

Original Research Article

Technical analysis of softwares used for dental practice management

Uallace da Silva Oliveira¹
Camila Anselmo da Silva²
Antonio Carlos dos Santos Costa¹
Alex Ferreira dos Santos¹
Eudes Diônatas Silva Souza¹
Ismar Eduardo Martins Filho²
Sérgio Donha Yarid²

Corresponding author:

Uallace da Silva Oliveira
Rua Joana Enrique, n. 33
CEP 45570-000 – Ipiaú – BA – Brasil
E-mail: uallaceoliveira@hotmail.com

¹ Department of Chemistry and Exact Sciences, State University of the Southwest of the State of Bahia – Jequié – BA – Brazil.

² Department of Health, State University of the Southwest of the State of Bahia – Jequié – BA – Brazil.

Received for publication: November 29, 2011. Accepted for publication: May 22, 2012.

Keywords: Dentistry; dentistry information technology; software.

Abstract

Introduction: The business world has been in constant competition and information is the main tool for the decision process in order to obtain more clients, to improve the performance, the quality of services and to increase profits. Facing this reality, Information Technology (IT) has been improving technologies and making possible many advances in this area. **Objective:** This article aims to perform a technical analysis about softwares designed for dental practice management by assessing their available functions. **Material and methods:** Softwares were assessed in the period from July to October of 2011 by using the following criteria: functions, interface, security and price. **Results:** The software had neither all fundamental items nor all the security items assessed. 75% responded positively to at least half of the interface heuristics proposed by Nielsen. Price is around R\$ 576.96 per year and 40% of the softwares have purchase rate from R\$ 50.00 to R\$ 100.00. **Conclusion:** The research and analysis found out that most of softwares show some problems about security and functions. However, they exhibited user-friendly interface and affordable prices.

Introduction

The business world has been in constant competition and information is the main tool for the decision process in order to obtain more clients, to improve the performance, the quality of services and to increase profits. Facing this reality, Information Technology (IT) has been improving technologies, promoting changes in the way the information is created, maintained and recovered regarding to both the individuals and the communities [10, 11].

According to Shleyer and Spallek [29], dentistry informatics is the application of both the computer and the scientific information in the improvement of the dental practice. In this context, there are the application systems accounting for the collection, processing and retrieving of data and information [11, 17].

There are various application systems on the market in order to facilitate the work of the dentist. However, because of the lack of a more technical knowledge, the professional is subject to dissatisfaction with the product chosen, for not meeting their needs because it is a program whose handling is complex and it has no safe regarding to the improper access of the data or their loss. Thus, this study aimed to evaluate the characteristics of free and paid software and to verify whether they have the minimum requirements for managing a dental office; protecting the data and information; and regarding to their interface and price.

Material and methods

Eight dental softwares were analyzed. They were obtained from manufacturers that advertised their products on the internet. Five were paid softwares (Easy Dental, Dental Clinic, Dental Office, Dental Soft and Total Clinic Odontológico) and three were free softwares (Open Dental, DocViewer Plus and Odontologia Manager).

The paid programs were obtained through the download of their demo versions. These versions have limited usability, such as limits on the amount of records of patients or limited time for testing. Although the demo software had such limitations, these not prevented their evaluation. The free softwares were also obtained through directly download from the manufacturers of the products.

In the assessment, the following criteria were evaluated: functionality, interface, safe, and price.

Concerning to their functionalities, the presence of mandatory items were verified (identification of the professional, identification of the patient, anamnesis, clinical examination, treatment planning, treatment evolution and interurrences) which comprised the clinical record as well as additional items

(prescriptions, certificates, contract of allocation of dental services and complementary examinations), which according to the Brazilian Federal Board of Dentistry comprise the dental documentation [2].

According to Barbosa and Silva [3], interface is the name given to all portion of a system with which the user maintain contact when using it, both actively and passively. The interface assessment was based on the Nielsen heuristics. The heuristics, according to Nielsen, are general rules to describe the properties of the usable interfaces [23].

In the list of heuristics of usability proposed by Nielsen, the interface of a computer system must have: visibility of system status, system compatibility with the real world, user control and freedom, consistency and standards, error prevention, recognition rather than remembrance, flexibility and efficiency of use, aesthetic and minimalist design, help tool recognizable by the user, diagnose and correct errors, help and documentation [22].

It was also assessed whether the dental programs had protection and datum /information preservation resources. According to Silva and Stein [27], these resources may be summarized such as protection against the non-authorized use or access to the information, as well as the protection against the denial of service to authorized users, while the integrity and the confidentiality of this information are preserved.

Also, the price of the programs was assessed, which would help the dentist to evaluate the cost-benefit ratio.

Results

The results obtained by analyzing the functionalities indicated that, regarding to the essential items; 87.5% of the softwares analyzed showed the item of professional identification, 87.5% showed the patient identification; in all softwares the anamnesis form was present; 75% exhibited the item of clinical examination; 75% of the item treatment planing; and in 12.5% of the softwares it was seen the item treatment evolution and interurrences.

Concerning to the additional items, 12.5% of the softwares showed prescriptions; 25% had certificates; none software showed the contract of allocation of dental services; and all e softwares showed the item and complementary examinations.

The results obtained with the functionality analysis are shown in tables I and II.

Table I contains the percentage values reached by all the softwares analyzed regarding to the mandatory items.

Table I - Percentage of the mandatory items showed in the softwares

Software	Mandatory items
Easy Dental	83.33%
Dental Clinic	50.00%
Dental Office	83.33%
Dental Soft	83.33%
DocViewer Plus	33.33%
Odontologia Manager	83.33%
Open Dental	83.33%
Total Clinic Odontológico	83.33%

Table II presents the percentage values reached by all the softwares assessed regarding to the additional items.

Table II - Percentage of the additional items showed in the softwares

Software	Additional items
Easy Dental	25.00%
Dental Clinic	25.00%
Dental Office	50.00%
Dental Soft	25.00%
DocViewer Plus	25.00%
Odontologia Manager	50.00%
Open Dental	25.00%
Total Clinic Odontológico	50.00%

The analysis performed regarding to the safe items revealed that 75% exhibited any tool for the control of the access to the software, either through the user's name, password or biometric reader; 75% had the backup resource (safe copy) of the data; and 25% had the auditing item (resource that records all what had been used or performed in the software).

Table III shows which safe resources the softwares demonstrated.

Table III - Verification of the existence of the safe items of the softwares

Software	Access through password	Backup	Auditing
Easy Dental	X	X	X
Dental Clinic	X	-	-
Dental Office	X	X	X
Dental Soft	X	X	-
DocViewer Plus	-	-	-
Odontologia Manager	-	X	-
Open Dental	X	X	-
Total Clinic Odontológico	X	X	-

Concerning to the interface analysis of the softwares, 75% positively corresponded to at least half of the heuristics proposed by.

Table IV - Heuristic evaluation of the software interface

Software	Heuristics
Easy Dental	60.00%
Dental Clinic	50.00%
Dental Office	80.00%
Dental Soft	50.00%
DocViewer Plus	50.00%
Odontologia Manager	20.00%
Open Dental	20.00%
Total Clinic Odontológico	80.00%

The verification of the cost of the softwares showed that the price mean per year of the paid softwares was of R\$ 576.96. It was also verified that 40% of the softwares exhibited a membership fee, which ranged from R\$ 50.00 to R\$ 100.00.

Table V - Verification of the cost of the softwares to analyze the presence of the membership and license per year fee

Software	Membership fee	Cost (R\$)
Easy Dental	No	Yes
Dental Clinic	No	Yes
Dental Office	Yes	Yes
Dental Soft	Yes	Yes
DocViewer Plus	No	No
Odontologia Manager	No	No
Open Dental	No	No
Total Clinic Odontológico	No	Yes

Discussion

The items according to the dental record proposed by the Brazilian Federal Board of Dentistry are divided into mandatory (identification of the

professional, identification of the patient, anamnesis, clinical examination, treatment planning, treatment evolution and intercurrents: items comprising the clinical file) and additional (prescriptions, certificates, contract of allocation of dental services and complementary examinations) [2].

Concerning to the identification of the professional, according to the Brazilian Dentistry Code of Ethics [9], it is mandatory that all forms contain the name and registration number of the dentist (in the Regional Council of Dentistry), as well as the name representing the dentist profession. Corroborating this, 87.5% of the softwares analyzed presented this item. The identification of the patient is also important not only because it enables to know who he/she is and how to find him/her, but also because it enables detailed information about her/him (age, gender, address, nationality, occupation etc.) [14]. Similarly, 87.5% of the softwares exhibited the identification of the patient. Through the anamnesis, it is possible to identify the chronic diseases that will require specific care and that can interfere in dental treatment [25]. These items showed by most of the softwares are, therefore, of extreme relevance in the dental file. All softwares had the anamnesis record.

Still as an integrating part of the dental record, the clinical examination is divided into anamnesis and physical examination. The clinical examination is also divided into the intra- and extraoral examination. In the intraoral examination, there is the dental chart and the evaluation of the oral tissues. Briño [6] defines the dental chart as the graphic and detailed representation of the normal anatomical characteristics, pathological particularities, prosthetic particularities, anomalies, habits and the treatments performed by the dentist in an attempt to restore the tooth loss, which ultimately makes easier to identify one person from another. The dental chart was present in 87.5% of the softwares.

The evolution and the treatment intercurrents which comprised the patient history are also within the clinical record [2]. Concerning to the civil and criminal implications of the clinical form, Calvielli and Silva [7] recommended that it should contain the oral state of the patient prior to the treatment and the complete records of the treatment performed. Unlikely, 87.5 % of the softwares analyzed did not show this item.

Concerning to the item treatment plan, 25% of the softwares did not exhibit it. The non-inclusion of this item may cause ethical-legal problems to the dentist because the Brazilian Code of Consumer Protection and the Brazilian Dentistry Code of Ethics demand that the all the treatment options

be showed to the patient [21]. According to Gomes *et al.* [12], the treatment planing should obligatorily include the several treatment options of that determined case.

Concerning to the prescriptions, they were present in 12.5% of the softwares analyzed. The prescription is a dental-legal document and its copy should be attached to the file of the patient [28].

About the dental certificates, Silva [28] highlighted the importance of their correct elaboration because they are also legal documents. The certificate is the document most executed by the dentist. It is constituted by the following elements: the professional, the patient, their identification, the dental fact, and the consequences of this fact [13]. The certificate was present in only 25% of the softwares. Such fact is justified in the study of Almeida *et al.* [2], because it is difficult to construct models for all the situations demanding specific readings. However, this is not applied to the softwares, because if all the information of the patient and the dentist is within their database, this is able to generate specific certificates (military, education or labor) and automatically insert these data.

Concerning to the contract of allocation of dental services, Melani and Silva [19] affirmed that “the contract between the dentist and the patient should not be written, could be verbally and even implicit”. However, because of the increasing in the number of processes involving the patient [26], it is important to document these contracts. The mandatory and additional items showed by the Brazilian Federal Board of Dentistry aim the regulation and maintenance of the dentist-patient relationship. The article 594 of the Brazilian Civil Code claims that “all service or licit, material, or immaterial work can be contracted through payment” [5]. The aforementioned contract should be freely signed between the dentist and the patient and it is valid as rule of law between them, authorizing the contractor to seek justice in compliance with the obligation not fulfilled by the contractor [4]. The contract item was not present in none of the softwares analyzed.

Concerning to the complementary examinations, Guerra [13] affirmed that radiographs, models, laboratorial examinations should be correctly processed for its use and durability, identified and attached to the file of the patient. Corroborating this, all analyzed softwares showed resources for the storage of the complementary examinations.

By analyzing the interface of the softwares, it was found that most met at least 50% of the Nielsen heuristics. The interface is the key point of the

software product success. A user-friendly interface provides the user a pleasant environment and leads the user to the sensation that the product is of easy handling. To provide this sensation, some items such as the intuitive and little polluted interface influence on the product acceptance [15, 24, 30].

An intuitive interface makes easy the user interaction with the software, leading to the easily localization and use of the software resources.

To evaluate the interface of the dental softwares the Nielsen heuristics describing the main characteristics of a usable interface were used. The list can be seen in table VI.

Table VI - Version of the Nielsen heuristics [22]

Visibility of the system status	The system needs to maintain the users informed on what is happening, providing an appropriate <i>feedback</i> within a reasonable time
System compatibility with the real world	The system needs to speak the user's language, by using words, phrases and concepts familiar to the user, instead of terms oriented to the system. To follow the conventions of the real world, making that the information appears in the natural and logic order
User control and freedom	Users frequently chose mistakenly functions of the system and they need to have clear emergency exits to leave the undesirable state without having to course an extensive dialogue
Consistency and standards	Users did not need to guess which different words, situations or actions mean the same thing. To follow the conventions of a computing platform
Prevention of errors	Better than a good message is a carefully design preventing the error before it happens
Recognition instead of Remembrance	Make objects, actions and options visible. The user should not have to remember the information from one to another part of the dialogue. Instructions for the system use should be visible and easily recoverable whenever necessary

Flexibility and use efficiency	New users become experts with the use. Provide accelerators in order to increase the interaction velocity. To enable the a experienced users "cut corners" in common shares
Minimalist design and aesthetics	Dialogues should not contain irrelevant or rarely necessary information. Any extra information unity in the dialogue will compete with relevant information units and decrease its relative visibility
To help the users to recognize, diagnose and correct the errors	Error messages should be expressed in plain language (no codes) indicating precisely the problem and constructively suggest a solution
Help and documentation	Although it is better to have a system that can be used without documentation, it is necessary to provide help and documentation. This information should be easy to find, focused on the user's task and not very extensive

Although the software has user-friendly interface, it is necessary that the information entrusted to it are stored safely or that it can be retrieved at any time if a problem occurs in the system, since the dental records must be kept for all the patient's or dentist's life and served as evidence in cases of lawsuits against dentists [2, 8]. Therefore, the information security of the software is essential because it configures in maintaining the confidentiality and integrity of the information from both the company and the users, and its absence implies in risks of data loss, data leakage or misuse [1, 16, 18].

Concerning to the safe of the softwares, 87.5% of the products analyzed showed any resource of protection of data access. However, of these, only 28.57% has all the items evaluated. Once the data are vulnerable to an increase number of threats [1, 16, 18], it is important that the softwares had at least three of the safe items analyzed.

Concerning to the cost analysis of the softwares, it was noted a good cost-benefit ratio, enabling their acquisition by the dentist. According to the study of Morita *et al.* [20], it was found that in 2007, 67% of the Brazilian dentists submitted to the Federal Revenue an annual income estimated between R\$ 12,000.00 and R\$ 48,000.00. Thus, the annual costs of the software licenses are financially accessible to these professional.

Conclusion

Most of the softwares evaluated showed deficiencies regarding to the safe and functionality criteria, but they had a user-friendly interface and accessible prices.

References

1. Albuquerque R, Ribeiro B. Segurança no desenvolvimento de software – como desenvolver sistemas seguros e avaliar a segurança de aplicações desenvolvidas com base na ISO 15.408. Rio de Janeiro: Campus; 2002.
2. Almeida CAP, Zimmermann RD, Cerveira JGV, Julivaldo FSN. Prontuário odontológico – uma orientação para o cumprimento da exigência contida no inciso VIII do art. 5.º do Código de Ética Odontológica. Rio de Janeiro: CFO; 2004.
3. Barbosa SDJ, Silva BS. Interação humano-computador. Rio de Janeiro: Elsevier; 2010.
4. Bittar, CA. Responsabilidade civil médica, odontológica e hospitalar. São Paulo: Saraiva; 1991.
5. Brasil. Novo Código Civil: Lei n. 10.406/2002. Diário Oficial da União, Brasília, DF, 10 jan. 2002.
6. Briño EN. Odontologia legal y práctica forense. Buenos Aires: Purinzon; 1982.
7. Calvielli I, Silva M. Aspectos éticos e legais do exercício da Odontologia. In: Paiva JG, Antoniazzi JH. Endodontia: bases para a prática clínica. 2. ed. São Paulo: Artes Médicas; 1988.
8. Cerveira JGV. A legalidade dos documentos digitais. Odontol Clín Científ. 2008 Oct-Dec;7(4):299-302.
9. Conselho Federal de Odontologia. Código de Ética Odontológica. Rio de Janeiro: CFO; 2003.
10. Correia ARM, Matos CRC, Pinto ALM, Filipe MJM, Costa PMFV. Informática odontológica: uma disciplina emergente. Odonto Ciênc. 2008 Oct-Dec;23(4):397-402.
11. Dotta EAV, Teles GHP. Sistemas aplicativos para uso odontológico. RGO. 2003 Apr-Jun; 51(2):119-22.
12. Gomes MA, Candelária LF de A, Silva M. Aspectos legais da prevenção das doenças bucais em relação à documentação profissional. RBO. 1997 Jan-Feb;19(1):18-28.

13. Guerra RC. Importância da documentação odonto-legal na prática clínica. CRO notícias. 1997.
14. Guimarães E, Cariello A, Almeida CAP. Prontuário odontológico: uma orientação para cumprimento da exigência contida no inciso VI do art. 4.º do Código de Ética Odontológica. Conselho Federal de Odontologia; 1994. 20 p.
15. Kafure I, Cunha M. Usabilidade em ferramentas tecnológicas para o acesso à informação. Revista ACB. 2006 Aug-Dec;11(2):273-82.
16. Krause M, Tipton HF. Handbook of information security management. Boca Raton: Auerbach Publications; 1999.
17. Laudon KC, Laudon JP. Sistemas de informação. Rio de Janeiro: LTC; 1999.
18. Laureano MAP, Moraes PES. Segurança como estratégia de gestão da informação. Economia & Tecnologia. 2005;8(3):38-44.
19. Melani RFH, Silva RD. A relação profissional-paciente. O entendimento e implicações legais que se estabelecem durante o tratamento ortodôntico. Rev Dental Press Ortodon Ortop Facial. 2006 Nov-Dec;11(6):104-13.
20. Morita MC, Haddad AE, Araújo ME. Perfil atual e tendências do cirurgião-dentista brasileiro. Dental Press Int. 2010.
21. Németh G, Paula LM, Varella MA, Angeletti P. Prontuário odontológico na clínica de cursos de Odontologia. ABENO. 2001;1(1):77-81.
22. Nielsen J. Usability engineering. Cambridge: Academic Press; 1993.
23. Nielsen J. Usability inspection methods. New York: Wiley; 1994.
24. Oddone N, Meirelles R. O portal de periódicos da CAPES e os indicadores de desempenho da informação eletrônica. DataGramaZero. 2006 Jun;7(3).
25. Romano E. Sinais de alerta. J CROSP. 2000 Dec;94(1):3-5.
26. Rosa FB. Dentista versus paciente ortodôntico: levantamento de problemas jurídicos nas últimas três décadas. J Bras Ortodon Ortop Maxilar. 1998;3(13):60-76.
27. Silva DRP da S, Stein LM. Segurança da informação: uma reflexão sobre o componente humano. Ciências & Cognição. 2007;10:46-53.
28. Silva M. Compêndio de Odontologia Legal. Rio de Janeiro: Medsi; 1997.
29. Shleyer TKL, Spallek H. Dental informatics. J Am Dent Ass. 2001 May;132(5):605-13.
30. Zem-Mascarenhas SH, Cassiani SHB. Desenvolvimento e avaliação de um software para o ensino de enfermagem pediátrica. Rev Latino-Am Enferm. 2001 Nov-Dec;5(6):13-8.