive storage appropriately.

Thus, based on the existent archive amounts as well as the amount of activity forecasted for the next years, the purpose of this article is to enable an estimation of the amount of archive to be generated by a business agent for a given future period (n), as well as the archiving space corresponding to such period.

In case a company closes down, without its business being taken over by another company, the documents with historical value will be taken over by the National Archives or the county directorates of the same, and the ones having practical value, regarding citizens' individual rights, on the basis of which certified copies and excerpts are issued, will be submitted to the Ministry of Labor and Social Protection or to the county directorates of the same.

We note that all business entities have the obligation to issue as per the law, at the request by natural and legal persons, certificates, copies and excerpts from the documents they create and own and that are related with them.

3. Types of documents that need to be archived by business entities

The grouping of documents received or delivered is made upon a rigorous analysis, and only the documents related to the same issue and having the same term for record keeping are included in the same file, based on pre-determined indicators, which comprise in a specific form the group of documents created within an institution (Dinu C., Nicula V. 1978).

The nomenclature of files is made by each creator for his/her documents in a table where categories of documents compiled according to issues are registered by work departments for the specific record-keeping deadline.

The specialized literature in the field emphasizes the importance of the nomenclature of files (Cohn Emilia 1979). An archive without nomenclature is like a heterogeneous conglomerate of documents, the reorganization of which requires a re-classification of documents, which means the work is double. Separating documents on the basis of the nomenclature is the most efficient and, at the same time, the most operative system (Coman Voica 1984).

It is very important to create this nomenclature, as the documents generated or kept by the company may be identified based on it, and at the same time, the amount of archive may be estimated depending on the record-keeping term thereof.

The business agent must take into account that the documents handled by a company must not be considered or treated as a whole since they are differentiated, mainly depending on the mandatory time period for archiving (required under the law), and, and secondarily, depending on the frequency of using or accessing the documents.

Further to the analysis of the documents transmitted by several companies having different scope of business, number of employees, and turnover, the authors of the article estimated the evolution of each type of documents for a time period (n).

We assume that any company, irrespective of its size, holds an archive fund comprising the following types of documents, minimum:

Code/type of document	Name of the file (summarized content of the issues it covers)	Maintenance term
D_1	Decisions of the Board of Directors/General Meeting of Shareholders/Steering Board	Permanent
D_2	Internal correspondence	10 years
D_3	External correspondence	10 years
D_4	Registry of correspondence entry-exit	10 years
D_5	Documents inventories	P
D_6	Attendance book	3 years
D_7	Collective labor bargaining agreement, Internal Regulations, Company Organization and Functioning Regulations and other internal regulations and norms	P
D_8	Applications, notes, reports, minutes regarding current/administrative activity	3 years
D_9	Personnel organization charts	P
D_{10}	Internal regulations regarding standardizing job duties	P
D_{11}	Investigation documents and findings regarding labor accidents, Records of labor accidents and occupational diseases	P

D_{12}	Files of permanent or temporary employees or of former employees	70 years
D_{13}	Workbooks of the company's employees	70 years
D_{14}	Individual medical file of employees	15 years
D_{15}	Semestrial balance sheets	50 years
D_{16}	Control documents	10 years
D_{17}	Payrolls	50 years
D_{18}	Fiscal sheets, fees/employees	50 years
D_{19}	Payrolls, fees pay lists, contracts, pay slips, postal orders, copyrights, scripts	50 years
D_{20}	Declarations to the budget of social securities CAS, health, unemployment, statistics, other declarations	50 years
D_{21}	Salary certificates, banks, certificates of length of service, retirement certificate	10 years
D_{22}	Registry of payment orders, cash-office and suppliers	10 years
D_{23}	Cash-register documents: cash book	10 years
D_{24}	Foreign currency cash book	10 years
D_{25}	Cash-office receipts	10 years

D$_{26}$	Check-books	10 years

4. Potential issues faced by business entities in maintaining archive records

Given that recently the relevant authorities established the legislative framework regulating the record, inventory, selection, maintenance and use of archives, employers are faced with the following issues:

- unfamiliarity with legal regulations in effect on archiving documents

- modality of registering, recording, archiving and accessing the documents that "enter" or "exit" the company

- predicting the evolution of the amounts of documents to be archived by the company

- predicting the space necessary for storing the archive

- managing the archive (destruction of the types of documents for which the record-keeping term provided by the law expired, the appropriate maintenance of other types of documents)

- handling the archive

5. Mathematical model

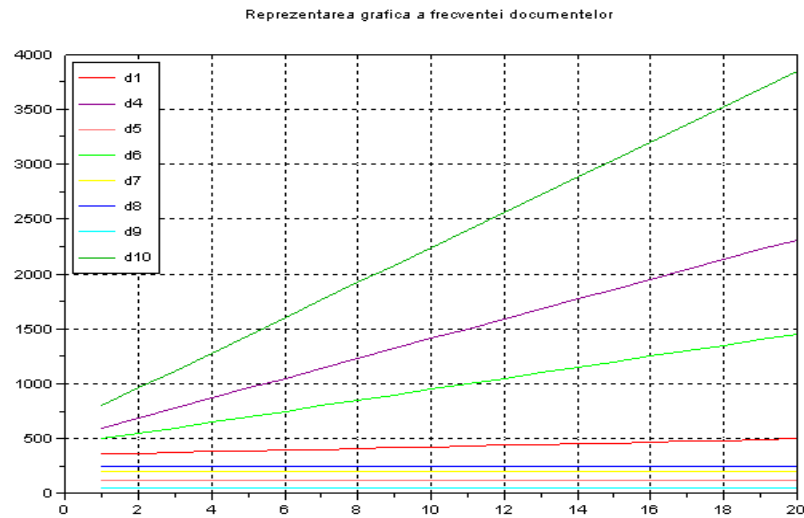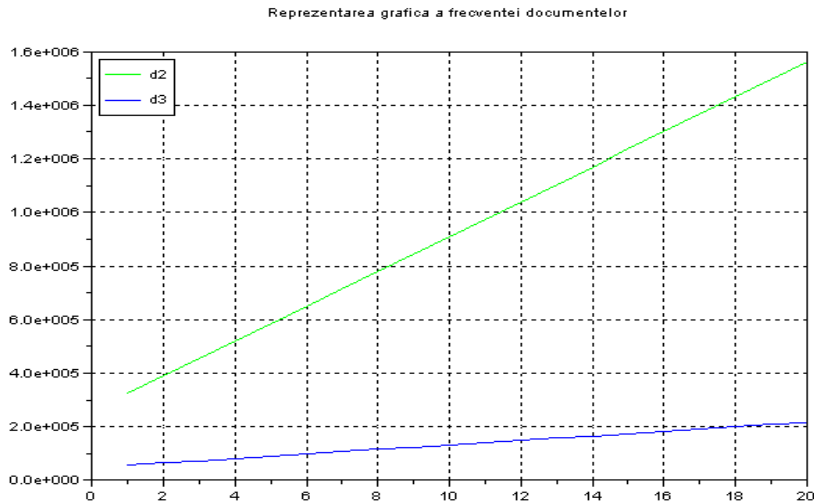The main objective of this paper is to estimate a space of archiving for a given period of time.

Considering the fact that the Romanian market has a very emphasized dynamic, it has been tried to find a model that can easily adapt.

Following the history of some enterprises with different profiles, it has been made the grafic of frequency development [3] of different types of documents. For this we had in view more criteria of the commercial societies analysed, which influence the evolution of the archieves, such as: the field of activity, the number of employees and the turnover.

---

[3] The development is influenced by the specific of the enterprise

Because types D_2 and D_3 have a raise of 10^5, faster than the rest of documents, they were represented on their own.

Reprezentarea grafica a frecventei documentelor

Reprezentarea grafica a frecventei documentelor

We shall make the following notes:

n the period of time for which we want to do the estimation;

p the types of documents that want to be archivated;

a_{ij} the frequency of document D_j at time i, $j = 1,\ldots, p,\ \ i = 1,\ldots, n$.

It must be mentioned the fact that in the archive are included the documents that have keeping time temporary (n_1, n_2, n_3 ani) and documents that have keeping time permanent.

Al those documents that have as period of archiving a number bigger than n, will be conidered as if they had a permanent keeping term.

Writing with y_i the frequency of document D_i which is not included in the archive, we can make the following analysis:

- For a period of time n_1, from the archive will not exit any document and then we have

  $y_i = 0$ for all $i = 1, \ldots, n_1$;

- From moment $n_1 + 1$ it starts exiting from the archive document D_{j_1} (with keeping term n_1 years) and we will have

  $y_i = a_{i-n_1, j_1}$ for all $i = n_1 + 1, \ldots, n_2$;

- From moment $n_2 + 1$ starts exiting the archive documents D_{j_2} and D_{j_3} (with keeping term n_2 years) and we will have

  $y_i = a_{i-n_1, j_1} + a_{i-n_2, j_2} + a_{i-n_3, j_3}$ for all $i = n_2 + 1, \ldots, n_3$;

- From moment $n_3 + 1$ starts exiting the archive documents D_{j_4} and D_{j_5} (with keeping term n_3 years) and we will have

  $y_i = a_{i-n_1, j_1} + a_{i-n_2, j_2} + a_{i-n_3, j_3} + a_{i-n_4, j_4} + a_{i-n_5, j_5}$ for all $i = n_3 + 1, \ldots, n$.

The inference above continues or stops, depending on the documents variety and keeping periods in the archive.

This way we can estimate the capacity of the archive for a period of time of n years according to the formula

$$c_n = \sum_{i=1}^{n} \sum_{j=1}^{p} a_{ij} - \sum_{i=1}^{n} y_i .$$

6. Computational results

An enterprise F has the following types of document, accordingly to strokes of arhivation

Code/type of document	Name of the file (summarized content of the issues it covers)	Maintenance term
D_1	Decisions of the Board of Directors/General Meeting of Shareholders/Steering Board	Permanent

D_2	Internal correspondence		10 years
D_3	External correspondence		10 years
D_4	Registry of correspondence entry-exit		10 years
D_5	Attendance book		3 years
D_6	Collective labor bargaining agreement, Internal Regulations, Company Organization and Functioning Regulations and other internal regulations and norms		P
D_7	Personnel organization charts		P
D_8	Investigation documents and findings regarding labor accidents, Records of labor accidents and occupational diseases		P
D_9	Files of permanent or temporary employees or of former employees		70 years
D_{10}	Individual medical file of employees		15 years

In the first year, in the archive enters the following volume of documents[4]

a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}
360	325000	56250	600	120	500	200	200	50	800

---

[4] We are reffering to the number of pages

The estimated rising of each type of document is

k_1	k_2	k_3	k_4	k_5	k_6	k_7	k_8	k_9	k_{10}
0,02	0,20	0,15	0,15	0	0,10	0	0	0	0,10

We mention that in this example we have considered the enterprise to have a medium number of 200 employees.

Using the mathematic program SCILAB, the authors of this article have made a mathematic program of calculating the capacity of the archive.

Rolling the data entrance pogram above there had been found the following results for the capacity of the archive estimate in different periods of time

```
a4=evstr(x_mdialog('Volumul documentului D4',['a4='],['']));
a5=evstr(x_mdialog('Volumul documentului D5',['a5='],['']));
a6=evstr(x_mdialog('Volumul documentului D6',['a6='],['']));
a7=evstr(x_mdialog('Volumul documentului D7',['a7='],['']));
a8=evstr(x_mdialog('Volumul documentului D8',['a8='],['']));
a9=evstr(x_mdialog('Volumul documentului D9',['a9='],['']));
a10=evstr(x_mdialog('Volumul documentului D10',['a10='],['']));
k1=0.02;k2=0.20;k3=0.15;k4=0.15;k5=0;k6=0.10;k7=0;k8=0;k9=0;k10=0.10;
S=0;
for i=1:n
S=S+(1+k1*(i-1))*a1+(1+k2*(i-1))*a2+(1+k3*(i-1))*a3+(1+k4*(i-1))*a4+(1+k5*(i-
1))*a5+(1+k6*(i-1))*a6+(1+k7*(i-1))*a7+(1+k8*(i-1))*a8+(1+k9*(i-1))*a9+(1+k10*(i-
1))*a10;
end
S
n1=3;n2=10;n3=15;n4=70;
F=0;
for i=1:n
 if i<n1
 F=0;
 end
```

```
if (i>=n1)&(i < n2)

F=F+(1+k5*(i-n1))*a5;

end

if (i>=n2)&(i < n3)

F=F+(1+k2*(i-n2))*a2+(1+k3*(i-n2))*a3+(1+k4*(i-n2))*a4+(1+k5*(i-n1))*a5;

end

if (i>=n3)&(i<n4)

F=F+(1+k2*(i-n2))*a2+(1+k3*(i-n2))*a3+(1+k4*(i-n2))*a4+(1+k5*(i-
n1))*a5+(1+k10*(i-n3))*a10;

end

if (i>=n4)

F=F+(1+k2*(i-n2))*a2+(1+k3*(i-n2))*a3+(1+k4*(i-n2))*a4+(1+k5*(i-
n1))*a5+(1+k10*(i-n3))*a10+(1+k9*(i-n4))*a9;

end

end

F

C=S-F;

x_matrix('Capacitatea arhivei se estimeaza la urmatorul nr de pagini',C)
```

n=10 years	n=15 years	n=20 years	n=25 years
6772901.5 pg	10099621pg	13425371pg	16752550pg

7. Conclusions

The main objective of this paper was to estimate a space of archiving for a given period of time(larger than 10 years). Following the history of some enterprises with different profiles, it has been made the grafic of frequency development of different types of documents. For this we had in view more criteria of the commercial societies analysed, which influence the evolution of the archieves. Using the mathematic program SCILAB, the authors of this article have made a mathematic program of calculating the capacity of the archive.

References

Cohn Emilia (1979), „Nomenclatorul de dosare şi indicatorul de termene de păstrare – instrumente de bază în activitatea arhivistică", *Revista Arhivelor*, an LVI, vol. XLI, nr. 1

Coman Voica (1984), „Metodologia de elaborare a nomenclatorului dosarelor", *Revista Arhivelor*, an LXI, vol. XLVI, nr.4

Dinu Cristiana, Nicula Vasile (1978), „Constituirea dosarelor pe termene de păstrare", *Revista Arhivelor*, an LV, vol.X2, nr.4

„Dicţionar al Ştiinţelor speciale ale istoriei" (1982), Bucureşti, Ed. St. Enciclopedică

„Dictionarul Explicativ al Limbii Romane" (DEX), editia a II-a 1996, Editura Univers Enciclopedic

Gavrila, Camelia (2007), „Scilab. Aplicatii, Modelare si Simulare.Scicos", Editura MatrixRom, Bucuresti

„Instructions regarding the archiving activity of creators and owners of documents", as approved by the management of National Archives by Resolution Minutes no. 217 of May 23, 1996.

Knuth Donald, E. (2002), „Arta programarii calculatoarelor", Editura Teora, Bucuresti

Monitorul Oficial Partea I, nr. 71 din 09.04.1996 - Law 16/1996 (Law of National Archives)

Monitorul Oficial nr. 476/03.07.2002 - Law 358/2002 for the amendment and supplementation of Law of National Archives 16/1996

Emergency Ordinance no. 39/2006 on the amendment and supplementation of Law of National Archives 16/1996

Monitorul Oficial Partea I nr. 345 din 22/05/2007 - Law 135/2007 on the documents archiving in electronic format

„Regulation regarding the organization and functioning of the Committee for the certification of archive personnel", as approved by the management of National Archives by Resolution Minutes no. 219 of June 3, 1996.

http://www.scilab.org.