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Evaluating E-Communities of Wireless Networks Worldwide

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Abstract: Many people communicate among themselves using wireless networks. They have developed e-communities in order to discuss issues about their network development, problems, opportunities, and wireless technology advances among others. The purpose of this paper is to present an evaluation framework and analyze the current status of such Electronic Communities of Wireless Networks (ECWNs) in four continents: Africa, America, Europe and Oceania. The evaluation framework contains fifty criteria categorized into four categories: 1) Usability, 2) Technical Characteristics, 3) Community's Commitment, and 4) Members' Commitment. Then, fifty-seven ECWNs were evaluated using these criteria. The results show that there are large differences among ECWNs with respect to the forum structure, archives accessibility, interactivity, services, members' commitment, participation and relationships. In most ECWNs, two major drawbacks are the lack of online forums and a newsletter service. Finally, suggestions are made in order to improve current ECWNs.

Keywords*:* commitment, community network, criteria, e-communities, evaluation, municipal network, municipal wireless, usability, Wi-Fi networks, wireless community.

1. INTRODUCTION

Currently, wireless networks have spread all over the world. Wireless networks could be used to provide various e-services such as mobile learning (Vasiliou & Economides, 2007) and mobile banking (Zarifopoulos & Economides, 2009). Using a wireless network protocol (e.g. IEEE 802.11x), antennas and web technology, people carrying wireless devices (Economides & Nikolaou, 2008) would communicate in a municipal or city-area (Gorp & Morris, 2008; Hampton & Gupta, 2008; Lawrence et al., 2007; Shankar, 2008; Szabo et al., 2007; Tapia et al., 2006). Such wireless networks first appeared in the late 1990s, when IEEE 802.11 devices became available to the public. Nowadays, they have spread in many cities all over the world.

People who use such wireless networks have created electronic communities on the Web where their members share ideas, experiences and suggestions about the improvement of their network, as well as other general issues. According to Leimeister et al. (2004) “A virtual community consists of people who interact together socially on a technical platform. The community is built on a common interest, a common problem or a common task of its members that is pursued on the basis of implicit and explicit codes of behavior. The technical platform enables and supports the community’s interaction and helps to build trust and a common feeling among the members”. The focus of this paper is on Electronic Communities of Wireless Networks (ECWNs). Members of wireless network communities are interested in developing their wireless network, learning advances on wireless network technology, exchanging ideas and experiences related to wireless networks, etc. Members of many wireless networks have created ECWNs websites. Some of these communities are very well organized, but others are still at a very early level of development. The purpose of this paper

is to evaluate the ECWNs' status in four continents (Africa, America, Europe and Oceania) by investigating their websites. After identifying their inefficiencies, suggestions were made for overcoming these drawbacks.

After extensive Internet search during 2006, fifty seven ECWNs were selected through multiple lists and information sources (e.g., Free Global Wireless Community, FreeNetworks, Municipal wireless network, Wikipedia, Wireless Communities). The websites that appeared in the majority of the lists and sources were chosen. One restriction was the language. It was decided to examine communities that use English as the communication language. The number of selected communities from each continent was representative of the total number of communities in this continent. So, six ECWNs were selected from Africa, twenty five from America, eleven from Europe, and fifteen from Oceania.

In section 2, a framework for evaluating e-communities is developed. In section 3, ECWNs in the four continents are evaluated according to the evaluation framework. Finally, conclusions are made regarding the strengths and limitations of ECWNs and future research suggestions are made.

2. PREVIOUS RESEARCH

In order to evaluate the ECWNs, an evaluation framework is needed. Next, previous studies on evaluation frameworks are presented. For each previous study, the corresponding criterion of our evaluation framework (Table) is given in parenthesis.

Gregson and Ford (1998) recommended that both quantitative and qualitative approaches should be considered in evaluating community networks. Also, the community network goals should be considered. Unruh et al. (2002) provided an evaluation framework for digital community information systems. They emphasized that information should be objective and

bias – free (Table: 3.1 Content). They also noted that the websites should support a wide range of access speeds and browsers (Table: 2.3 Openness). Koch et al. (2002a) showed how e – commerce can benefit from Internet communities. Communities' members provided all the needed personal data in order for suppliers to provide personalized offers to the members (Table1: 3.5 Services). Koch et al. (2002b) highlighted the importance of mobile access to the Internet. They underlined that the functionality of a community is based upon the participation of the largest part of its registered members (Table: 4.2 Participation). Borges and Baranauskas (2003) proposed ways to support the facilitator in e – learning communities. They emphasized on the interaction between all the members of a computer – based electronic environment. They supported that a facilitator (a user who initiates conversations) should motivate the other members to take part in the community's discussions (Table: 4.2 Participation). Leimeister et al. (2004) carried out a survey to identify the most important factors for an e-community's success, from the perspective of both the members and the communities' managers. According to members, handling their data sensitively was the most important factor (Table: 2.4 Security). Other important factors were the website's stability (Table: 2.1 Reliability & Maintainability), the frequent content updates (Table: 3.1 Content), the managers' appreciation of the members' contributions (Table: 3.4 Operators' Commitment) and the offerings to the members (Table: 3.5 Services). The most important factor according to the communities' operators was the wide participation (Table: 4 Members' Commitment). Mueller – Prothmann and Siedentopf (2003) explained the significance of usability for e–learning communities' success. Among other factors, they underlined the importance of the community website's easy navigation (Table: 1 Usability).

Preece et al. (2004) emphasized the significance of sociability and provided a usability/sociability heuristics table for online health support communities, from the members' perspective. Regarding the usability of an Internet community, they suggested

usable websites (Table: 1 Usability) with accessible archives (Table: 1.4 Archives Accessibility) that are available 24/7 (Table: 2.1 Reliability & Maintainability). Regarding the community's sociability, they suggested that the members are mostly in charge of the community and that the operators nurture every new member (Table: 3.4 Operators' Commitment). An e-community is considered successful when there is a wide participation of the members (Table: 4.1 Users' Commitment, 4.2 Participation). Li (2004) reviewed thirty – six (36) academic papers on Internet communities and noticed the similarities between the papers regarding the ways in which a community can evolve. Regarding the members' participation in the community, he noted that anyone could register in a community and thereinafter participate as frequently as he wants to. The community's moderators should sometimes initiate discussions in which every member can participate, so that there is no dominance in the discussions by some members (Table: 4.2 Participation). Lurkers (users who do not post messages but are known to read postings regularly) should be able to read the archived discussions without registering (Table: 1.4 Archives Accessibility). Finally, he pointed out that the most important reason to register in an e-community is the development of online friendships (Table: 4.3 Relationships). Sorensen and O Murchu (2004) investigated e – learning communities, and suggested that even users that are not technology – experts should be able to navigate through an Internet community and participate broadly in the community's matters (Table: 1.2 Navigability). They also suggested that the members should feel comfortable in an e-community (Table: 4.3 Relationships) in order to participate actively (Table: 4.2 Participation). Lambropoulos (2005a; 2005b) presented a usability and sociability evaluation criteria catalogue for Internet communities and stresses the fact that both usability and sociability are important for a community's success. She argued about the importance of communities' operators help and support towards the members (Table: 3.2 Support), the privacy of personal data (Table: 2.4 Security), the necessity of the members' participation

(Table: 4.1 Users' Commitment) and the significance of easily accessible communities' websites (Table: 1.1 User Interface, 1.3 Forum Structure). Schwabe and Prestipino (2005) conducted a research on travel communities' success factors and stated the critical ones. Regarding usability, they suggest easy – to – use and well – structured websites (Table: 1 Usability). Regarding commitment, they emphasized the significance of frequently updated and of high quality content (Table: 3.1 Content). Finally, they discussed about the importance of personalization in Internet communities (Table: 3.5 Services).

So, most previous studies consider only some evaluation criteria. However, a comprehensive evaluation framework is needed in order to evaluate the e-communities in a holistic way. Next, such an evaluation framework is developed and is used to evaluate fifty seven (57) ECWNs. The results show large differences among these communities. Suggestions are made for improvements.

3. EVALUATION FRAMEWORK

In this section, a new evaluation framework is developed based on the authors' experience on websites' design, development and evaluation, on discussions with colleagues and on previously published papers regarding Internet communities. This evaluation framework combines criteria from previous research with new ones. Four evaluation categories are considered in the framework: 1) Usability, 2) Technical Characteristics, 3) Community's Commitment, and 4) Members' Commitment. The first two categories are related to the website of the community, while the next two categories are related to the community itself and its members. Each category contains several subcategories and each subcategory includes several evaluation criteria (Table). Next, these categories, subcategories and criteria are presented.

3.1. Usability

The usability of a website refers to how effective, efficient and satisfying is the website for its visitors (Mueller – Prothmann & Siedentopf, 2003). The Usability category contains four subcategories: User Interface, Navigation, Forum Structure, and Archives Accessibility.

User Interface: The website of the community must be easy to use and its members should be able to perform basic tasks, like registering and reading or posting messages easily (Preece et al., 2004; Schwabe & Prestipino, 2005). However, its design also has to inspire those who are used to new technology (Sorensen & O Murchu, 2004).

Navigability: The navigation through the website should be easy and fast (Preece et al., 2004).

Forum Structure: A forum is the place where the community's members exchange their personal views on several topics. The presentation and the structure of the content in a community – in this case, the messages that the members have posted – should facilitate the users (Schwabe & Prestipino, 2005; Unruh et al., 2002). So, the discussion board should be organized by topic, by member and by date (Lambropoulos, 2005b).

Archives Accessibility: The e-community should be open to all users (Li, 2004) and not only to its members. The archives of the posted messages and discussions should be accessible to anyone who is interested in them, so that he could make his own choice to join the community or not.

3.2. Technical Characteristics

The Technical Characteristics are related to the efficient operation of the community's website. Its subcategories are the following: Reliability & Maintainability, Performance, Openness, and Security.

Reliability & Maintainability: The community must be accessible 24 hours a day, 7 days a week, so that its members can rely on its continuous availability (Preece et al., 2004). In case of a system error that may lead to a possible breakdown of the server, the reaction time of the operators should be rather quick (Leimeister et al., 2004). The managers of the ECWN should also make frequent improvements to the website, so that it remains up – to – date.

Performance: The website should have fast input, output and processing speed and support many concurrent users.

Openness: The website should be able to support various types of user connections. It would also be better if the members of the community do not need to use special software programs to access the community (Unruh et al., 2002).

Security: The first and most important factor for the success of an e-community, from the perspective of its members, is the sensitive handling of their personal data (Leimester et al., 2004). The community's operators should certify and guarantee that no personal data or profiles will be sent or sold to third parties. Only the member himself should be in control of his personal data. Finally, there should be no unauthorized monitoring (e.g. cookies) of the members' activities and navigation through the Internet.

3.3. Community's Commitment

The community should satisfy each one of its members, and their operators ought to take all appropriate steps to fulfill their expectations. It is essential that every new member is welcomed, supported and nurtured (Lambropoulos, 2005b; Preece et al., 2004). The

subcategories in this category include the community's Content, the Support to the members, the Interactivity between community and members, the Operators' Commitment to the members, and the provided Services.

Content: According to Powazek (2002), the most important subcategory of a community is its content. The posted information should be valid and accurate (Unruh et al., 2002). The content of the website should be of high quality and regularly updated (Leimeister et al., 2004). If a member expresses his personal opinion, which might be against the operators' opinion (within certain limits) he should not be censored (Li, 2004). The managers need to be tolerant to those kinds of messages and allow them to be posted on the discussion forum. Finally, it would be good if the operators provided a variety of links to other useful websites related to wireless technology.

Support: A factor that should be taken into consideration (Lambropoulos, 2005a) – especially in ECWNs – is providing information about the community's subject (in this case, wireless technology). A lot of users are not very familiar with wireless technology, but are really interested in it. So, a section where they could learn how to use this kind of technology would be rather helpful. There would also be a Frequently Asked Questions section and a section for technical support. Finally, the operators could provide the statistical analysis of the members' participation, for those who want to learn about the community's members and their participation.

Interactivity: The community's operators have to inform the members about every new project or event that takes place and concerns them. This could be achieved by alerting the members with frequent newsletters (Mueller – Prothmann & Siedentopf, 2003), RSS (Really Simple Syndication) feeds, IM (Instant Messaging) and pod casts. Similarly, automatic notifications would be sent to members according to their declared interests (Lambropoulos,

2005b). In this was, the operators show that they care about the community members and interact with them, keeping in mind their personal interests.

Operators' Commitment: The members' opinion about the community and the various aspects having to do with it should be taken into account and the operators ought to seriously consider adopting ideas that could evolve the community (Leimeister et al., 2004). They should also recognize the members' contributions and reward them.

Services: The range of services and privileges that the community's operators offer to its members make them contribute more to its evolution. The offered services and products ought to be many and useful. They would also be personalized, considering the fact that community managers have all the information about the members needed to select an appropriate service or product for them (Koch et al., 2002b; Schwabe & Prestipino, 2005).

3.4. Member's Commitment

According to Koch et al. (2002a), "a functioning community depends on the active participation of a significant percentage of its members … Only a broad participation in the community activities can sustain the functioning of the community". Subcategories in this category include the Users' Commitment, Participation [of the members], and Relationships [between the members].

Users' Commitment: A community is considered successful if the number of its registered members is high and growing (Leimeister et al., 2004; Preece et al., 2004). The members ought to be devoted and contribute to the community's evolution. Members could vary in terms of sex (male / female), nationality or culture. The community may be homogenous with members having similar points of views, or heterogeneous, with members having opposite points of views; both types are useful. Finally, the time that one has been a member of the

community is also important. Older members are more familiar with the community's issues and are able to help new members acclimatize themselves in the community.

Participation: A broad participation leads to better interaction between the members of the community. So, there should be a growing daily frequency of postings per member for each topic (Leimeister et al., 2004). The size of the conversations (the numbers of messages that each conversation contains) initiated about a topic could be rather long, too (Preece et al., 2004). An important issue that should be stressed is that there should be some kind of balance in messages posted by the members. That means that all the members of the community should post messages frequently, and not only a few of them. If some members do not participate actively, the operators could initiate a conversation with them and help them familiarize themselves with the community's issues (Borges & Baranauskas, 2003; Li, 2004).

Relationships: According to Li (2004), a very important factor for users who participate in a virtual community is the development of online friendships. It would be better if the members discuss issues about not only wireless technology but also other topics. The online relationships would be also developed offline by arranging frequent real – world meetings.

So, the full evaluation framework consists of four major categories, sixteen subcategories, and fifty criteria (Table).

Table *Evaluation Criteria for E-Communities of Wireless Networks*

1. USABILITY
1.1 User Interface
1.1.1 Simple & Easy to use
1.1.2 Aesthetic design

1.2 Navigability

1.2.1 Easy navigation

1.3 Forum Structure

1.3.1 Discussion board organized by topic

1.3.2 Discussion board organized by member

1.3.3 Discussion board organized by date

1.4 Archives Accessibility

1.4.1 Accessible archives

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2. TECHNICAL CHARACTERISTICS

2.1 Reliability & Maintainability

2.1.1 Continuous operation

2.1.2 Recoverability in case of error

2.1.3 Continuous improvement

2.2 Performance

2.2.1 Input / Output / Processing speed

2.2.2 Supports many concurrent users

2.3 Openness

2.3.1 Supports various types of users' connections

2.3.2 No need for users to have special software

2.4 Security

2.4.1 Certifications & Guarantees

2.4.2 User's privacy

2.4.3 No cookies

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3. COMMUNITY'S COMMITMENT

3.1 Content

3.1.1 Valid & Objective

3.1.2 Updated & of High quality

3.1.3 Quantity & Various Types of content

3.1.4 Tolerance (not censorship)

3.1.5 Bibliography, references & links to other sites

3.2 Support

3.2.1 Technical support and help, Frequently Asked Questions, How to use it

3.2.2 Statistical analysis of participation

3.3 Interactivity

3.3.1 Newsletter

3.3.2 Alerts for new content

3.4 Operators' commitment

3.4.1 Evolution of the community according to its members' ideas

3.4.2 Appreciation of the members' contributions by the operators

3.4.3 Members' integration in the administration of the community

3.5 Services

3.5.1 Quantity of services

3.5.2 Usefulness of services

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4. MEMBERS' COMMITMENT

4.1 Users' Commitment

4.1.1 Number of members registered in the community

4.1.2 Members committed to the community

4.1.3 Male / Female members

4.1.4 Variety of nationalities, cultures, religions etc. of members

4.1.5 Homogenous / Heterogeneous

4.1.6 Since when a member is registered

4.2 Participation

4.2.1 Number of messages per day

4.2.2 Number of messages per day per member

4.2.3 Number of answers per message

4.2.4 Length per message

4.2.5 Number of messages per topic

4.2.6 Number of messages per topic per day

4.2.7 Number of members per topic

4.2.8 Balance versus tolerance by some members

4.3 Relationships

4.3.1 Friendly versus hostile

4.3.2 Informal versus formal

4.3.3 Information exchange

4.3.4 Feelings & emotions exchange

4.3.5 Development of relationships in the real world

Members of a wireless networks community create a website in order to coordinate the development of their wireless network, exchange ideas and experience, and communicate in general. The proposed evaluation framework was used to evaluate ECWNs by looking at their websites.

The first author used this framework to evaluate fifty seven ECWNs. For every community, he assigned a score from 0 to 5 to each criterion (0 = non existence, 1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good). For example, if an ECWN lacked a

discussion forum (which means that it was not mature enough or existed only to provide information about the wireless network and the offline meetings), the score for Forum Structure and Archives Accessibility was “0” (“non existence”). The scores were based on the author’s personal view. It was trying to evaluate the attractiveness of these ECWNs to someone who is not a member in order to become one. Then, the score for each subcategory is calculated as the average of the scores given to the corresponding criteria.

4. EVALUATION RESULTS

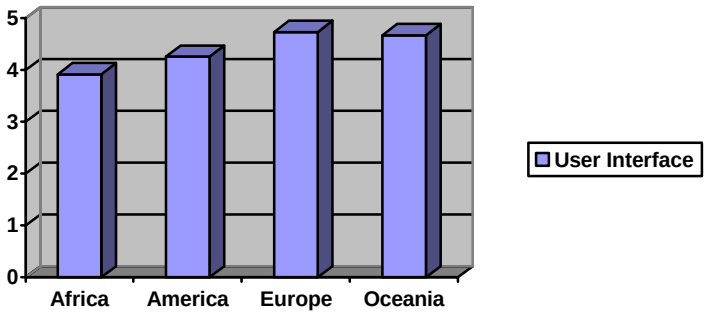
In this section, the status of the ECWNs is presented through sixteen figures, one for each subcategory. Each figure shows the average scores that correspond to the continents. The continent’s score was calculated as the average score of the ECWNs in this continent for the particular subcategory.

4.1. Usability

User Interface

Most of the ECWNs’ websites were easy to use, so the scores were high for User Interface (Figure 1). However, there were some websites, especially in Africa and America, whose design was not aesthetically pleasant and user friendly and a novice user would have difficulties in using it.

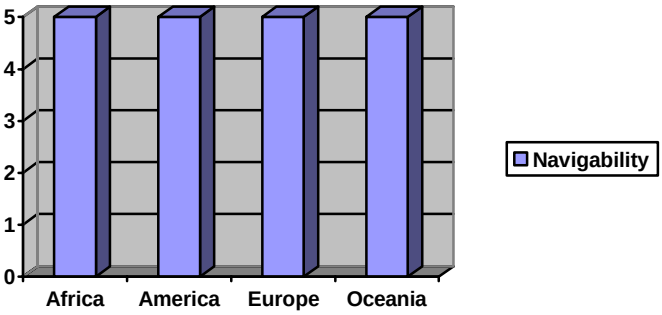
Figure 1: User Interface



Navigability

The websites of all ECWNs were easy to navigate through, so they were all given a “very good” (“5”) score for Navigability (Figure 2).

Figure 2: Navigability

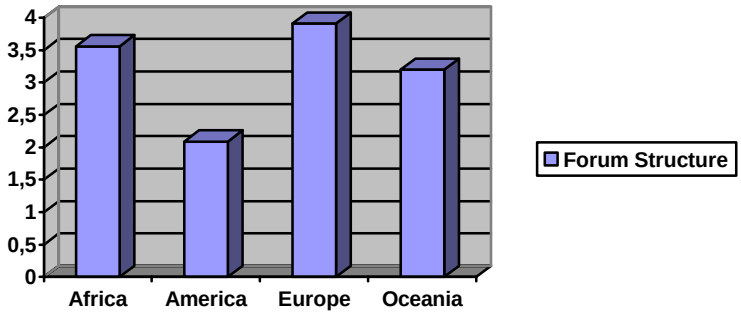


Forum Structure

A major drawback in some websites in America, Europe and Oceania was the lack of an online discussion forum (Figure 3). Some of these ECWNs were recently created so they may need more time to develop a well – organized discussion board and evolve to complete communities. However, there were some ECWNs that have existed for a long time, but

whose managers were not committed enough to develop a forum. The website existed only to provide fixed information about the wireless network and wireless technology in general, or information about offline meetings of the networks' members. The score given to a website with this drawback for Forum Structure was "0" ("non existence"). The average scores vary from "2.09" to "3.91" in the three continents due to the number of websites in them that lacked a forum. Africa missed the "very good" ("5") score since in a few ECWNs the posted messages were not organized by member.

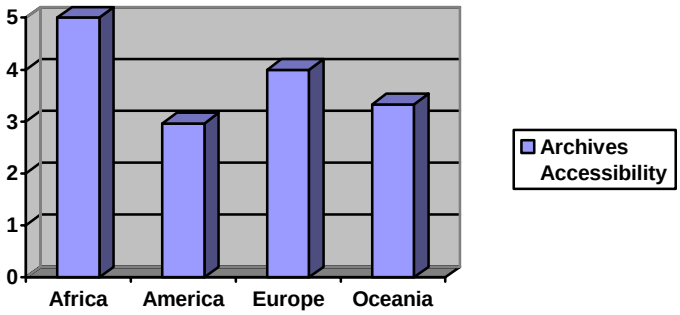
Figure 3: Forum Structure



Archives Accessiblity

All of Africa's ECWNs had accessible archives, so they were given a "very good" ("5") score for Archives Accessibility (Figure 4). In the other three continents, the websites that lacked an online forum lacked archives as well, so they were scored with a "0" ("non existence") for the particular subcategory. In very few communities, especially in America and Oceania, if a user wanted to access the archives, he had to register first, a fact that is discouraging for most users.

Figure 4: Archives Accessibility

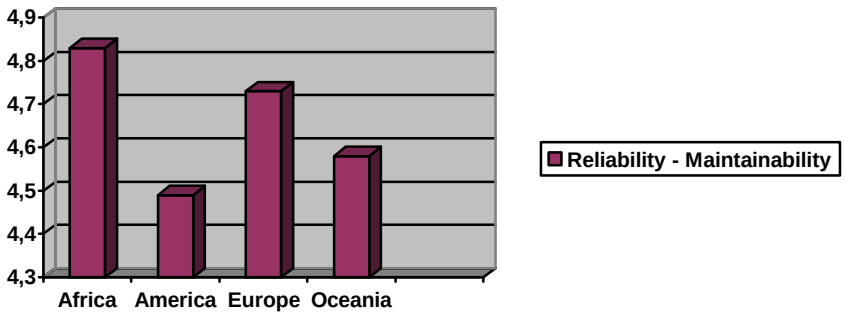


4.2. Technical Characteristics

Reliability & Maintainability

All the websites were reliable. Some ECWNs, though, were not recently updated, so they were given lower scores for this subcategory, which also includes maintainability (Figure 5). Furthermore, a few websites in Europe and Oceania, and more in America, had not been improved by their managers for a long time; that explains the fact that the average scores are lower in these continents than the score of Africa.

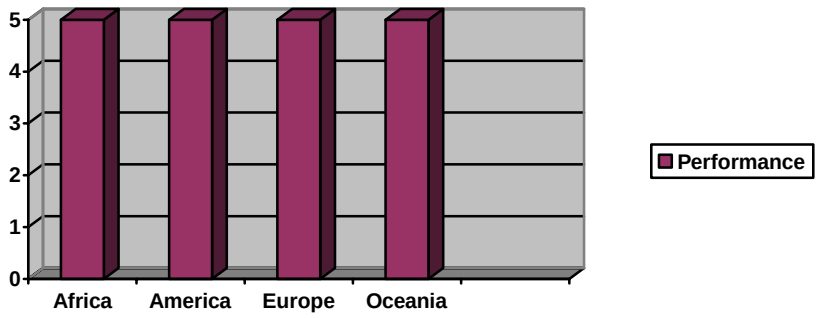
Figure 5: Reliability & Maintainability



Performance

There were no performance problems in any of the evaluated ECWNs (Figure 6). The input, output and processing speed was fast and the websites could support many concurrent users. So, all the communities were scored with the highest mark, “5” (“very good”).

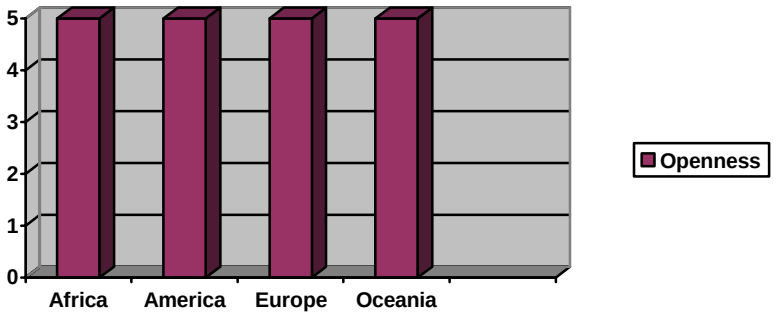
Figure 6: Performance



Openness

No website presented an openness problem (Figure 7). All ECWNs were accessible without the need for special software, while they supported various types of Internet connection. All ECWNs scored “5” (“very good”).

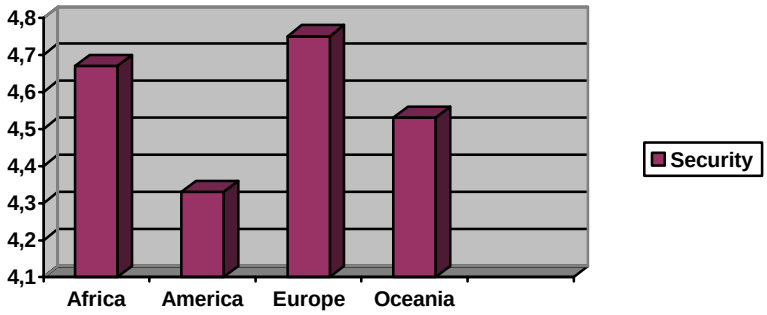
Figure 7: Openness



Security

In Africa, Europe and Oceania, the average score in Security was below "5" due to the fact that in some ECWNs, the operators did not explain thoroughly the guarantees of the personal data's security (Figure 8). In America, one ECWN informed the users that from the moment that they were going to register, cookies would monitor their navigation through the Internet, a fact that is quite discouraging for many people who do not want to be watched. The score given for Security in that ECWN was very low, so the average score for the specific subcategory in America dropped.

Figure 8: Security

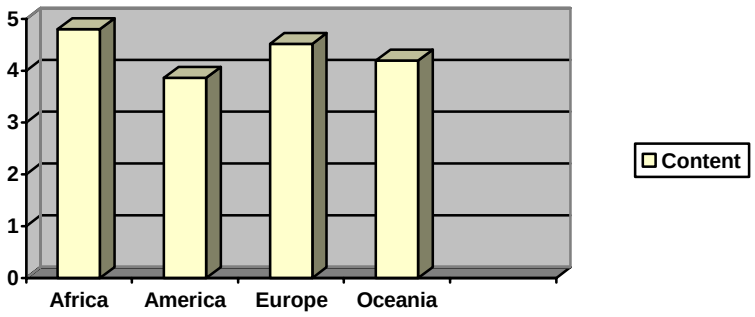


4.3. Community's Commitment

Content

The majority of the ECWNs contained valid, high quality and regularly updated content (Figure 9). Almost all of them had a "Links to other sites" section, where one could find many interesting links about wireless technology, like suppliers of hardware for wireless networks. In America, Europe and Oceania, the average score was lower than in Africa, because the managers of some ECWNs did not seem to care about their communities' content. The ECWNs were active for a long time, but their content had not been updated for a long time as well.

Figure 9: Content

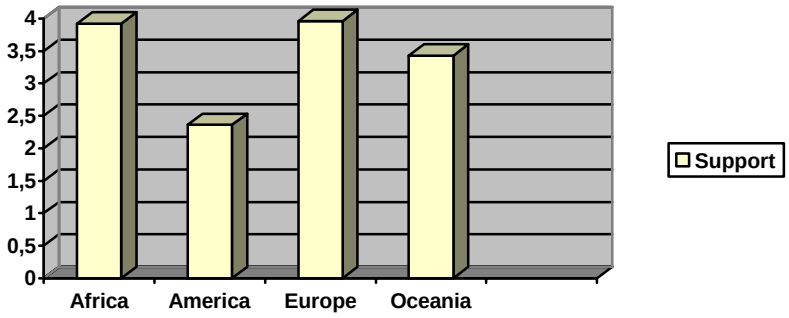


Support

Regarding the Support subcategory, most of the communities had a Frequently Asked Questions section, where all the basic questions about wireless technology and networks where thoroughly answered (Figure 10). The reason that the average score was almost "4" ("good") for Africa and Europe, "3.43" for Oceania and "2.36" for America is the lack of the statistical analysis of members' participation. Not many websites provided information about the participation of the registered members, which would help users to see the community's

activity. Also, in very few communities in America and Oceania, there was hardly any help or support topics for the interested members or a Frequently Asked Questions section.

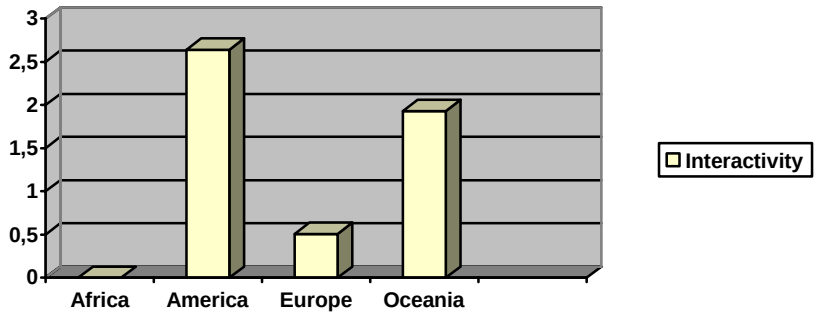
Figure 10: Support



Interactivity

An important result of this research was the fact that a lot of communities ignore the Interactivity subcategory (Figure 11). In Africa, not one of the communities that were reviewed sent newsletters or alerts for new content to inform its members about a new interesting event or project. In Europe and Oceania, the average scores were “0.51” and “1.93” respectively, which means that very few communities sent newsletters. In America, more than half of the evaluated ECWNs achieved higher scores. However, this does not mean that there could not be any improvements to Interactivity in America; the status of the subcategory was better than in the other continents, but not good enough.

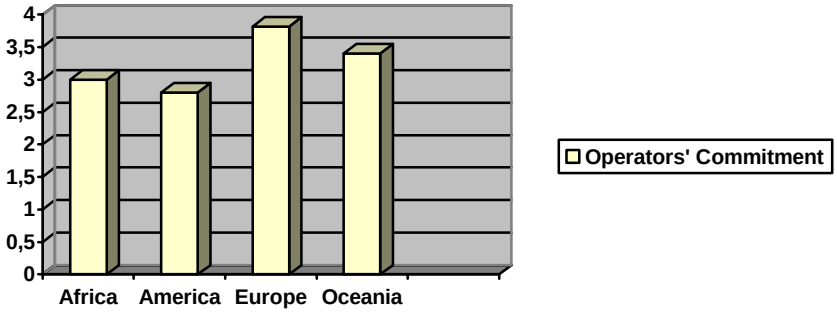
Figure 11: Interactivity



Operators' Commitment

In America, Europe and Oceania, the members had a fair part in the evolution of the majority of the communities, whereas their contributions were appreciated by their managers and were rewarded with a number of offers (Figure 12). However, there were some community managers that did not take much consideration of the members' ideas about its evolution and very few ECWNs whose managers seemed to be totally out of interest about them. These communities were given low marks, which resulted in the average score for the subcategory being less than "4", in all three continents. Finally, the operators' commitment towards the registered members was "fair" in Africa, where all the ECWNs were scored with the mark "3" for the subcategory.

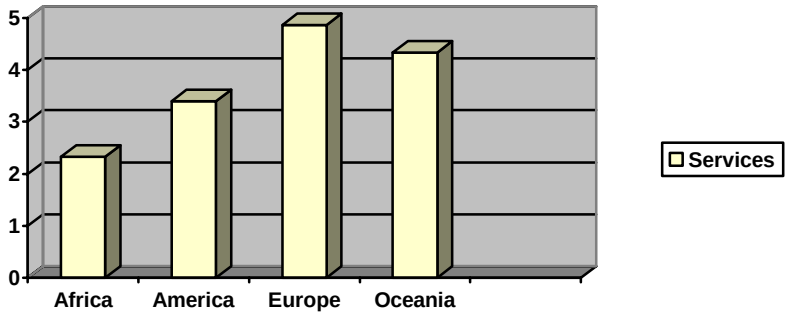
Figure 12: Operators' Commitment



Services

Europe leads in this factor, since the majority of its communities provided many and useful services to their members, such as links to websites regarding wireless technology as well as discounts in purchases of wireless equipment through certain sites (Figure 13). It was the only continent where almost all the ECWNs provided services. On the contrary, Africa's communities provided the fewest, still useful though, services. Oceania's drawback was the quantity of the services provided. They were useful for the members, but they were few, in comparison to European ECWNs. Finally, there were some communities in America that provided no services at all and so its average score was lower than the other two continents' score.

Figure 13: Services



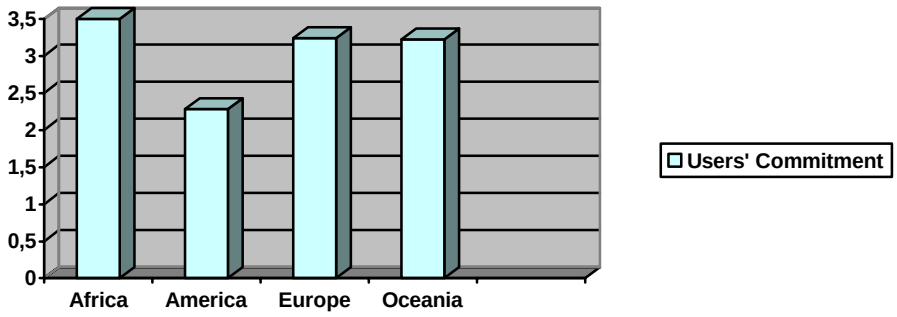
4.4. Members' Commitment

Users' Commitment

The majority of the communities in Africa had a high number of loyal registered members, so Africa achieved the highest average score ("3.5") in Users' Commitment

(Figure 14). The average score was not higher because in two communities the number of the registered members was not as high as in the other four. Europe and Oceania's ECWNs achieved the same average score, whilst America was the continent with the lowest score. As it was mentioned before, in all three continents, more in America and less in Europe and Oceania, various ECWNs had no online discussion board. The purpose of many websites' Internet existence was only to present information on how to get wireless access on wireless projects in the city that the website was referring to. However, the members of the wireless networks may have been interacting offline, but there should also be online participation as well.

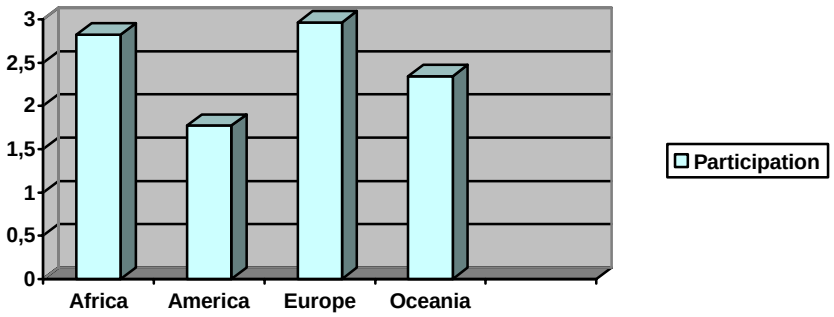
Figure 14: Users' Commitment



Participation

The online participation of the members was "fair" in Africa and Europe (Figure 15). There were many messages posted for all the topics in the forums of the communities and the replies to the messages were numerous, too. The fact that lowered the average score was the dominance by some members in the conversations. In many communities, some of the first registered members generated and carried on all of the discussions, while newer members did not participate actively.

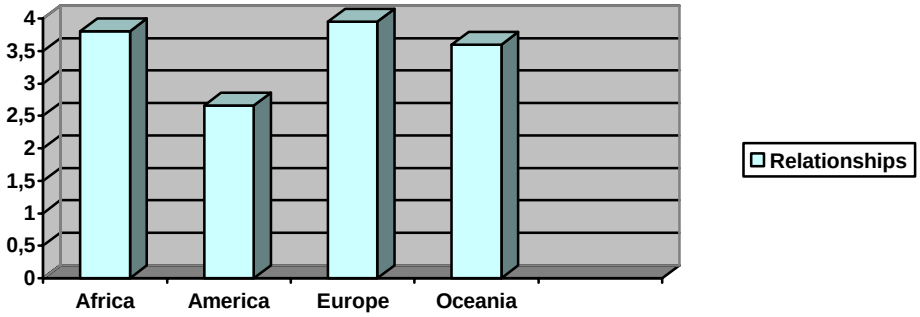
Figure 15: Participation



Relationships

The relationships developed among the members were very friendly in all the continents (Figure 16). Besides the information about wireless technology and the network's development that they exchanged, they also exchanged feelings and emotions about general matters. Their online relationships were developed in the real world as well, due to the offline events that were regularly scheduled. There were meetings arranged even in websites that lacked an online forum, by posting announcements on the main page of the website. In that case, the ECWNs' members hoped to evolve the e-community by transferring their offline relationships to the Internet. America achieved a lower average mark than the rest because of very few ECWNs whose members not only did not interact online, but they also did not have any meetings planned for the near future.

Figure 16: Relationships



5. CONCLUSIONS AND FURTHER RESEARCH

Wireless technology has many advantages. Many people believe that wireless networks will eventually replace wired ones. People should be informed about these new innovations. An efficient way to be informed, educated and exchange experiences is through Internet communities, where anyone can easily have access to. The ECWNs' managers should organize their websites properly, so that Internet users would be able to learn about wireless networks advantages and make proper use of them.

In this paper, an evaluation framework for ECWNs was developed. Using this framework, fifty seven ECWNs in four continents were evaluated. The results of the evaluation showed that there were differences among the continents and more work is needed to achieve a high level of efficiency.

More specifically, most of the European communities' websites were easy to use and did not have any technical problems. The communities' operators were committed to their members, by offering them various services. The members, on the other hand, had a satisfying online participation and had developed strong relationships among them. Although wireless networks have been developed only recently in Africa, its ECWNs achieved a high quality level. However, a very important drawback of its communities is the fact that none of them sent newsletters or alerts for new content to its members. Similarly, Oceania's ECWNs

achieved a high quality level. However, some of its communities did not have an online forum, mostly because they were recently created. America was the first continent to build a wireless network and the number of existing ECWNs in America was very large. Many communities in America were highly sophisticated and could be considered as the state of the art. However, there were also several underdeveloped ECWNs that lacked some basic characteristics. This was due to the fact that either they were recently created, or their operators were not committed to their evolution.

The evaluation revealed two major drawbacks of the ECWNs. The first one is the lack of an online forum in many websites. There may be an excuse for the recently created communities since their operators need some time to manage them properly. However, there were other websites that have been operating for a long time and they only provided information about the wireless network and offline meetings. The managers of these ECWNs have to evolve them and make them complete e-communities, so that the offline relationships between the wireless network's members would be transferred online as well. Still, there were some communities whose operators were totally careless and also did not support any offline meetings.

The second important drawback was the lack of a newsletter service. The majority of the ECWNs did not send newsletters to inform their members about their community and network's progress. In Africa, no community provided a newsletter service. In Europe, the percentage of communities that sent newsletters was 20%, while in Oceania it was fairly higher (40%), but not high enough. In America, the percentage rose to 55%. More than half of the evaluated communities sent newsletters and alerts for new content to their members. The ECWNs that lack this service should start offering it.

The aim of this paper was to present an evaluation framework and the average status of ECWNs. The selected e-communities were representative of ECWNs in the four continents.

So, not only mature and best practice communities were evaluated, but also communities that were recently created. Further research could be carried out focusing only on mature communities, so that the status of best ECWNs could be identified. Thematic wireless communities would be also evaluated using this framework. For example, it would be interesting to investigate developments in tourism wireless communities. Finally, the ECWNs' members themselves could evaluate their and others' ECWNs.

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