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## EDITORIAL PREFACE

This is second issue of volume two of International Journal of Human Computer Interaction (IJHCI). IJHCI is an International refereed journal for publication of current research in Human Computer Interaction. Publications of IJHCI are beneficial for researchers, academics, scholars, advanced students, practitioners, and those seeking an update on current experience, state of the art research theories and future prospects in relation to applied science. Some important topics covers by IJHCI are affective computing, agent models co-ordination and communication, computer mediated communication, innovative interaction techniques and user interface prototyping for interactive systems etc.

The initial efforts helped to shape the editorial policy and to sharpen the focus of the journal. Starting with volume 2, 2011, IJHCI appears in more focused issues. Besides normal publications, IJHCI intend to organized special issues on more focused topics. Each special issue will have a designated editor (editors) – either member of the editorial board or another recognized specialist in the respective field.

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## Cognitive Approach Towards the Maintenance of Web-sites Through Quality Evaluation in Operative Phase

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### Abstract

It is a well established fact that the Web-Applications require frequent maintenance because of cutting– edge business competitions. The authors have worked on quality evaluation of web-site of Indian e-commerce domain. As a result of that work they have made a quality-wise ranking of these sites. According to their work and also the survey done by various other groups Futurebazaar web-site is considered to be one of the best Indian e-shopping sites. In this research paper the authors are assessing the maintenance of the same site by incorporating the problems incurred during this evaluation. This exercise gives a real world maintainability problem of web-sites. This work will give a clear picture of all the quality metrics which are directly or indirectly related with the maintainability of the web-site.

**Keywords:** Web-Applications, Quality, Maintainability Factors, Maintainability Sub-factors.

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### 1. INTRODUCTION

The software maintenance as defined in IEEE standards [2] is: The modification of a software product after delivery to correct faults, to improve performance or other attributes or to adapt the product to a modified environment. According to Basili and Mills [3] the software maintenance may be looked as : Most software systems are complex, and modification requires a deep understanding of the functional and non-functional requirements, the mapping of functions to system components and the interaction of components.

Maintainability is an important attribute in all the software applications as it is learned that only 25% to 33% of the total effort put in during the complete life cycle of a software system goes in actually building the system [5]. The rest is consumed by effort expended towards the operational maintenance of this system. This figure clearly indicates that maintenance takes more efforts as compared to the development of the software. The maintainability of software system has always been a problem with software professionals. Since the third-party maintenance is now becoming a reality as more and more organizations are opting for third-party maintenance of their Web-Applications. It is the high time that software maintenance be looked in the right perspective so that a realistic cost estimates be prepared for the software maintenance. Most Web-Applications involve critical business assets which promote their services through internet. Because of globalization and cut-throat business competition, these Web-Applications evolve continuously during their life-cycle. Lehman et.al. [1] gave two laws of software evolution that affect the evolution of Web-Applications. They are

1. The law of continuing change: A program used in real world must change or eventually it will become less useful in the changing world.

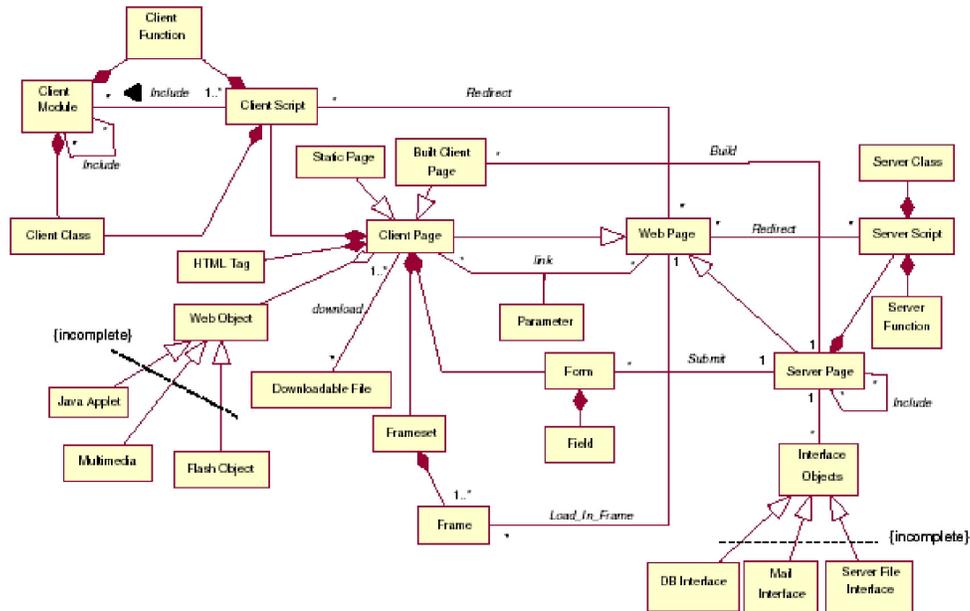
2. The law of increasing complexity: As a program evolves it becomes more complex and extra resources are needed to preserve and simplify its structure.

Web-Applications are different from traditional software systems in the sense that they involve heterogeneous technologies in hardware as well as software. For successful development of large Web-Applications, we need a team of people with wide ranging knowledge and skills. We need Graphic designers to develop the look and feel, we need people with library science background to organize, navigate and search information. We need database designers and programmers to develop code, network security and other security aspects. We often involve architects to get better aesthetics in the Web-Applications. The code development will involve hypertext structures, JSP, Servlet, scripting languages, etc. It is a common practice that Web-Applications are hosted and maintained by third party. Because of heterogeneity of such Web-Applications, the maintenance becomes a cumbersome process and becomes impossible to predict maintenance cost using traditional models and metrics. When we talk about the web-application maintenance the structure of a web-application should be considered. Web-Applications are different from traditional software systems in the sense that they involve heterogeneous technologies in hardware as well as software. Web-Applications are built up of different items coded with different programming languages. Any web-application is an arrangement of web pages. These pages can be static as well as dynamic. Dynamic pages are generated at run-time. The static pages are normally written in HTML. The dynamic pages are normally written using the scripting languages, and the back end is typically written using the database management languages.

## 2. LITERATURE SURVEY

An object-oriented model for describing the component of a web-application is proposed by Conallen [12]. The model is also used in reverse engineering [13, 14, 15] of a web-application. This model is a UML class diagram depicting each type of relevant item of a WA as a class, and possible relationships between these items as UML association, aggregation/composition, and generalization relationships. The relevant classes of this model include *pages* that can be distinguished into *server pages*, i.e., pages that are deployed on a web server, and *client pages*, i.e., pages that a web server actually sends back to a client request. Several types of relationships interconnect the classes of this model. These relationships include: the *link* one between pages that are interconnected by static hyper textual links, the *submit* relationship between a form and the server page that elaborates the form data, the *redirect* one between a script and a web page, the *include* one between a client/server script and a client/server module/page, the relationship *build* between a server page and the client page it dynamically builds, and the *load\_in\_frames* relationship between a *Client page with frame* and the set of pages referred by its <frame> tags, have to be considered.

The model describing the WA components and their relationships is provided in Figure 1[12] as a UML class diagram. Each WA can be represented by an instance of this model, that provides a description of the internal organization of the WA, where each actually implemented page and page component, and each actual relationship between them is explicitly represented. This model is obtainable by statically and dynamically analyzing the source code of an existing web-application [13]. Also web-application may be executed on different computers in a distributed architecture.



**FIGURE 1:** Reference model for a web-application

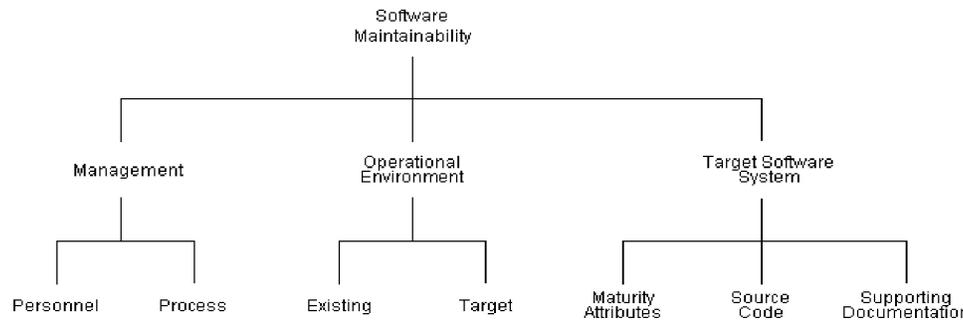
Pressman [6] describes maintainability as the ease with which a program can be corrected if an error encountered, adapted if its environment changes, or enhanced if the customer desires to change the requirements. Following ISO9126[5] guidelines state the factors of maintainability. Many papers discussing maintainability models for traditional software systems are present in literature. The model proposed by Oman and Hagemester[11] is one of the most exhaustive and complete models which considers the additional strong factors associated with the maintainability of a software in general. It is important to note that it is not sufficient to measure the attributes of a software system alone without considering the environment in which it is working.

### 3. THE OMAN AND HAGEMEISTER MAINTAINABILITY MODEL

Oman and Hagemester presented a maintainability model based on a hierarchical tree structure comprehending 92 attributes affecting the maintainability of a software system. The leaf nodes in the hierarchy represent an identified maintainability attribute and, for each of these, attribute metrics are defined to evaluate that maintainability characteristic. In Figure 1 the top level of the OHMM hierarchy is showed. At this level, three main categories of factors are pointed out:

- ~ Management: practices of management employed, and facts related with them;
- ~ Operational environment: environment, in terms of hardware and software, involved in the operation of the system under examination;
- ~ Target Software System: the examined software system under maintenance, including the source code and support documentation.  
Oman's work focuses mainly on the Target Software System; Figure 2, shows a detail of the sub-tree concerning this category. Three major categories can be identified in this sub-tree:
- ~ Maturity Attributes: maintainability characteristics referring to the maturity degree of the system under evaluation, relying on the aging, stability, reliability, number of defects; and number of maintenance interventions, techniques of development used;

- ~ Source Code: maintainability characteristics due to those ones of the source code; Supporting Documentation: maintainability characteristics due to the supporting documentation; they are divided in two categories:
- ~ Documentation Abstraction: characteristics related with content (completeness, correctness, and descriptiveness) of supporting documents set;
- ~ Physical Attributes: characteristics related with the form (readiness, modifiability) of supporting documents set.



**FIGURE 2 :** Oman Hagemester model of maintainability

#### **4. IMPORTANT CONSIDERATIONS USED FOR THE SURVEY**

The authors have proposed the quality metrics for e-commerce based web-sites and also validated their quality model[19]. They have evaluated the few web-sites and given them qualitywise ranking. The quality model is a hierarchical tree divided into factors. The factors are further divided into sub-factors and metrics. Based on those results we have planned to assess the maintenance part of those sites. Presently we are working on the site of futurebazaar. The relevant measurement goals for the assessment of maintenance are determined using the Goal-Question-Metric (GQM) approach [17], which is based upon the assumption that any measurement must be defined in a top-down fashion. The result of applying the GQM approach is a model that has three levels: The conceptual level - Goal; ii) The operational level - Question; and iii) The quantitative level - Metric. The goal is refined into several questions and each question is then refined into metrics, either objective or subjective.

To validate a measure following four questions should be asked [16].1) Is the measure adequately capturing the attribute it purports to measure (i.e., construct validity)?2) Is the attribute itself well-defined based on an explicit empirical model (i.e., empirical relational system) ?3) Is there any empirical evidence supporting the underlying hypotheses of the empirical model?4) Is the measure useful from a practical perspective?

A survey approach offers the following advantages [18]: i) reaches many users; ii) makes use of existing experience; iii) makes use of standard statistical analysis techniques; and iv) confirms that an effect generalizes to many projects/organizations.



FIGURE 3: Homepage of <http://www.futurebazaar.com>

## 5. RESULT AND DISCUSSION

The software quality and maintainability are directly related[10], i. e. a good quality software is expected to have low maintainability. The authors[9] in a recent paper have discussed the quality attributes of Web-Applications and mentioned that maintainability is also a quality factor. The Authors in their previous work have proposed quality metrics for e-commerce based web-sites after evaluating the quality of few Indian e-commerce based web-sites[19,20]. After evaluating the sites they have ranked [www.futurebazaar.com](http://www.futurebazaar.com) as one of the best sites. In this paper the authors have selected the metrics to be incorporated as a maintenance process of the web-sites. The survey conducted by the authors give following results [See Table 1]. The survey based on questionnaire is being carried out and the participants were the persons involved in web-application maintenance and developers working with software development companies of international repute( TCS, IBM to name a few). We have analysed 55 questionnaires and following metrics have selected to be incorporated in the web-sites in their operative phase. The domain selected by the authors are of Indian e-commerce base. We further wish to extend this work to web-sites of other domains also. It has been already established that the Functionality & Content[10] affects the quality of the web-site. Considering the component of a web-applications proposed by Conallen [12] the authors propose to examine the relationship in context to the maintenance as their future work. In future the authors wish to assess the actual maintenance efforts in incorporating these changes in the web-site already in the operative phase.

<b>Factor/sub-factor/Metrics for Maintenance</b>	<b>Recommended (In %)</b>
Usability/On-Line Feedback & Help /Last update date	79
Usability/Address Directory /Customer Care	82
Functionality/Removal of Broken Links	85
Functionality/Calculation of any discount offered for a period-Business Logic Change	88
Functionality/Removal of the items which are not available (database updation)	86
Functionality/Adding the new items in the existing list	84
Functionality/Customer-oriented & Domain Related Features/New & Forthcoming	80
Usability/Online Feedback & Help /Best Sellers	84

**TABLE 1:** Recommendation of the survey conducted for the metrics to be incorporated for maintenance

**Disclaimer:** The information given in this paper shows views of the authors and not of the company.

**REFERENCE:**

[1] M. Lehman, J. Ramil, P. Wenric, D. Perry and W. Tursky, ‘ Metrics and laws of software evolution the nineties view.’ In proceedings of the 4th International Software Metrics Symposium, IEEE Computer Society Press, 1997, pp. 20-32.

[2] A. K. Mishra ,P. Bhatt, ‘Influencing Factors in Outsourced Software Maintenance’ , May 2006.

[3] Basili , Mills ‘ Understanding and Documenting Programs.’ IEEE Transactions on Software Engineering SE-8,3(1982), pp. 270-283.

[4] Zelkowitz, Marvin V., Perspectives in Software Engineering, ACM Computing Surveys (CSUR) archive, vol. 10, issue 2, June 1978, pp197-216.

[5] ISO/IEC FDIS 9126-1 : Software Engineering – Product Quality Part Quality Model (2000): <http://www.usabilitynet.org/tools/international.html#9126-1>

[6] R. S. Pressman , Software Engineering A Practitioner’s Approach, 6th edition, McGraw-Hill International Edition 2005.

[7] Banker,Rajiv D., Datar, Srikant M., Kemerer, Chris F., and Zweig , Dani.,’Software complexity and maintenance costs’, Communications of the ACM, 36,11Nov 1993, pp81-94.

[8] A. K. Mishra , P. Bhatt , ‘Dynamics of Software Maintenance’ ,ACM SIGSOFT Software Engineering Notes Page 1 September 2004,Volume 29,Number 5.

[9] P.Tripathi , M. Kumar, “ Some Observations on Quality Models of Web Applications”, International Conference Of Web Applications ICWA’06, Bhubaneswar , Orissa , India, 23-24 December 2006.

[10] Lilburne , Devkota , Khan, ‘Measuring Quality Metrics or Web-Applications, I R M A International Conference , New Orleans, USA, 2004.

- [11] P. Oman, J. Hagemester, 'Metrics fo Assessing a Software System's Maintainability', Proceedings of IEEE International Conference on Software Maintenance, 1992, IEEE Computer Society Press, Los Alamitos, CA.
- [12] J. Conallen, *Building Web Applications with UML*, Addison Wesley Publishing Company, Reading, MA.
- [13] G. A. Di Lucca, A.R. Fasolino, U. De Carlini, F. Pace, P. Tramontana, 'WARE:a tool for the Reverse Engineering of web Applications', *Proc. of 6th European Conference on Software Maintenance and Reengineering*, Mar. 2002, IEEE CS Press,pp. 241-250.
- [14] G. A. Di Lucca, A.R. Fasolino, U. De Carlini, F. Pace, P. Tramontana, 'Comprehending Web Applications by a Clustering Based Approach', *Proc. of 10thIEEE Workshop on Program Comprehension, IWPC 2002*, IEEE CS Press, pp. 261-270.
- [15] D. Coleman, D. Ash, B. Lowther, and P. Oman, 'Using metrics to evaluate software system maintainability,' *IEEE Computer*, vol. 27, no. 8, pp. 44-49,1994.
- [16] Briand , Devandu, Melo, 'An Investigation into Coupling Measures for C++', Proceedings of ICSE'97, Boston (1997), 412-421.
- [17] Basili,Caldiera,Rombach 'The Goal Question Metric Approach', *Encyclopedia of Software Engineering*, Wiley (1994).
- [18] Kitchenham, Barbara Ann: 'Evaluating Software Engineering Methods and Tool, Part 1: The Evaluation Context and Evaluation Methods'; *Software Engineering Notes*, 21, 1 (Jan. 1996), 11-15.
- [19] P. Tripathi, M. Kumar, Srivastava 'Quality Evaluation of Web-sites of Indian E-commerce Domain', SERP08,in proceedings of International Conference Software Engineering and Research Practices 08,Las Vegas,USA,14-17 July 2008, pp 134-139.
- [20] P.Tripathi , M.Kumar, Srivastava 'Ranking of Indian E-commerce Web-applications by Measuring Quality Factors ', SNPD08, in proceedings by IEEE, International Conference Software Engineering, Networking ,Parallel and Distributed Computing 08, Phuket,Thailand,6-8 August 2008,pp. 949-953.

## Progress of Virtual Teams in Albania

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### **Abstract**

Virtual teams are used more and more by companies and other organizations to receive benefits. They are a great way to enable teamwork in situations where people are not sitting in the same physical place at the same time. As companies seek to increase the use of virtual teams, a need exists to explore the context of these teams, the virtuality of a team and software that may help these teams working virtually.

Virtual teams have the same basic principles as traditional teams, but there is one big difference. This difference is the way the team members communicate. Instead of using the dynamics of in-office face-to-face exchange, they now rely on special communication channels enabled by modern technologies, such as e-mails, faxes, phone calls and teleconferences, virtual meetings etc.

This is why this paper is focused on the issues regarding virtual teams, and how these teams are created and progressing in Albania.

**Keywords:** Virtual, Team, Communication, Development.

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## **1. INTRODUCTION**

A virtual team is a group of people who interact through interdependent tasks having the same goals and purposes. This team works across space, time and organizational boundaries linked with each other by ICT (Information and Communication Technologies). Meanwhile a classic model of a team is a group of people from the same organization interacting face-to-face. What sets virtual teams apart is that they cross boundaries. Virtual teams now use electronic technologies to cope with the opportunities and challenges of cross-boundary work.

Such teams are used more and more by companies and organizations to cut travel and other business costs. Businesses who want to set a presence to global market or outsource their operations need to involve virtual teams. Not all projects are suitable for a virtual team and not everyone is suitable for working in a virtual environment. Members of this team should be able to work independently and must be self motivated. In order to see how intense the member's work is, this person should show very clear results.

Communication is another critical factor, because team member should be able to communicate clearly, constructively, and positively. It is well known that communication with the help of the technology has the loss of many nonverbal hints of face-to-face communication. Another big

challenge of virtual team is building and maintaining trust between the team members. The issue of trust needs special attention for team existence.

For further understanding of the concept virtual team, it is necessary to understand what a team is and what makes it virtual. The use of the word virtual is meant to describe the meaning of using electronics in receiving information for specific reasons. A team is a group of individuals who work interdependently for solving the problems and accomplishing tasks. Recent developments in the field of ICT (Information and Communication Technology) have enabled the organizations to start using the so called virtual teams. The use of the word virtual, as in the virtual team is meant to describe the meaning of using electronics in enabling the flow of information for specific reasons. A lot of definitions have been given regarding the term virtual team, some of them are listed below:

- A virtual team is "A group of people who work interdependently with a shared purpose across space, time, and organization boundaries using technology [1].
- "Groups of workers with unique skills, who often reside in different geographical places and who have to use for cooperation means of ICT in order to span the boundaries of time and space [2].
- "Group of geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task [3].
- "Virtual team is a collection of task-driven members behaving as a temporary group, whose members are separated by geographic or temporal space [4].
- "Groups of people who work closely together even though they are geographically separated and may reside in different time zones in various parts of the world [5].
- "Cross-functional work-groups brought together to tackle a project for a finite period of time through a combination of technologies [5].
- "Groups of geographically, organizationally and/or time dispersed workers brought together by information and telecommunication technologies to accomplish one or more organizational task [6].

As we can see from these definitions, there are a few words and phrases that are similar in meaning and are the essence of the virtual team phenomena. These are: working together, using ICT for communication, working in different places and team members are separated from each other geographically [12].

Virtual teams are supported by both hardware and software. General hardware requirements include telephones, PCs, modems, and communication links such as the public switched network and local area networks. Software requirements include groupware products such as electronic mail, meeting facilitation software, and group time management systems.

Usually virtual teams are created around a specific task with team members being selected based on their skills in relation to the task or project. In general these teams exist during project's life time.

## **2. THE VIRTUALITY OF TEAM**

Different views have been given on the aspects that differentiate virtual team from ordinary team. One to be considered is the geographical distance which makes the difference between members of the team. Another important view is the use of ICT for communication between virtual team members. This is the main criteria that distinct virtual teams from ordinary teams. Team members, who work together in the same building and use only ICT tools for communication, it is considered to be a high level virtuality team. In this case team members will face the same problems and challenges as if they would be separated by a long distance.

The two extreme kinds of teams are: pure ordinary team which is a team that uses eye-to-eye contacts for cooperation purposes without any use of ICT for communication. These teams do not use any element of virtual teamwork communications, which means 0% virtuality. And the other one is pure virtual team that sustains heavily in the use ICT for cooperation and communications purposes which means 100% virtuality. With the rapid development of the technology the trend is

towards going virtually. In reality there are few truly virtual teams, most virtual teams are more or less diverse in culture, more or less permanent and use a mix of face to face and electronic communications.

Taking in consideration the fact that what distinguishes virtual teams from ordinary teams is use of ICT in communication, it is important to analyze in detail the communication aspect of virtual teamwork. As mentioned by G.Mihhailova [7], the communication process in a virtual team can be described by:

1. *Diversity of communication mediums*, people communicate using many different mediums of communication and some of them are rich mediums enabling team members to see each other, hear their voices, observe the body languages etc. At the other extreme are the poor communication mediums that do not permit all this benefits. Due to many reasons, members of the virtual team use a lot of relatively poor communication medium. Meeting eye-to-eye is the best medium of communication [17] but its usage depends at many other factors such as: organization type, project type, location and so on. In the nowadays global economy, for the multinational organizations meetings eye-to-eye are almost impossible to be held at least for the operational level. So at this point the importance of ICT means of communications increases.

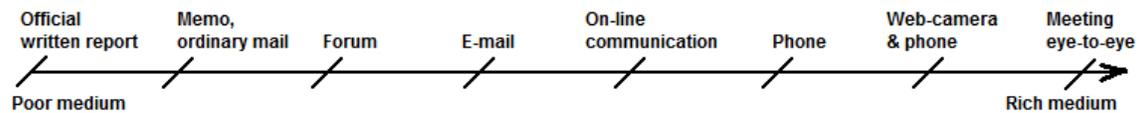


FIGURE 1: Richness of the communication mediums [7]

2. *Time spent on communication* is also an important aspect that needs to be mentioned as the degree of virtuality of the teamwork. It is different when the virtual team members communicate once a month for some minutes using a web camera compared to another virtual team that is constantly 24 hours connected by web camera.

### 3. SOFTWARES IN SUPPORT OF VIRTUAL TEAMS

Communicating virtually needs the help of software in different aspects such as communication, presentation, project management, calendar, account and backups [18]. Software that may be used are as follows:

- The main software that a virtual team need is the communication software, which is used to replace face to face communications. This is not easy but software like Skype, Google Talk etc, can help on overcoming this task. Skype as a communication software offers the possibility to communicate by phoning, chatting, conferencing and video conferencing and works on different platforms such as Windows, Mac and Linux. It is a powerful tool because team members are able to chat and call other members when necessary. The next useful feature is the ability to transfer files. Sending document or screenshots by Skype can be faster than by email, it supports video and works with any camera attached to the computer. Google Talk is software offered by Google Inc. A lot of features has been added to this software from 2005, the year when it has been released, till now. It offers different communication ways, works on many platforms and it is available in different languages.
- Presentation software is also needed. Skype enable communication but it does not allow screens sharing. There are software that offers instance desktop sharing and online meetings, which operates in different platforms, like GotoMeeting, WebEx and BudgetConferencing.
- Successful project requires precise planning and prior research. Time and resources need to be effectively managed to ensure the success of the project. There are certain applications doing this task, like: Basecamp, CentralDesktop, ActiveCollab, TeamWorkLive, QuickBase

etc. This software presents a dashboard view of the upcoming milestones and latest activity. Each person can also get a view of his/her milestones and tasks. The tasks are modeled as a to-do list and can be attached to the milestones, which are connected to a date.

- Calendar is a part of the project management solution, particularly a view of events and milestones. There are quite a few calendaring solutions and one of them is Google Calendar. This software has an intuitive user interface that does a very good job on managing events. Team members can see and book events on the same calendar. Other alternatives are Yahoo! Calendar, Kiko etc.
- Accounting software is also needed. The problem is that the financial matters are complicated and getting software designed to manage payroll, inventory, sales and other needs of a company is a very good idea. Some of the accounting applications are QuickBooks, IntAcct, and Keep More etc.
- Backup software. Despite the kind of work and information, it is better to store them in order to be safe. Now there are online backup solutions that can be deployed quickly and on budget. ElephantDrive is a storage virtualization service used primarily as an online backup tool. It comes with an intuitive user interface, that allows users to specify files and directories that they want to backup. Other solutions may be JungleDisk, Mozy etc.

The software mentioned in this section makes the communication and cooperation of virtual team easier and also lower the infrastructural costs.

#### **4. VIRTUAL TEAMS IN ALBANIA**

Information and Communication Technology (ICT) development in Albania recently has noted a good progress. The usage of ICT in general is increased year by year and the ICT market value is over 550 million Euros [8]. The growth of Internet market in the SEE region is about 40% (Cullen International). Actually the mobile penetration has achieved 110% and internet user's penetration at 31% (ITU) [9], [10]. A survey made by IDRA (Institute for Development Research and Alternatives) during 2007 and 2008 on some medium and big companies, tells us that the usage of internet in businesses has increased too. 84% of those companies were connected with Internet and 58% of them had intranets. The electronic communications such as e-mail, SMS, besides voice conversations is increased day after day. The public administration is connected with an intranet called GovNet [15]. The public administration is using it for internal communications in organization and for communication between organizations. At the same time the public administration is offering interactive online services for citizens and business. These figures tell us that the incentives and ICT infrastructure for development of virtual teams in Albania exists.

Virtual teams are an emerging reality in the Albanian society. Though, the process of building these kinds of teams is still in its first stages. In the following sections, the reader will find the proper information about the current situation regarding this issue from different points of view.

##### **4.1 Virtual Teams and the Government**

Virtual teams are strongly related to the usage of IT equipments and, therefore, to the process of R&D in the field of IT. Hereby, it must be stated that, until some years ago, this issue hasn't been considered as an important one by the government representatives.

Though, recently there are some projects that are focused on the R&D process over IT in a national and international level [13], [14]. These projects will also contribute towards creating broad virtual teams, considering the geographical criteria they fulfill.

The following table gives a summary of the research projects, national and international, over IT made during the recent years in Albania. These projects were part of a bigger project, SCORE, whose aim is to strengthen the strategic cooperation between the European Union and the Western Balkans countries in the field of R&D over IT [16]. Some of these projects are not related

to research only, but mostly to the infrastructure needed to create a proper environment for the future research. This infrastructure is also crucial for the future virtual teams.

Field of research over IT	National Projects	International Projects	Project funding
E-government	Building the LAN infrastructure in the High School of Police and using this for updating administrative and scientific information	<ul style="list-style-type: none"> <li>▪ SWEB</li> <li>▪ GOVNET</li> </ul>	181,215 Euro (not including funding for GovNet)
E-learning E-science E-infrastructure	Setting up the infrastructure for the Academy of Sports in Tirana and using this to share the didactic and scientific information, based on hypertext technologies.	<ul style="list-style-type: none"> <li>▪ SEEREN 2</li> </ul>	75,618 Euro
E-infrastructure E-science	A software that manages the activities of the school registrar and also information in the teaching process	<ul style="list-style-type: none"> <li>▪ SEE-GRID,</li> <li>▪ SEE-GRID 2</li> </ul>	180,220 Euro
Building the Research Policies over ICT		<ul style="list-style-type: none"> <li>▪ SCORE</li> </ul>	100, 000 Euro

**TABLE 1:** Research projects in the field of ICT in Albania

We mentioned above that public administration is connected through GovNet but we didn't mention how it helps in the process of building virtual teams. During the recent years in public administration the routine of daily work in internal communications has been replaced by e-mail as a communication mean between supervisor/leader to his dependents/team members, as a communication mean between colleagues, for exchanging information and also for finishing the given tasks.

Another thing to be mentioned is that the creation of a data pool, or a shared access place with information and documents necessary to be shared with each other, is very common today in the public administration. Usage of ICT is now helping inter-organizational communication and one good example for this is the process of communication between the ministry of European Integration and the other ministries related to the issue. There is a large virtual team created as the EU integration group. This group is composed from different participants as representatives in each one of the ministries and other central agencies. Each participant in this virtual team is responsible for specific tasks under the scope of its institution. In addition each participant as a local administrator has some kind of access to read and put data on the database of national plan of implementation of SAA agreement. Of course as the majority of experiences with virtual teams, this group is not a pure or 100% virtual team, since the group has face to face meetings periodically, but the main way of communication is through ICT, e-mail communication and through web. This way of working in the process of EU integration is an effective way by reducing time consumed and costs.

A last development towards virtual teams is the government project of e-Cabinet, or the online meeting of the Council of Ministers. It consists of online communications with a virtual team during the meeting bringing less papers, less time consumed, lower costs, more transparency and more effectiveness.

Going back to the first part of the paper, at the definitions already given for virtual teams, we are considering a virtual team as “*a group of people who work interdependently with a shared purpose across space, time and organizations boundaries using technology*”. Nowadays some kinds of services are being offered online in Albania, for example e-tax services.

E-tax services consist in a service that enables business representatives to declare tax payments to taxation offices, fulfilling the tax forms and sending them to these offices through ICT. After its submission the taxation office elaborates the form or declaration and sends a message back for further steps. This process can be seen as a bilateral or a joint work.

We have two parts or a group of people working interdependently (they are related with each other to fulfill the task) with a shared purpose in different places, using ICT. We have a model of a virtual team, despite the fact that these two parts are not part of the same organization.

Considering this model, there is already a good development in Albania towards virtual teams. Maybe in taxation field, there will be a higher level of virtual teams if the processes of declaring, fulfilling the forms and paying go through electronic way completely so that we will have no face to face communication.

The Electronic Procurement System has already been developed in Albania and the first public procurement in electronic way was due in 2007. During 2008, 2% of total budget was procured in electronic way while for 2009 at 100%. We are not looking further on electronic public procurement on its pros and cons, but we are looking the electronic procurement as a practice of virtual teams. The Electronic Procurement System gives the procurement units the possibility to be connected remotely. In addition, this system gives the procurement units the possibility to work independently to fulfill *a shared purpose across space, time and organizations boundaries using technology* as a real virtual team.

Some other examples already developed are NCR (National Centre of Registration), and NCL (National Centre of Licensing). The communication between organizations (not only internal communications) goes through electronic way or by using technology.

#### 4.2 Virtual Teams and NGO-s

Virtual teams can also be built between different teams pertaining of several NGO-s residing in Albania or elsewhere. Virtual teams can be very useful in such cases when a continuous discussion and communication is needed in order to achieve the aims each of these NGO-s has in order to build a better society for the future.

Based on the data gathered from such projects as FP6, IS2WEB and SEE INNOVATION, the following fields show the core capacities and competencies of the research NGO-s in the field of ICT in Albania.

Research fields over ICT	Responsible NGO-s for the respective field
ICT for enterprises (business activities, job schedules)	18
ICT for the government	16
Programs, Technologies, safety and reliability	12
Personal environment	10
New media	10
ICT for learning, E-learning	9
Home environment	8
ICT for health	7
ICT for mobility	7

Embedded Systems, digitalization and control	6
Knowledge, knowledge systems of learning	6
ICT for cultural heritage	6
ICT for production	6
ICT for inclusion	5
ICT for Environment	5
Simulation, Visualization, cooperation and mix realities	4
New perspectives on ICT design for the science and other technology disciplines	4
Intelligent Infrastructure	4
ICT for reliability and confidence	4
Future and developing technologies	4
Robotic systems	1

**TABLE 2:** Research fields over ICT and the respective NGO-s

Obviously, many of the fields mentioned above are somehow innovative and, therefore, challenging for the people that work in the respective NGO-s. Thus, a potential space for virtual teams is necessary.

It should be well-known that NGO-s do create large networks between them in order to share their experiences continuously. Thus, considering this and also the numbers given in the table above, anyone could judge about the impact the research over ICT will have on the creation of virtual teams between NGO-s. Meanwhile, the proper network has been already established.

### 4.3 Virtual Teams and Private Sector

Let's see some concrete examples how virtual teams are working in the private sector in Albania. Starting from some years ago, telecommunications companies themselves are using intranet for daily internal communications, e-mail is a normal way of communication instead of previous memos and paper work. In addition usage of SMS is quite normal in communication and helps you to remain connected with team members in daily work. The banks have their intranets and extranets and are 24/7 online connected with their branches, their headquarters and their partners outside Albania.

A lot of international companies are present now in Albania and of course the main way of communication in these companies and especially between local branches and the headquarters is the electronic communication through e-mail. Of course, using e-mail is the most popular way of communication and this is not the highest level of virtual teams but it certainly fulfills the basic requirements of virtual teams' definition. E-mail is the most popular way of communication but it is not the only one. Foreign companies like Eagle Mobile, Vodafone Albania, AMC etc, uses online communication and videoconferencing too. In very specific cases, from our survey we came to know that they even use screen sharing for live system support or live error handling techniques.

If we want to make an assessment of the level of development of this kind of virtual teams of course that they are not pure virtual teams or 100% virtual teams. For some reasons such as the creation of confidence between team members, complexity of projects, the diversity of culture and misunderstanding, there is a crucial need for face to face communications.

However, at the local level it might be difficult and not reasonable or justified to have virtual teams as pure ones or at 100% level. The pure virtual team is helpful in international organizations and in global communications.

For this, let us show an example from the telecommunication sector. ITU (International Telecommunication Union), in order to help the exchange of best practices between different countries and especially on regulatory issues, has established the GREX (global regulatory exchange) as a global communication mean between its members. This group is a global virtual team where members don't know each other, there is no any face to face communications. Each member of this virtual team has the possibility to put a question and wait an answer from any team member of its experience on the specific issue. This is an example of a pure virtual team. In such cases the virtual team is quite helpful and is good to be encouraged.

## **5. CRITICAL DISCUSSION ON VIRTUAL TEAMS REALITY IN ALBANIA**

The critical discussion of the virtual teams elopement in Albania can be done based on three independent activities which are vital for the process of virtualization. According to Dutton [19] these activities are:

- Networking – the usage of ICTs in improving the efficiency and the possibility for gathering and disseminating information.
- Restructuring – the possibility of creating different organizational structures where management roles can be easily interchanged or even sometimes overlapped in order to ensure a good work of the virtual team. Put in a simpler form would be changes in vertical or horizontal coordination as well as work unit composition.
- Learning Culture – the capability for fast learning as virtual teams are more fluid in nature then normal teams, they tend to be disbanded as soon as they complete their aim and get recreated again when a new need arises.

Below we will treat all these activities as they tend to get reflected in each of the sectors described in section 4.

The situation of Virtual Teams in the public sector in Albania as shown above seems promising but still a lot needs to be done in order to improve the situation. In case we analyze based on the three activities mentioned above, the reasons for this situation are:

- Lack of Networking – Even though the government is strongly pushing to a high ICT usage in all the governing fields, there is still deficiency as far as the rural areas are concerned. There are many rural communes, where there is still no internet connection and the computers are only used for office documents creation. As far as the private sector is concerned, there are many cases when eager managers who understand the importance of a strong ICT network have used more expensive means of communication between their company branches. Anyway, more recently there is a lot of investments in this direction with more active measures such as optic fiber backbones laying as well as the liberalization of the market of private telecommunication and ISP companies. This will mean better physical networks, as well as a better situation for the virtual teams in Albania.
- Difficult Restructuring – The government channels in Albania are highly autocratic in nature and there is always resistance to hybrid type of teams in handling different processes. The fear of losing power makes sometimes the office managers reluctant to support the virtual team operability. This is true also for small and medium private enterprises in Albania, whether the bigger companies such as banks or telecommunication companies are more open to new ways of conducting work in general, and virtual teams specifically. The government is being more supportive in this direction by showing a high interest in the ICT and creating also a Ministry for IT and Telecommunication. This ministry is conducting a lot of activities through which it is raising awareness about new ways of doing business and taking decisions.
- Moderate Learning Culture – To be realistic we need to say that the ICT level of knowledge in Albania is moderate. The reason for that is the very long time the country passed under communist regime, and for the last 20 years the country had to built a totally new curricula for

the people's education. The results seems to be really remarkable because in such a short time there are established Universities (public and private) in all the main cities in Albania. The ICT knowledge seems to be in high levels within the big cities but still there is a lot to be done in more rural areas where the number of IT illiterates is higher. This is more visible in the public sector because the private companies seem to be more careful in choosing the right people for the right process. These kinds of knowledge levels have for sure a strong effect also in the possibility of proper functioning of the virtual teams. Anyway with the time, people are becoming more literate in ICT, and in big cities we see people of more ages starting to be more dependent in virtual means of communication, such as emails, messengers and so on.

Even though the drawbacks are still there, with the right decisions from the government, as well as the private sector the virtual teams will have a lot to do in Albania. With the clear evidence of them being used by the big companies such as telecommunication, media, banks as well as central government, more and more organizations will be inclined to follow. The globalization of the world economy is a strong push in this direction, and Albania makes no exception.

## **6. CONSLUSION & FUTURE WORK**

The term virtual team is being used very frequently and as a result a number of definitions have been given about this term. Despite the diversity of definitions, they all have in common words or phrases. The most common assumption is that a virtual team requires use of ICT and that there is a big distance between the virtual team members. It is concluded in the paper that the use of ICT for communication is the most important characteristic for describing a virtual team.

Different views exist on the aspects that differentiate the virtual team from the ordinary team. Some of them consider the geographical distance to be the most important one which makes the difference between the team members. The other one has come to conclusion that the use of ICT for communication between the virtual team members is the main criteria that distinguishes virtual teams from the ordinary ones.

During the last years, virtual teams are being used as a very efficient tool from the Albanian businesses and public institutions. There are several projects, of a national and international level, that are mainly concerned with ICT infrastructure, which would help towards creating a solid base for the daily activities of the future virtual teams.

Several initiatives have been settled that may be seen as potential models of virtual teams, including electronic systems and also new government agencies created to improve the legal services for businesses and individuals.

The most important thing is that there is a general positive approach towards creating these brand new type of teams, since both government institutions and businesses are very interested in this topic and are constantly searching for innovative ways to improve their daily activity. Though, we are still at the beginning phases. The following period will show whether the commitment of these main actors in the Albanian environment towards ICT will be enough to keep the pace of the regional and EU countries. EU integration is the main objective and the integration process will certainly require a lot of communication between teams in different geographical areas. Virtual teams will certainly have their say on this process and should be given the proper importance.

## **7. REFERENCES**

- [1] J.Lipnack, J.Stamps. "Virtual Teams: People Working across Boundaries with technology". J.Wiley & Sons Inc. pp 29 – 31 (2000).
- [2] B.L. Kirkman, J.E. Mathieu. "*The role of virtuality in work team effectiveness*". Best conference paper: Academy of Management Annual meeting. Louisiana, 2004.

- [3] A.M. Townsend, S.M. DeMarie, A.R. Hendrickson. "Virtual teams: Technology and the workplace of the future". Academy of Management Executive. 12:17-29, 1998.
- [4] C.L. Delisle, J.Thomas, K. Jugdev, P. Buckle. "Virtual project teaming to bridge the distance: a case study". In Proceedings of the 32th Annual Project Management Institute, 2001.
- [5] J. Bal, P. Foster. "Managing the virtual team and controlling effectiveness". International Journal of Production Research, 38(17):4019-4032, 2000.
- [6] Powell, Piccoli & Blake, pp 7 (2004)
- [7] Gerda Mihhailova. "From ordinary to virtual teams: A model for measuring the virtuality of a team work". In Proceedings of the Frontiers of e-Business Research Conference. 2006
- [8] AKEP, "IDC Report"
- [9] AKEP, "Mobile Market analysis"
- [10] AKEP, "Monitor". Telecommunication Forum, 45, 16 November 2009
- [11] IDC Report, "Albanian IT Market"
- [12] B.S. Bell, S.W.J. Kozlowski, „A typology of virtual teams" Group & Organization Management, Vol. 27 No. 1, March 2002, pp.14-49.
- [13] <http://www.undp.org.al/index.php?page=projects/project&id=206>, accessed 2011.
- [14] <http://www.undp.org.al/index.php?page=projects/project&id=126>, accessed 2011.
- [15] [http://www.atf.al/img/Presentations in PDF/Information Society in Albania - e-Government perspective – Endri Hasa.pdf](http://www.atf.al/img/Presentations%20in%20PDF/Information%20Society%20in%20Albania%20-%20e-Government%20perspective%20-%20Endri%20Hasa.pdf), accessed 2011.
- [16] Ministry of Information & Technology, "Strategjia Kombetare e Shkences, Teknologjise dhe Inovacionit 2009-2015", 2009
- [17] <http://www.groupjazz.com/pdf/vteams-toronto.pdf>, accessed 2011.
- [18] <http://alexiskold.wordpress.com/2007/02/28/software-for-virtual-teams>, accessed 2011.
- [20] Dutton, WH. "Society on the Line: Information Politics in the Digital Age". Oxford University Press, New York, 1999.

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