TheATLAS

Comparative Quality Evaluation of Internet Banking Applications Case Study of Three Romanian Banks

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This paper constitutes the initial experiments with the WebQEM[1] method applied to the Internet banking applications of three renowned Romanian banks, for the purpose of the comparative evaluation of their quality. The first part comprises a statement of purpose and objectives, after which we succinctly highlight some reference points in the context of the research. The WebQEM method is then adapted to our purpose. We continue by presenting the application phases, and the procedures and algorithms used within this method. The following sections describe the experiment in detail: the conditions, the experimentation methodology and the results, as well as the findings and the conclusions. The work method presented in this paper is currently perfected for use in a much larger and more complex study, dedicated to the Internet banking applications of a target number of 26 Romanian banks; the study will be published by Lambert Academic Publishing. At a later stage, our intention is to improve the comparative evaluation method in the context of valuing the benefits brought by the methodology of transdisciplinarity.

Keywords: internet banking, WebQEM method, ergonomics, usability of software applications, methodology of transdisciplinarity.

1 Introduction

Electronic remote-access financial solutions have become a daily need for millions of users around the world. Quality design for a financial software application intended for the general public is very complex and not an easy thing to do. Multiple issues need to be considered, such as an efficient navigation structure, pleasant appearance, ease of use, etc.

For a wider target audience in the design and development of such applications, a number of additional aspects must also be considered related to the characteristics of different types of customers these applications must service (for instance, users who have PCs with monitors of a specific resolution; unstable Internet connections; some obsolete equipment; different types of Internet browsers etc).

Although in theory the notion of "universal-use software application" exists, translating this concept into practice is and will be a challenge for all the

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[1]WebQEM is a method of quantitative evaluation and comparison of website quality, developed between 1998 and 2000 by a group of researchers from the National University of La Pampa in Argentina, led by Professor Luis Olsina.

developers of software applications in general, and for the developers of finance-banking applications in particular [1].

The goal of this study is to develop an efficient "modus operandi" for the quality evaluation of electronic remote-access financial solutions and the objectives are:

- To identify a minimal set of necessary criteria for the evaluation of electronic remote-access financial solutions in terms of ergonomics and usability;

- To adapt the WebQEM method (for website quality evaluation) to the requirements of the process of evaluation of electronic remote-access financial solutions;

- To apply the adapted formula of the WebQEM method to a number of three Internet banking solutions present on the specific Romanian market (BT 24; BRD Net; and Raiffeisen Online);

- To formulate a set of concrete suggestions that would be useful for the professional development of electronic remote-access financial solutions on the specific Romanian market.

2 Context for Case Study

Most studies conducted to date on Romanian electronic remote-access financial solutions by different stakeholders in this field (forums in the communications and banking area, representatives of various financial institutions and banks, the media, educational and research institutions etc) are limited not only in numbers, but also in terms of scientific content and substance.

Such aforementioned stakeholders mainly confined their analyses to comparative statistical data pertaining to issues such as: the number of users, the number and volume of operations with the analyzed applications, or the costs involved, while showing less interest in issues related to the ergonomics and usability of such systems.

In the context that quite recent studies conducted by professionals in this field show that the number of customers of electronic remote-access financial solutions depends more on the development of new and better services than on lower prices for their supply, we can say that the approach to the study, i.e.

the analysis, made by the aforementioned interested parties is incorrect.

However, based on the bibliographic documentation done during the preparation of this paper, we can include in the "similar achievements" category a series of analytical endeavors that touch tangentially upon the issues to address here, namely:

- The study conducted in 2007 by TreeWorks[2], which aimed to analyze the online presence of Romanian banking institutions, emphasizing the manners in which they use the Internet to promote their offers[3];

- Diploma thesis – Avantajul Competitiv n Serviciile Internaionale de Internet (Competitive Advantage in International Internet Services) [2];

- Master's thesis - Studiu comparativ al serviciilor de Internet-Banking în contextul dinamicii pieei de profil din România (Comparative Study of Internet Banking Services in the Context of the Dynamics of the Specific Romanian Market) [3];

- Article in "Ghieul Bancar" ("Bank Counter"): "Ce bănci mizează pe Internet Banking" ("Which Banks Stake on Internet Banking")[4];

- Article in "Ghieul Bancar": "Tot mai muli utilizatori de Internet Banking" ("More and More Internet Banking users")[5];

- Web article: Banca Comercială Română are cel mai bun serviciu de Internet banking (Banca Comerciala Romana has the Best Internet Banking Service)[6];

- Web article: Soluiile eBanking din Romnia (Romanian eBanking Solutions)[7].

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[2]TreeWorks is a company specialized in developing web-based communication and interactive solutions. TreeWorks was founded in 2002, and has developed so far more than 100 projects for domestic and international (US, Japan) clients, many of which are extremely complex.

[3]http://www.baniinostri.ro/stiri/stiri.php?ContentID=10298, last accessed November 11, 2012.

[4]http://www.ghiseulbancar.ro/articole/54/1102/Ce_banci_mizeaza_pe_internet_banking.htm, last accessed November 12, 2012.

[5]http://www.ghiseulbancar.ro/articole/7/4724/Tot_mai_multi_utilizatori_de_internet_banking.htm, last accessed November 12, 2012.

[6]http://www.9am.ro/stiri-revista-presei/Business/12085/Banca-Comerciala-Romana-are-cel-mai-bun-serviciu-de-Internet-banking, last accessed November 11, 2012.

[7]Source: http://www.ebanker.ro/Despre_noi.aspx, last ac-

3 Premises of the Case Study

3.1 Presentation of the WebQEM Method [4]

WebQEM is a method of quantitative evaluation and comparison of website quality, developed between 1998 and 2000 by a group of researchers from the National University of La Pampa in Argentina, led by Professor Luis Olsina [5]. The method has adapted the ISO 9126 quality model and the ISO 14598 evaluation process to websites, and comprises four closely correlated phases:

1. Defining and specifying the quality requirements;

2. Basic evaluation;

3. Global assessment;

4. Analyzing and documenting the results, and drawing the conclusions.

3.2 Conditions for the Experiment and Experimentation Methodology

After the prior study of some specialized papers on the same subject (WebQEM method experimentation) [4], for the purpose of acquiring the investigation means, experiment objectives, WebQEM concepts and procedures, the evaluation process specific to the above-mentioned method was applied to a number of three Internet banking services in the portfolio of some banks that we consider representative for the specific Romanian market. The three banks are:

1. Banca Transilvania

2. Banca Romn de Dezvoltare (BRD - Groupe Societe Generale)

3. Raiffeisen Bank

The choice of the above-mentioned banks for this study was based on several considerations related to the fact that all three banks:

- Belong to the category of major banking players in the Romanian retail banking sector;

- Have a tradition of supplying Internet banking services in Romania (BRD Net was launched

onto the market on September 1, 2004[8] ; Banca Transilvania and Raiffeisen Bank have provided Internet banking services since 2002);

- Are among the only 5 banks in the top 10 Romanian banks that provide a demo Internet banking account[9];

- Obtained close scores in usability evaluations conducted so far[10] (average scores obtained: Raiffeisen Bank – 7.38; BRD – 6.23; Banca Transilvania 6.53);

- Have client portfolios of comparable size in the Internet banking sector[11].

The experiment was conducted over one week, and involved the use of multiple investigation means, such as: content analyses, comparative analyses, direct testing (banking operations, queries, reports), and performance monitoring over different time intervals/on different days of the week.

In order to collect the data, we compiled lists of criteria that include both the definition of criteria, and a number of additional explanations (related to criteria significance), where required. The outcomes of observations have resulted in the assigning – for each considered criterion of a score (between 0 and 100), a Yes/No response, and an evaluation, which were summarized in an enclosed list.

3.3 Data Collection

The evaluation form includes:

- Tree structure of features, sub-features, and measurable attributes;

- The type de response expected by the evaluator:

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cessed November 13, 2012.

[8]http://www.bizwords.ro/stiri/povesti_de_success/1133/ Internet-Banking-tranzactii-din-fotoliul-de-acasa.html, last accessed November 18, 2012.

[9]http://www.ghiseulbancar.ro/articole/7/5705/Studiu_priv ind_serviciile_de_e-banking.htm, accessed: November 12, 2012.

[10]http://www.ghiseulbancar.ro/articole/7/5705/Studiu_priv ind_serviciile_de_e-banking.htm, accessed: November 12, 2012.

[11]http://www.ghiseulbancar.ro/articole/5/4772/Un_milion_ de_clienti_principalul_obiectiv_al.htm, accessed: November 12, 2012. http://www.efinance.ro/articol.php?id _revista=200704&id_sectiune=especial&ordine_sectiune=1, accessed: November 15, 2012; and http://www.comunic.ro /article.php/10000_de_clien%C5%A3i_BRD_Net/1534/, accessed: November 15, 2012.

– A score on a scale of 0 to 100, which represents the assessment of the measured attribute;

– Yes/No evaluation, which indicates whether the measured attribute satisfies/does not satisfy the requirement;

– A value chosen from a list, which indicates the degree to which the requirement is satisfied.

Evaluation was performed by individual observation / inspection / monitoring of the applications and by filling in the evaluation form according to the outcomes of observations. Data was collected manually, due to the numerous Yes/No questions, which involve visual inspection; furthermore, in the case of the attributes measurable directly by a preference criterion, the only way to obtain an assessment was the judgment of the evaluator.

The collected data were summarized and analyzed in a Microsoft Excel document, and the WebQEM method was applied to all the collected values.

4 Stages of the Case Study

In order to quantitatively and qualitatively evaluate and compare the Internet banking applications, we went through each of the 4 phases of the WebQEM method.

4.1 Defining and Specifying the Quality Requirements

In this stage, we created, the tree structure of the features, sub-features, and measurable attributes, called "Specification of quality requirements" [2]. For the creation of such specification, we considered the following quality features: usability, functionality, reliability, efficiency, and security (Table 1).

4.2 Basic Evaluation

Establishing the elementary criteria: Each quantifiable attribute is associated a variable X_i, which can receive a real value through an elementary function [4]. The final result is the transposition of the value of the function into a quality elementary preference Eqi, which can take values in the interval (0,1).

The EQ_i values are interpreted as follows:

- $EQ_i = 0$, when X_i does not satisfy the requirement;

- $EQ_i = 1$, when X_i satisfies the requirement;

- $0 \leq EQ_i \leq 1$, when X_i partially satisfies the requirement.

This article only gives the criteria established for usability (Table 2). We established criteria in a similar way for:

- Functionality

- Reliability

- Efficiency

- Security

Applying the calculus formulas for the measurable attributes: The partial results of the elementary preferences for the five features are given in Tables 3, 4, 5, 6, and 7.

4.3 Global Assessment

Logical aggregation of elementary preferences: The aggregation method used in the experiment consisted of the LSP (Logic Scoring of Preference[12]) model and the CLP (Continuous Logic Preference) operators.

In the process of global preference aggregation, the importance weights of the five features taken into account (usability, functionality, reliability, efficiency, and security) were determined by the evaluator based on a number of considerations, such as:

- The direct dependence between the level of usage, and the quality and manner of implementation of an Internet banking service. Consequently, the "usability" feature was given the highest weight (0.3);

- The importance of the security of the Internet banking systems for the customers' decision to buy / use. Consequently, the "security" feature was assigned the second largest weight (0.2);

- The increasing requirements of users in terms of the wide range of functions that the Internet banking applications must offer. Consequently, the "functionality" feature was assigned a weight equal to that of the "security" feature (0.2);

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[12]http://www.cs.auckland.ac.nz/ emilia/publications/ICWE2005LSP.pdf, accessed: November 17, 2012.
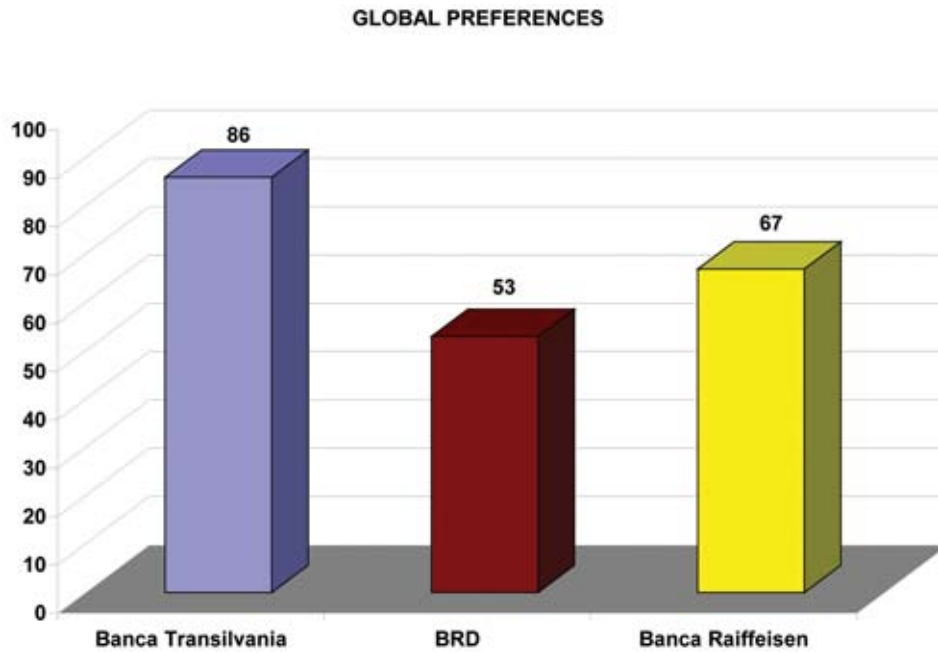
GLOBAL PREFERENCES

Figure 1: Global preferences of internet banking applications.

- The findings of the three years of experience in the field about the relatively low importance attached by clients to the aspects included in the categories of the "efficiency" and "reliability" features. Consequently, these two features were assigned a lower weight (0.15).

Calculation of partial and global quality preferences: Once the process of aggregation was finalized and the global scheme was obtained, the partial and global indicators were calculated for each Internet banking application analyzed using the formula:

$$e_0 = (W_1 E_1^r + ... + W_r E_k^r)^{1/r}, \quad W_1 + ... + W_k = 1$$

where

e_0 partial preference.
W weight of a certain attribute.
E elementary preference of an attribute.
k number of attributes in the aggregation block.
r conjunctive/disjunctive factor of the aggregation block[13].

The obtained results are given in Table 8. During the three previous phases, we recorded all the results

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[13]http://www.cs.auckland.ac.nz/ emilia/publications/ICWE2 005LSP.pdf, last accessed October 25, 2012, and http://gidis.ing.unlpam.edu.ar/downloads/pdfs/Olsina_ NRHM.pdf, accessed: October 25, 2012.

of evaluations and calculations, and now we are moving on to the analysis and interpretation of such results, and the drawing of the conclusions.

5 Results of the Case Study

Based on the obtained results, we will now present the findings, and draw the conclusions.

5.1 GLOBAL Feature

The final evaluation of the obtained quality features is given in Table 9, and the global values obtained for each of the three Internet banking applications are shown in the graph in Figure 1.

The analysis of the evaluation results shows that:

- Banca Transilvania's BT 24 application obtained high scores for all the 5 features considered (between 65.57 and 99.09

- Raiffeisen Bank's application obtained satisfactory scores for all the 5 features considered (between 16.86 and 97

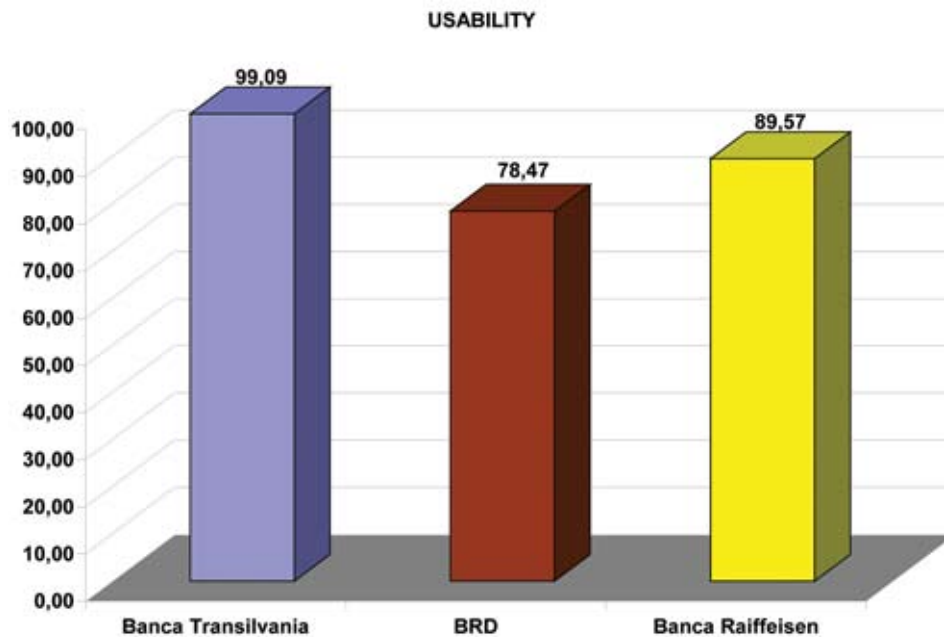- The BRD Net application obtained variable scores (between 6.86 and 89.31

Figure 2: Results obtained by the usability feature.

5.2 USABILITY Feature

The results obtained by the Usability feature in the case of each of the Internet banking applications are given in the graph in Figure 2.

Banca Transilvania's Internet banking application, BT 24, stands out in terms of usability, since it includes a number of additional elements as compared to the other two applications that were analyzed. Some of them are: contextual help, downloadable user's manual, balance report, and the wide range of communication channels available for the clients in order to keep in touch with the specific department.

Raiffeisen Bank's application also obtains a good usability score, since it stands out, despite the above-mentioned deficiencies, by a report option that is very useful to clients (i.e. the contracted loan report), report which is not present on the platforms of the other analyzed applications.

As compared to Raiffeisen Bank's application, the BRD Net application adds the order status report to its own list of deficiencies; it is the only application (among the analyzed ones) that does not provide such feature.

5.3 FUNCTIONALITY Feature

The results obtained by the Functionality feature in the case of each of the Internet banking applications are given in the graph in Figure 3.

In terms of functionality, the results of the applications that also obtained good scores on the previous criterion (usability) are very close. Nevertheless, both Banca Transilvania, and Raiffeisen Bank still need to improve some of the aspects (ex: BT 24 should introduce the recurrent payment option, while Raiffeisen Bank should introduce the order import option).

The deficiencies of the BRD Net application in this area refer to aspects such as: liquidation of savings accounts, order import, and recurrent payments.

5.4 RELIABILITY Feature

The results obtained by the Reliability feature in the case of each of the Internet banking applications are given in the graph in Figure 4.

Banca Transilvania's application, BT 24, obtained the highest reliability score; the only important aspect that this application fails to satisfy in this area (of the considered aspects) is the fact that the only browser the application runs on is Internet Explorer.

Although the BRD Net application obtained a good score in this area, one of its deficiencies is the fact that some of the web nodes present on its platform are non-answering, or their response is determined by the existence or absence of some settings / specific programs.
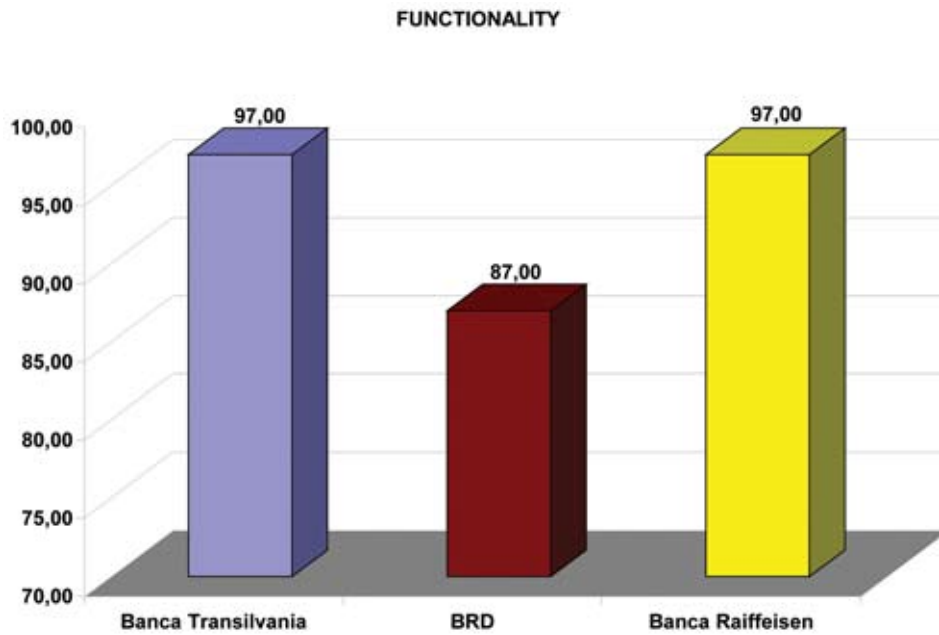
FUNCTIONALITY

Figure 3: Results obtained by the functionality feature.
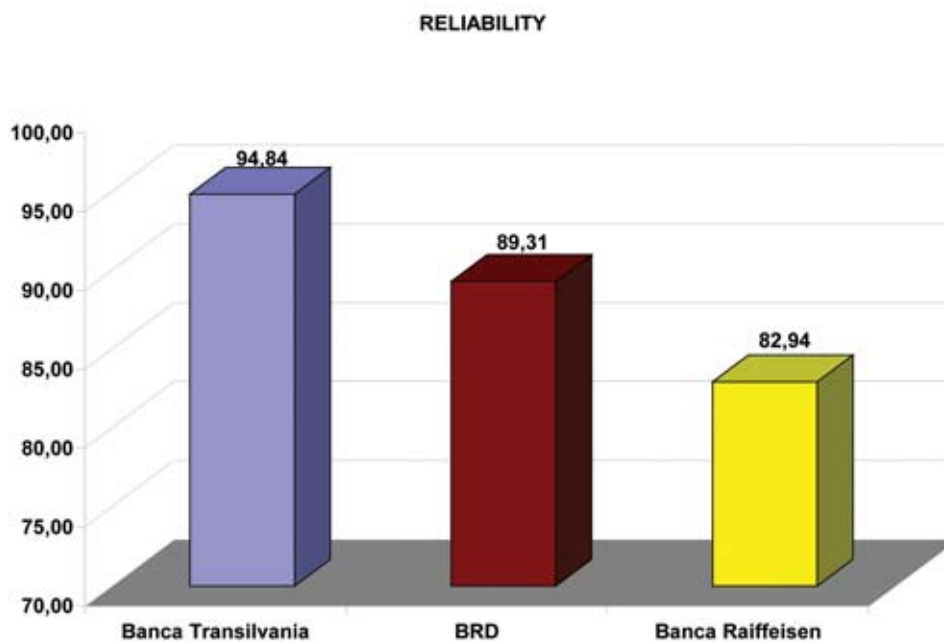
RELIABILITY

Figure 4: Results obtained by the reliability feature.

Raiffeisen Bank's application also shows similar deficiencies; a compelling example is the application's demonstrative section, which cannot be accessed unless Macromedia Flash Player is installed on the client's PC. In terms of the reliability of Raiffeisen Bank's application, we should also mention the less efficient display of the application's menu and links, which allows cases of isolated links to occur.

5.5 EFFICIENCY Feature

The results obtained by the Efficiency feature in the case of each of the Internet banking applications are given in Figure 5.

In terms of efficiency, Raiffeisen Bank's applica-

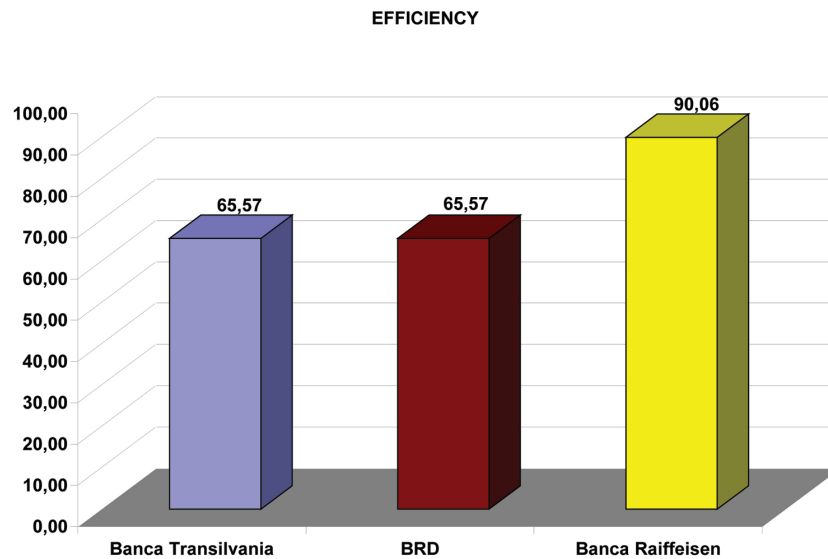**Figure 5:** Results obtained by the efficiency feature.
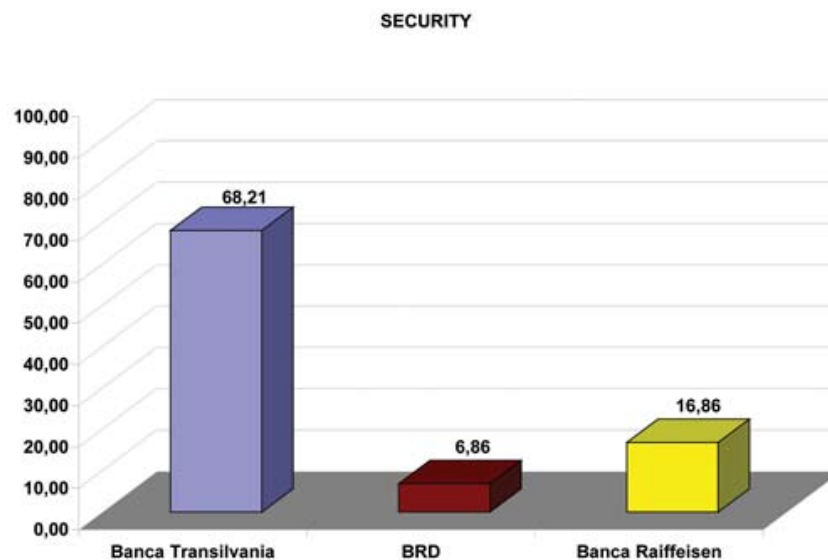
Figure 6: Results obtained by the security feature.

tion is the undisputed leader; the very high score it obtained in this area is mainly due to the fact that the update frequency of order processing and balance information is very high, since all such updates are practically performed online, which is not the case with the other two applications analyzed. Nevertheless, in the case of all the analyzed applications there is room for some improvement in this area in terms of the number of clicks needed to send an order to the bank.

5.6 SECURITY Feature

The results obtained by the Security feature in the case of each of the Internet banking applications are given in Figure 6.

Banca Transilvania's application, BT 24, stands out in the security area through a carefully developed procedure of sending to the clients the confidential data required for access to the application, which the other two applications lack. As far as this aspect is concerned, BRD is a complete opposite, since there are cases when the confidential data required for

access to the BRD Net application is sent by e-mail, which is an extremely insecure channel.

In terms of security of access to the application, BT 24 ranks first again; this application has two levels of access security:

- 1st level, ensured by the digital authentication certificates;

- 2nd level, ensured by the user ID and password-based authentication.

However, digital authentication certificates also have disadvantages; the main disadvantage is that they can only be installed on Windows operating systems and Internet Explorer browsers, affecting the addressability of the solution.

Although Raiffeisen Bank's application has a similar structure, on two security levels, it has deficiencies in terms of security; thus, one of the authentication steps depends on data that can be easily lost by users (identification data of cards). The BRD Net application ranks last as far as this aspect is concerned, because it has only one security level, by user ID and Password.

6 Conclusion

Considering the research objectives, we can draw the following conclusions:

- The WebQEM method's applicability to the qualitative measurement and evaluation of Internet banking applications has been demonstrated;

- Based on the model of the criteria used within the WebQEM method, which was applied to the analyzed websites, we identified a minimal set of criteria necessary for the evaluation of Internet banking solutions (usability, functionality, reliability, efficiency, and security);

- We were able to adapt the WebQEM method to the requirements of the process of evaluation of Internet banking solutions by considering a number of parameters, whose numerical values were established according to the value intervals provided by the specialized literature. A possible source of error in the mentioned approach could be the lack of clear criteria for associating the blocks of the LSP (logic scoring

of preference) diagram and the value of the conjunctive/disjunctive factor of the aggregation block ("r").

Another conclusion of this study is that the analyzed banks still have deficiencies in their manner of keeping in touch with the clients who have subscribed to the Internet banking applications.

Consequently, the results of this study can be considered as a promising beginning for supporting the – quite difficult – process of developing methodologies specific to the financial and banking industry and necessary for an adequate evaluation of Internet banking solutions.

7 New Directions for Development

The new directions for the development of the three Internet banking applications analyzed could be the following:

- To improve access security;

- To eliminate the single points of failure;

- To route the client traffic between different locations and/ or geographical regions automatically and in a balanced manner;

- To increase the applications' number of functions;

- To improve the manner of keeping in touch with subscribers by creating some online video help-desk offices, since it has been proven that Internet banking services lack the so-called "human touch".

Therefore, the three Romanian banks could consider implementing some modern solutions for communicating with clients, solutions intended to minimize the above-mentioned deficiencies.

Last but not least, from our point of view, such a complex comparative analisys can be, at a later stage, considerably developed by adapting a new approach, based on the transdisciplinary methodology. This methodology "comprises three axioms: multiple Levels of Reality, knowledge as complex and emergent and the Logic of the Included Middle"[14]. In this

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[14]http://integralleadershipreview.com/1746-demystifying-transdisciplinary-ontology-multiple-levels-of-reality-and-the-hidden-third, accessed: November 17, 2012, Sue L. T. McGregor, Featured Article: Demystifying Transdisciplinary Ontology: Multiple Levels of Reality and the Hidden Third.

way, the analisys will be more accurate, with more benefits, because: "Transdisciplinarity complements disciplinary approaches. It occasions the emergence of new data and new interactions from out of the encounter between disciplines. It offers us a new vision of nature and reality. Transdisciplinarity does not strive for mastery of several disciplines but aims to open all disciplines to that which they share and to that which lies beyond them[15] .

References

[1] Gorgan, D., 2007, User Interface Design, Course Notes, The Technical University of Cluj-Napoca.

[2] Voiculescu, A., 2000, Avantajul Competitiv n Serviciile Internationale de Internet (Competitive Advantage in International Internet Services), Diploma Thesis, The Bucharest University of Economic Studies, Faculty of Commerce, Department of Tourism and Services.

[3] Cereche, D., 2006, Studiu comparativ al serviciilor de Internet-Banking în contextul dinamicii pieei de profil din România (Comparative Study of Internet Banking Services in the Context of the Dynamics of the Specific Romanian Market), Master's Thesis, Babeş-Bolyai University of Cluj-Napoca, Faculty of Business within Babe-Bolyai University of Cluj-Napoca.

[4] Donciulescu, A.D., Costache, I., and Lepadatu, C.; 2004, Evaluarea calităii site-urilor web (Website Quality Evaluation), Institutul Naional de Cercetare-Dezvoltare în Informatic (National Institute for Research & Development in Informatics), Bucharest

[5] Olsina, L. , 2000, Quantitative methodology for evaluation and comparison of web site quality, Doctoral Thesis, UNLP, La Plata, Argentina.

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[15]http://ciret-transdisciplinarity.org/chart.php, accessed: November 13, 2012, CHARTER OF TRANSDISCIPLINARITY (adopted at the First World Congress of Trandisciplinarity, Convento da Arrábida, Portugal, November 2-6, 1994), Editorial Committee: Lima de Freitas, Edgar Morin and Basarab Nicolescu.

Table 1: Specification of all the quality features.

1. USABILITY:	2.1.5 Establishment of savings accounts
	2.1.6 Liquidation of savings accounts
1.1 General presentation of the application	
1.1.1 Intro page (including the main links)	**2.2 Related features**
1.1.2 Commercial and informative pages	2.2.1 Multiple signature masks
1.1.3 Operational interface	2.2.2 Order import
1.2 Interface and esthetic appearance	2.2.3 Recurrent payments
1.2.1 Grouping coherence of main controls	2.2.4 Programmed payments
1.2.2 Presentation permanence and stability of main controls	2.2.5 Predefined orders
1.2.2.1 Permanence of direct controls	2.2.6 Export of statements of account
1.2.2.2 Permanence of indirect controls	2.2.7 Order printing
1.2.2.3 Stability	2.2.8 Password change
1.2.3 Esthetic preferences (including customization according to corporate identity)	2.2.9 Entering and saving new beneficiaries
1.2.4 Uniformity of style	
1.3 Feedback and help	**3. RELIABILITY:**
1.3.1.Quality of help components	**3.1 Nontechnical (context) errors**
1.3.1.1 Contextual Help	3.1.1 Link errors
1.3.1.2 Downloadable user's manual	3.1.1.1 Isolated links
1.3.2 Contact data list	3.1.1.2 Invalid links
1.3.2.1 E-mail addresses	3.1.1.3 Non-implemented links
1.3.2.2 Phone & Fax numbers (including Green Line)	3.1.2 Various errors and inconveniences
1.3.2.3 Postal address	3.1.2.1 Number of deficiencies or absent features due to browsers
1.3.3 Demo component	3.1.2.2 Number of site deficiencies or unexpected results, independent of browser
1.3.4 FAQ component	3.1.2.3 Number of non-answering web nodes
1.3.5 Contact form component	3.1.2.4 Eloquence of error messages
1.3.5.1 Contact form over secured communication channel	
1.3.5.2 Contact form over ordinary communication channel (e-mail)	**4. EFFICIENCY:**
1.3.6 Report component	**4.1 Information accessibility**
1.3.6.1 Order status report	4.1.1 Accessible format of specialized information
1.3.6.2 Order execution report	4.1.2 Update frequency of balance information
1.3.6.3 Balance report	4.1.3 Presence of operations / balances history
1.3.6.4 Statements of account	**4.2 Complexity of operating procedures**
1.3.6.5 Account movements	4.2.1 Number of clicks needed to send an order to the bank
1.3.6.6 Savings account report	4.2.2 Order form complexity
1.3.6.7 Contracted loan report	**4.3 Processing time for operations ordered by users**
1.3.7 Foreign language support	
	5. SECURITY:
2. FUNCTIONALITY:	
2.1 Types of operations	**5.1 Security of communication between the user's PC and the bank's server**
2.1.1 RON payments	5.1.1 Digital authentication certificates
2.1.2 Foreign currency payments	5.1.2 Token / digipass devices
2.1.3 Sale of foreign currencies	5.1.3 User ID and password-based authentication
2.1.4 Purchase of foreign currencies	**5.2 Security of sending confidential data required for access**

Table 2: Criteria established for usability.

Code	Elementary preference function	Formula
1.1.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.1.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.1.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.2.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.2.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.2.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.2.4	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.1.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.1.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.2.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.2.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.2.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.4	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.5.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.5.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.1	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.2	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.3	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.4	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.5	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.6	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.6.7	D = 0 (no), D = 1 (Yes)	X = 100 * D
1.3.7	Ni - no. of foreign languages supported Si - level of language support, [0,2 - minimum support, 1 - medium support, 2 - total support]	X = 30 * SUM(Si)*Ni, if X>100 => X=100

Table 3: Partial results for usability.

USABILITY	Banca Transilvania	BRD	Raiffeisen Bank
1.1.1 Intro page (including the main links)	100	100	100
1.1.2 Commercial and informative pages	100	100	100
1.1.3 Operational interface	100	100	100
1.2.1 Grouping coherence of main controls	100	100	100
1.2.2.1 Permanence of direct controls	100	100	100
1.2.2.2 Permanence of indirect controls	100	100	100
1.2.2.3 Stability	100	100	100
1.2.3 Esthetic preferences (including customization according to corporate identity)	100	100	100
1.2.4 Uniformity of style	100	100	100
1.3.1.1 Contextual Help	100	0	0
1.3.1.2 Downloadable user's manual	100	0	0
1.3.2.1 E-mail addresses	100	0	100
1.3.2.2 Phone & Fax numbers (including Green Line)	100	100	100
1.3.2.3 Postal address	100	0	0
1.3.3 Demo component	100	100	100
1.3.4 FAQ component	100	100	100
1.3.5.1 Contact form over secured communication channel	100	0	100
1.3.5.2 Contact form over ordinary communication channel (e-mail)	100	100	0
1.3.6.1 Order status report	100	0	100
1.3.6.2 Order execution report	100	100	100
1.3.6.3 Balance report	100	0	0
1.3.6.4 Statements of account	100	100	100
1.3.6.5 Account movements	100	100	100
1.3.6.6 Savings account report	100	100	100
1.3.6.7 Contracted loan report	0	0	100
1.3.7 Foreign language support	90	6	90

Table 4: Partial results for functionality.

FUNCTIONALITY	Banca Transilvania	BRD	Raiffeisen Bank
2.1.1 RON payments	100	100	100
2.1.2 Foreign currency payments	100	100	100
2.1.3 Sale of foreign currencies	100	100	100
2.1.4 Purchase of foreign currencies	100	100	100
2.1.5 Establishment of savings accounts	100	100	100
2.1.6 Liquidation of savings accounts	100	0	100
2.2.1 Multiple signature masks	100	100	100
2.2.2 Order import	100	0	0
2.2.3 Recurrent payments	0	0	100
2.2.4 Programmed payments	100	100	100
2.2.5 Predefined orders	100	100	100
2.2.6 Export of statements of account	100	100	100
2.2.7 Order printing	100	100	100
2.2.8 Password change	100	100	100
2.2.9 Entering and saving new beneficiaries	100	100	100

Table 5: Partial results for reliability.

RELIABILITY	Banca Transilvania	BRD	Raiffeisen Bank
3.1.1.1 Isolated links	100	100	50
3.1.1.2 Invalid links	100	100	100
3.1.1.3 Non-implemented links	100	100	100
3.1.2.1 Number of deficiencies or absent features due to browsers	50	50	50
3.1.2.2 Number of site deficiencies or unexpected results, independent of browser	100	100	100
3.1.2.3 Number of non-answering web nodes	100	50	100
3.1.2.4 Eloquence of error messages	100	100	100

Table 6: Partial results for efficiency.

EFFICIENCY	Banca Transilvania	BRD	Raiffeisen Bank
4.1.1 Accessible format of specialized information	100	100	100
4.1.2 Update frequency of balance information	50	50	100
4.1.3 Presence of operations / balances history	100	100	100
4.2.1 Number of clicks needed to send an order to the bank	50	50	50
4.2.2 Order form complexity	100	100	100
4.3 Processing time for operations ordered by users	50	50	100

Table 7: Partial results for security.

SECURITY	Banca Transilvania	BRD	Raiffeisen Bank
5.1.1 Digital authentication certificates	100	0	0
5.1.2 Token / digipass devices	0	0	0
5.1.3 User ID and password-based authentication	100	100	100
5.2 Security of sending confidential data required for access	100	0	50

Table 8: Results obtained for the Usability criterion.

Features / Sub-features	Partial and global preferences		
	Banca Transilvania	BRD	Raiffeisen Bank
1. USABILITY:	**99.09**	**78.47**	**89.57**
1.1 General presentation of the application	100.00	100.00	100.00
1.2 Interface and esthetic appearance	100.00	100.00	100.00
1.2.1 Grouping coherence of main controls	100.00	100.00	100.00
1.2.2 Presentation permanence and stability of main controls	100.00	100.00	100.00
1.2.3 Esthetic preferences (including customization according to corporate identity)	100.00	100.00	100.00
1.2.4 Uniformity of style	100.00	100.00	100.00
1.3 Feedback and help	97.00	42.28	68.55
1.3.1.Quality of help components	100.00	0.00	0.00
1.3.2 Contact data list	100.00	25.00	75.00
1.3.3 Demo component	100.00	100.00	100.00
1.3.4 FAQ component	100.00	100.00	100.00
1.3.5 Contact form component	100,00	46,84	65,52
1.3.6 Report component	90.00	60.00	90.00
1.3.7 Foreign language support	90.00	6.00	90.00
2. FUNCTIONALITY:	**97.00**	**87.00**	**97.00**
2.1 Types of operations	100.00	90.00	100.00
2.2 Related features	90.00	80.00	90.00
3. RELIABILITY:	**94.84**	**89.31**	**82.94**
3.1 Nontechnical (context) errors	94.84	89.31	82.94
3.1.1 Link errors	100.00	100.00	80.00
3.1.2 Various errors and inconveniences	87.50	75.00	87.50
4. EFFICIENCY:	**65.57**	**65.57**	**90.06**
4.1 Information accessibility	76.69	76.69	100.00
4.2 Complexity of operating procedures	71.60	71.60	71.60
4.3 Processing time for operations ordered by users	50.00	50.00	100.00
5. SECURITY:	**68.21**	**6.86**	**16.86**
5.1 Security of communication between the user's PC and the bank's server	60.26	8.58	8.58
5.2 Security of sending confidential data required for access	100.00	0.00	50.00
GLOBAL PREFERENCES	**86.00**	**53.00**	**67.00**

Table 9: Final evaluation.

Features / Sub-features	Partial and global preferences		
	Banca Transilvania	BRD	Raiffeisen Bank
1. USABILITY	**99.09**	**78.47**	**89.57**
2. FUNCTIONALITY	**97.00**	**87.00**	**97.00**
3. RELIABILITY	**94.84**	**89.31**	**82.94**
4. EFFICIENCY	**65.57**	**65.57**	**90.06**
5. SECURITY	**68.21**	**6.86**	**16.86**
GLOBAL PREFERENCES	**86.00**	**53.00**	**67.00**