A Functional Evaluation of the Commercial Platforms and Tools for Synchronous Distance e-Learning

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Abstract—This article presents a detailed functional evaluation of the main currently available tools that can be used for synchronous distance e learning. This evaluation covers 20 tools commonly used in synchronous e learning. Some tools have been specifically designed for synchronous e learning and others were originally designed for web conferencing, but in their evolution, they have integrated most of the functions included in the tools designed for synchronous e learning. Today, most of web conferencing tools allow the remote presentation of rich multimedia contents, and therefore, they can be used in synchronous e learning with a satisfactory efficiency. On the contrary, most synchronous e learning tools have integrated a very sophisticated web conferencing support, so they can be used for sales presentation, tele-marketing or to support collaborative work. This functional convergence opens a huge market of users for these tools, in which are involved the most important companies of the software and telecommunications sectors.

Keywords—Synchronous distance e-learning, multimedia tools, e-learning tools, functional evaluation.

I. INTRODUCTION

TODAY there are many platforms and tools that can be used for synchronous distance e-learning. However, the functionality provided by tools and their costs differ between them.

The users (purchasers) of the tools need to know the functions offered for each tool and also the interface provided for each tool to access their functions, so that, they can select the tool most appropriate for their educational requirements.

The developers (sellers) of the tools also need to know the functions and interfaces provided by the most commonly used tools, so that, they can develop their new tools with a deep knowledge of the functionality and the interfaces commonly provided by this kind of tools.

In this evaluation work, we present and analyze the characteristics of the main tools commercially available. Next, the essential information obtained from the analysis is summarized in a table, and finally, the conclusions about the functional evaluation are presented.

II. PRESENTATION AND ANALYSIS OF THE TOOLS

This analysis starts with the most powerful and commonly used tools for synchronous distance e learning, which are WebEx and Centra. Then other wide used tools like Live Meeting or its predecessor, NetMeeting are analyzed. Finally the rest of the tools with less share of the market of distance e-learning are also analyzed.

A. WebEx Training Center

The Training Center [1] is the specific tool, or better, the platform of WebEx for e learning. Other available tools are Meeting Center (for collaborative work), Event Center (for presentations to large audiences), Sales Center (for sale promotions) and Support Center (for client support services). This rich set of specific application tools gives a clear idea of the power of the WebEx platform.

This tool operates on the Windows, Linux, MacOS and Solaris operating systems. The clients only must use a web browser, with a plug in installed previously, to have access to the servers of the platform, which are hosted in the WebEx company. Therefore, the Training Center operates as a service provided by WebEx to the customer companies that must pay per user and month to use the tool, although there are also flat rates.

The professor must have access to a portal of WebEx to reserve the class. Next, the professor and the students must access to the virtual class through a network technology developed by WebEx and called MediaTone.

The interface is shown in the figure 1. It is organized in three parts: At the top the menus bar, at the left the zone for presenting contents with a toolbar to make annotations over the contents. On the right part there are sliding panels for videoconferencing (the professor is in the screen), tracking the participants in a session, chat, etc.
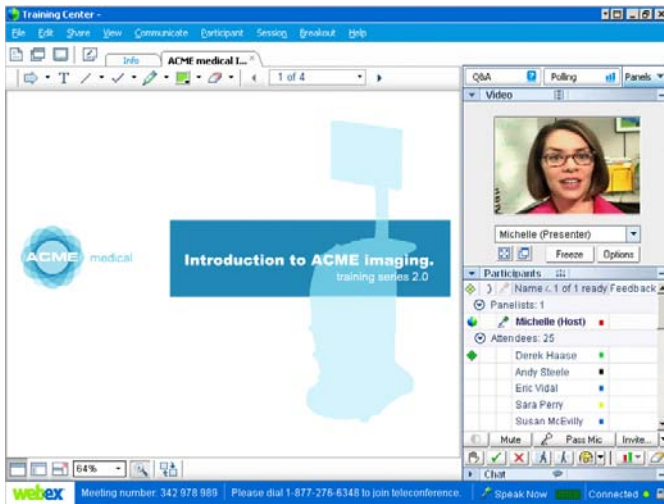
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Fig.1 Interface of WebEx Training Center tool

B. Centra Symposium

The Symposium [2] is the tool or the platform of Centra for e learning. Like in WebEx, it is part of a family of tools for specific applications: e-Meeting (for collaborative work), Conference (for corporative communications to large audiences) and Symposium (for e learning). Symposium was developed first and the other two tools were derived from it. The three tools operate over a central kernel, called Centra 7.

This tool only works on Windows, the servers and the clients. Centra sells the server software and each license of the client software, or a general client license valid for any number of clients. However, a customer company can contract the services of Centra instead of purchasing the software.
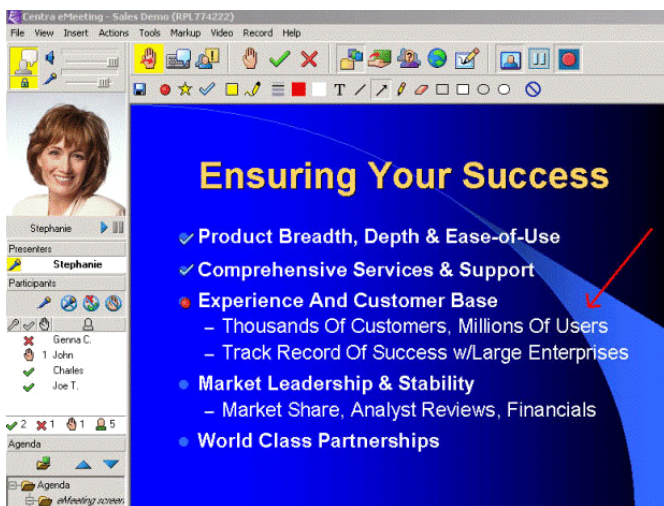

Fig.2 Interface of Centra Symposium tool

The interface of Centra Symposium is shown in figure 2. It has the same basic structure than the interface of WebEx, although the panels, shown on the right side in the interface of WebEx, are presented on the left side in this interface.

C. Microsoft LiveMeeting

The LiveMeeting [3] tool of Microsoft was based on the Placeware tool, designed for e-meetings. LiveMeeting only operates as a service provided by Microsoft

The participants can have access to an e meeting using two types of software clients: a specific program (only for windows) installed in the computer of the participant or a java applet executed in a web browser. A company can pay a monthly license for 5 users, any of which can organize e meetings, or pay a cheaper license when only one of the 5 users can organize e meetings.

The creation of a new e meeting is done accessing a web portal of Microsoft.

The interface of LiveMeeting, shown in figure 3, differs from the two previous tools. There is a main area devoted to the presentation of contents and several windows surrounding it, whose main functions are: show a scheme of the presentation to make easier its navigation; show a list of the participants in the e-meeting and their state (present, absent, intervening, etc.) in a graph similar to a table; it also includes a chat for questions and answers.

LiveMeeting allows the activation of a window for videoconference, but not simultaneously with the presentation of contents.
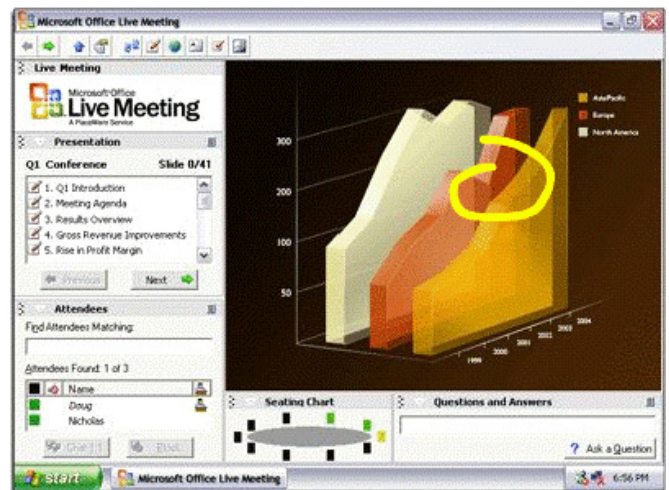

Fig.3 Interface of LiveMeeting tool

D. Microsoft NetMeeting

NetMeeting [4] is an elemental videoconferencing tool that has not specific characteristics focused on synchronous e learning, although it could be used for e-learning purposes with multiple limitations. We have included NetMeeting in this evaluation due to its generalized use a few years ago. It is free, because it is integrated in the Windows XP and there are versions for other operating systems.

NetMeeting can be considered as the predecessor of LiveMetting, and therefore, Microsoft does not provide technical support for this tool that will not be included in the next operating systems of Microsoft, like Vista. The interface of NetMeeting is shown in figure 4, which includes the basic elements for videoconferencing: the video window and the list of participants. At the bottom part there are buttons to start the utilities for e-learning, like the sharing of applications, chat, whiteboard and file transfer.

Fig.4 Interface of NetMeeting tool

E. Interwise Connect

Connect [5] is a powerful voice, web and video conferencing tool designed to cover the needs of mid to large-sized enterprises. It can be used as an ASP service or can be installed in an enterprise network, but Interwise also offers a blended deployment option.

Fig.5 Interface of Connect tool

Although this tool has been primarily designed for conferencing, specific functions for virtual training and web seminars have been included. Therefore, this tool provides and excellent support for synchronous distance e-learning. The figure 5 shows the six parts which compose the interface of the Connect tool.

F. Adobe Acrobat Connect

Acrobat Connect [6], formerly known as Macromedia Breeze Meeting, is a platform designed to enable business users to communicate and collaborate with small and large groups through web conferencing. The users only need a web browser with the Flash Player plugging installed to access the platform. Therefore, this tool operates only as an ASP service accessed through an URL address. This tool offers a complete set of functions to make the e-learning process easy and effective.

Acrobat Connect is totally based on the Flash technology of Macromedia (company acquired by Adobe) and it integrates with tools for generation of multimedia content, like Acrobat Professional to create PDF documents, Presenter to create rich-media presentations, and Captivate to create simulations. The figure 6 shows the interface of this tool, which contains the common elements of these interfaces: a big area for the presentation of educational contents, the video of the professor, a list of participants, and a window for text messages.
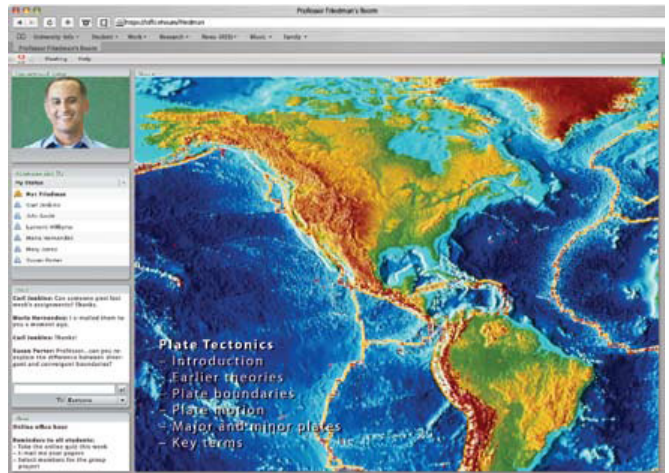

Fig.6 Interface of Acrobat Connect tool

G. LearnLinc

LearnLinc [7] is a tool specifically designed for synchronous distance e learning. It includes practically all the functions required for the development of effective e-learning sessions. This tool can be used as an ASP service or it can be deployed within any organization. This tool is part of a suite with other interesting tools, such as, MeetingLinc, for sales presentations, or ConferenceLinc, for one-to-many events such as Webinars. ConferenceLinc is also a very useful tool for distance e-learning. Figure 7 shows the interface of LearnLinc and ConferenceLinc tools.
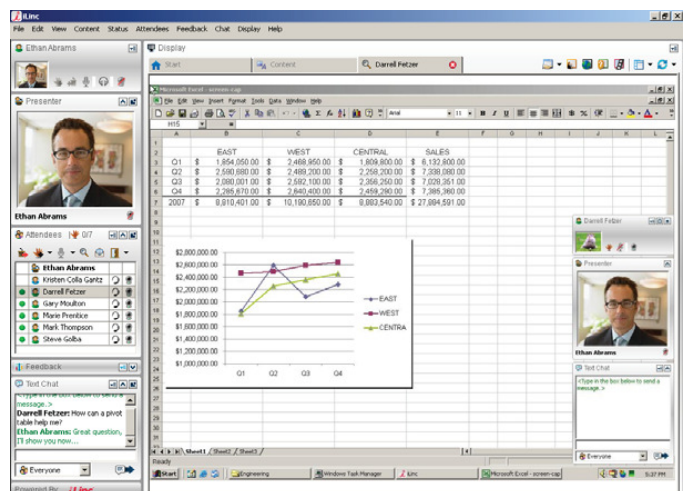

Fig.7 Interface of LearnLinc tool

H. Lotus Same Time

Same Time [8] is a tool clearly focused on supporting cooperative work. However, this tool includes web conferencing capabilities and allows the sharing of presentations, applications and desktops. Therefore, it could be used for e-learning purposes, although it has limitations. Figure 8 shows the interface provided by this tool.

Fig.8 Interface of Lotus Same Time tool

I. Wimba Live Classroom

Live Classroom [9] is a multiplatform tool focused on e learning that provides a complete set of features for distance learning. It operates as an ASP service whose servers can be hosted in Wimba or they can be deployed in the network of the users. This tool can be integrated with other e-learning platforms like Blackboard or WebCT. Figure 9 shows the user interface of this tool.

Fig.9 Interface of Live Classroom tool

J. Elluminate Live

Elluminate Live [10] is a tool for e-learning and collaboration available as a complete client-server product for its integration in a company or as an ASP service. It includes most of the characteristics required for distance e-learning. This tool is multiplatform and it has an SDK to add new functions. There are several editions of this tool: Enterprise, Academic, and Lite. Figure 10 shows the user interface of this tool.
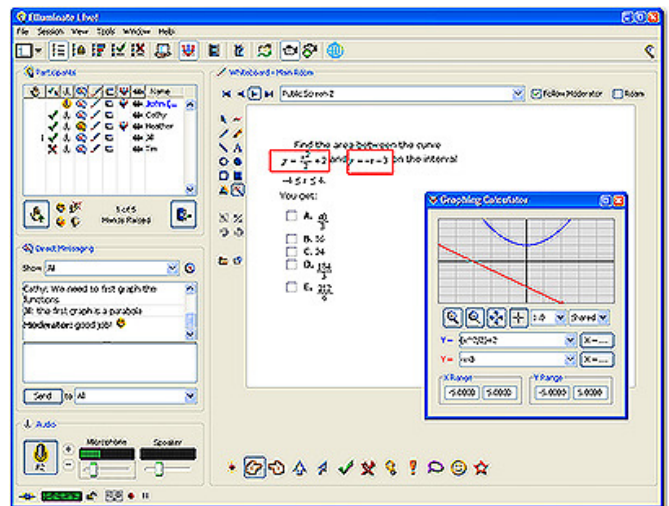

Fig.10 Interface of Elluminate Live tool

K. Raindance

Raindance [11] is a tool with two editions: the Meeting Edition, focused on web & video conferencing and the Seminar Edition, designed to conduct web seminars. They operate as ASP services and include the basic functions required for distance e learning. Figure 11 shows the interface of the Raindance tool.
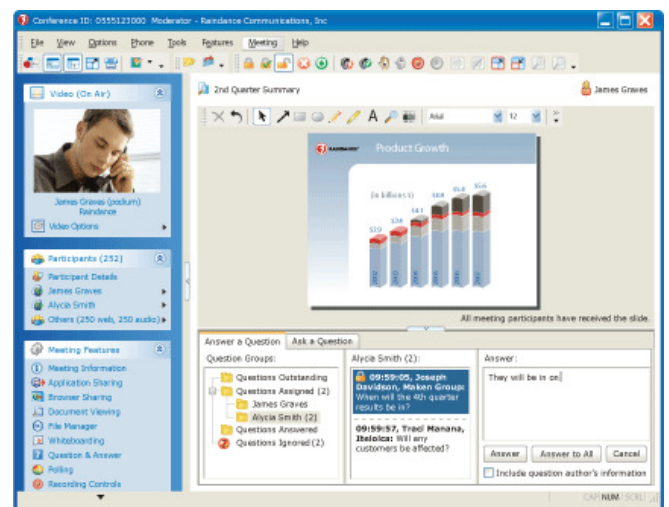

Fig.11 Interface of Raindance tool

L. Marratech

Marratech [12] is a multiplatform e-meeting tool. The client software is free and the users only have to pay for the server software. However, this tool is also offered as an ASP service. Although this tool has been primarily designed for e meeting, it includes all the functions required in synchronous e learning tools. This provides a lot of information about its deployment in a network and its scalability and security issues. The user interface, shown in figure 12, is similar to the interfaces provided by other tools.
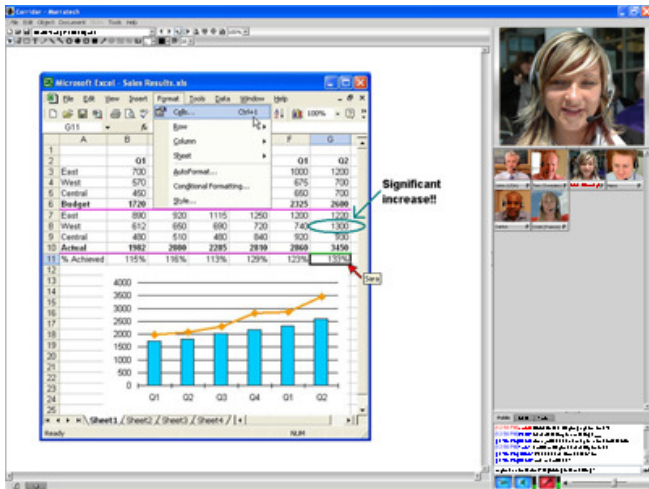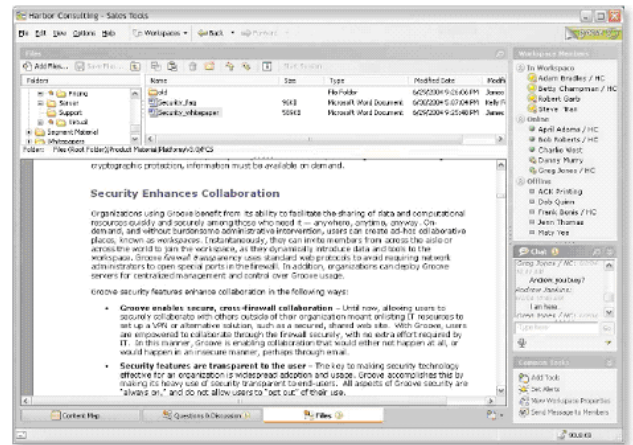
Fig.12 Interface of Marratech tool

M. e/pop Web Conferencing

Web Conferencing [13] is other tool based on distributed servers, primarily designed for conferencing, but that includes excellent options for presenting and sharing documents, in particular PowerPoint documents. It only operates in Windows systems and provides an API and a SDK for customization. The interface, shown in figure 13 is very complete and similar to the well-established e learning tools.

Fig.13 Interface of e/pop Web Conferencing tool

N. Groove Virtual Office

Virtual Office [14] is a tool for file sharing and supporting collaborative work. Although it has not been designed for e-learning, its functions for the remote presentation of documents can be used for e learning. The tool operates with the P2P philosophy, not requiring intermediate servers. Figure 14 shows the interface of this tool.

Fig.14 Interface of Virtual Office tool

O. MegaMeeting

MegaMeeting [15] is a platform mainly focused on videoconferencing, and provides less functionality in other aspects. The professional version (accessible as an ASP service) and the Enterprise version (also sold as a customizable solution) offer a good support to carry out remote presentation of Office documents. It also supports application sharing and the remote desktop control. The access to the service is through a web browser, not requiring the downloading and installation of new software in user computers. However, for the remote presentation of PowerPoint slides, a plugging must be installed, which requires also a Flash Player. Figure 15 shows the interface provided by this tool.
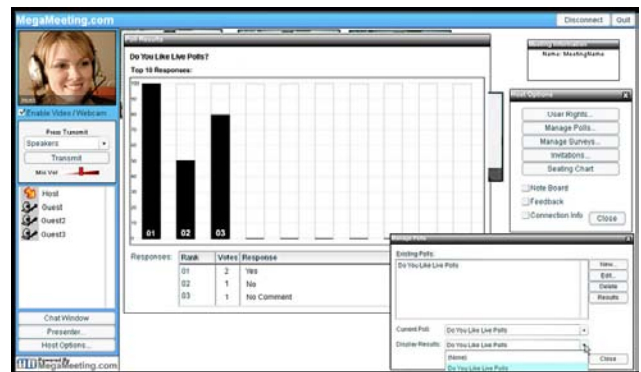

Fig.15 Interface of Megameeting tool

P. VoxWire Web Conferencing

Web Conferencing [16] of VoxWire is a tool similar to the previous, but focused in high quality audio conferences. This tool allows the presentation of contents to the participants, which can interchange text messages (chat) but not sharing applications. A company can use this tool as an ASP service or can purchase the tool. Figure 16 shows the interface provided by this tool.
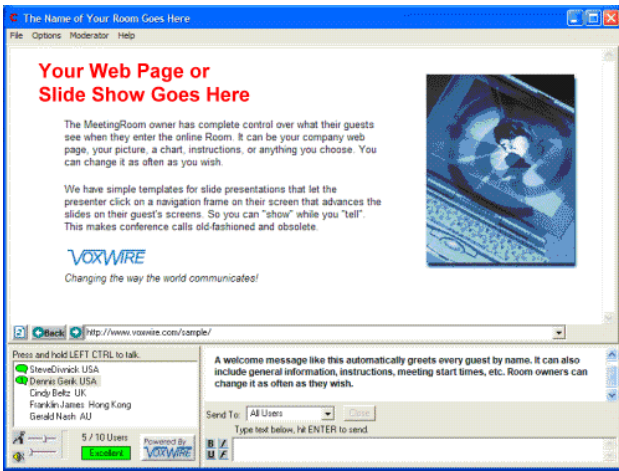
Fig.16 Interface of Web Conferencing tool

Q. HotConference

HotConference [17] is offered as an ASP service. Although this tool has been primarily designed for conferencing, it provides all the basic functions required for e learning and allows changing the visualization mode used by the clients easily. The instructor can control what the clients are seeing. The figure 17 shows the interface provided by this tool, in which, a window to present contents and a chat area can be observed. It also allows the use of a whiteboard to make annotations.
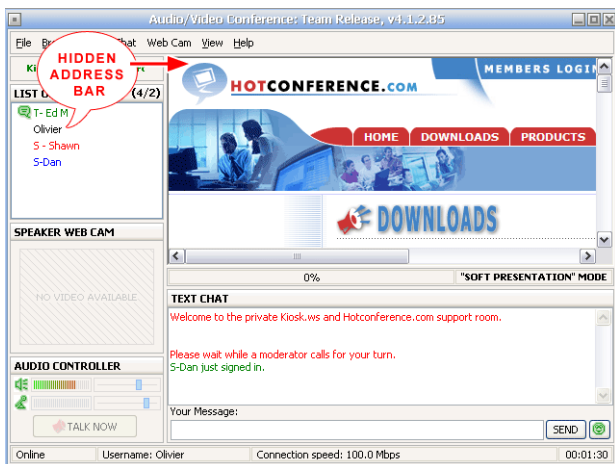

Fig.17 Interface of HotConference tool

R. PictureTalk

PictureTalk [18] is a multiplatform tool focused on web conferencing, but including so many functions that allows using it for e learning. There are three versions: Personal, Professional (both offered as ASP services) and Enterprise (which can be deployed in the network of a company).

The interface of this tool provides a console, in which the professor can select a function: present a document, annotate on a whiteboard, poll the participants or conduct a web tour. This console is shown on the left in figure 18. To present a document to the remote participants, the professor opens the document on a window, and then, he selects the area of the

window to send to the remote participants. After the professor pushes the capture button, the participants will receive the content of the selected area of the window continuously.
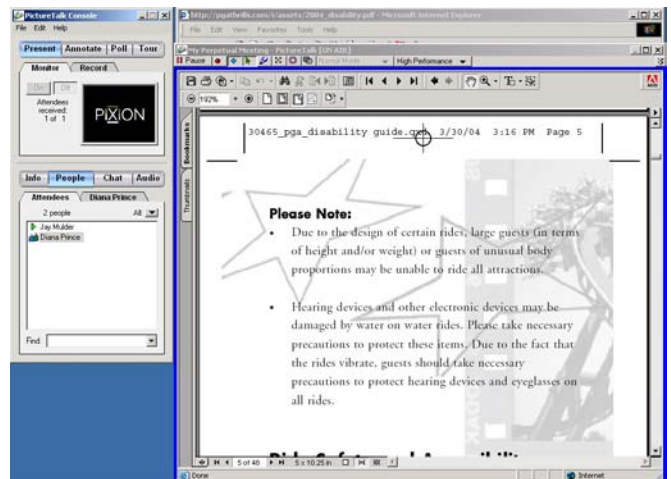

Fig.18 Interface of PictureTalk tool

S. Wave Three

Wave Three [19] is a tool composed of two modules: IP Communications and Conference Server. The first allows establishing point-to-point videoconferences between two users. The second allows deploying one or more intermediate servers to make multi point videoconferences possible. This tool is multiplatform and has functions also available in other tools, although they are not integrated in an appropriate manner to support e-learning sessions. The interface of this tool is composed of independent windows on the screen. Figure 19 shows an example of the common windows displayed by this interface.
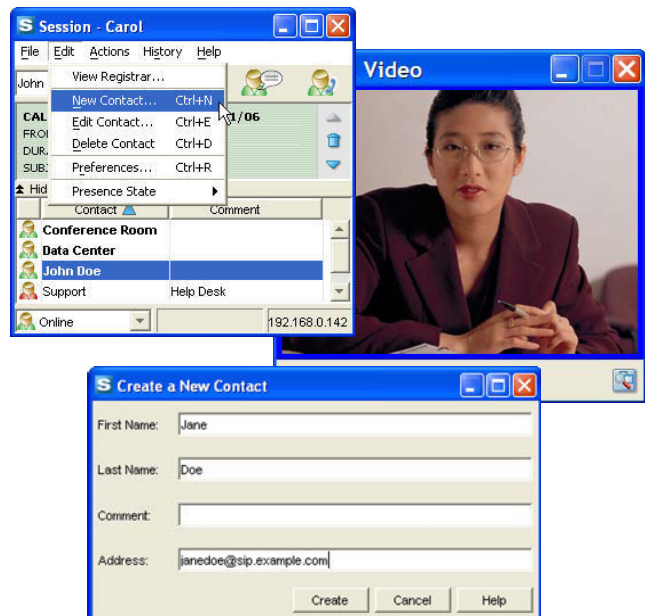

Fig.19 Interface of Wave Three tool

T. WebConference

WebConference [20] is similar to HotConference, but with additional functions focused to e learning and e meeting. This tool is offered as an ASP service, although the service can be hosted in servers of the client company. This tool includes most of functions required to support an effective e learning process. Figure 20 shows the interface provided by this tool, which includes the basic elements in these interfaces.
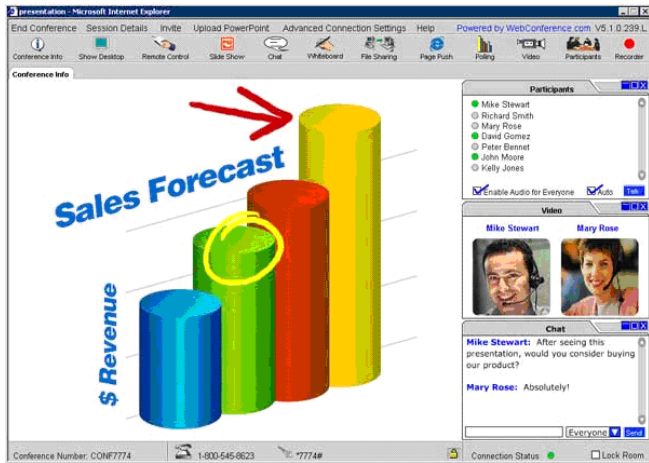

Fig.20 Interface of WebConference tool

III. SOLUTIONS BASED ON HARDWARE

Although this evaluation work is centered on software platforms and tools, there are companies that provide communication solutions that can be used for distance e-learning tasks. Next, we analyze three examples.

Polycom [21] provides excellent video and voice conferencing solutions and offer the appropriate network infrastructure and customized hardware to support them. During a conference, the presenter can show any document to the remote participants. This capability allows using these conferencing solutions for e-learning.

Fig.21 Polycom Instructor FS system

Tandberg [22] offers similar solutions, but it has established alliances with other companies to develop its solutions: for web conferencing with WebEx and for collaboration with IBM, Microsoft and Nortel. Figure 22 shows its integration with IBM Same time.
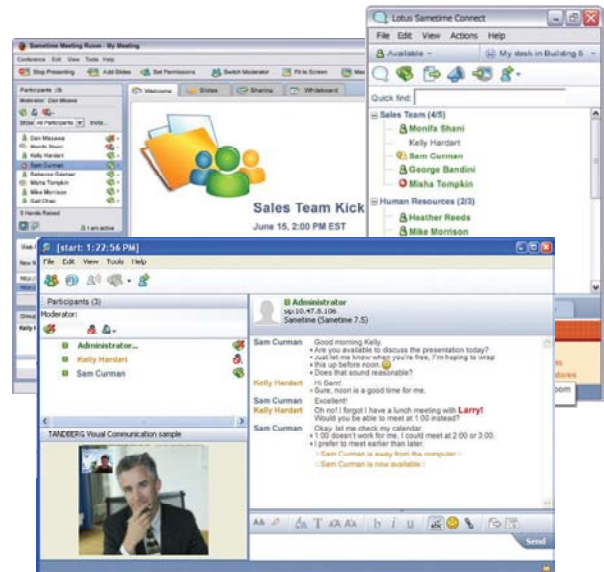

Fig.22 Interface of Tandberg with Same Time

Cisco [23] provides excellent hardware support for web conferencing and also the appropriate software, like the MeetingPlace tool. Figure 23 shows the interface of MeetingPlace tool. However, to provide better e meeting solutions Cisco has acquired WebEx.

Fig.23 Interface of MeetingPlace tool

IV. COMPARISON OF THE TOOLS

Table I summarizes the functional characteristics fulfilled by each of the tools evaluated in this work. The functional characteristics have been organized into several groups so that the information is more easily accessible.

From left to right, the first group of characteristics describes how the tool works: as a service provided by a specialized company or as a complex application installed in the own corporation, etc.

The next group includes the characteristics related to the presentation of contents to the students or learners and the possibilities to make and record annotations over the contents presented by the instructor.

The center of the table shows two characteristics that all the tools provide: the presence control that allows the professor to know the students that are receiving the class, and the chat as the basic mechanism through which the students interact with the professor.

The next group describes the possibilities to send the audio and video of the professor to the students.

Finally, the last group, at the right of the table, indicates the presence of additional characteristics in a specific tool, which can vary a lot between the tools considered in this evaluation work.

When there is not enough information about the presence or absence of a characteristic in a specific tool, a question mark (?) is put in the table.

TABLE I

COMPARISON OF THE CHARACTERISTICS OF THE MAIN COMMERCIAL TOOLS FOR SYNCHRONOUS E-LEARNING

	ASP service	Integrated in equipments	Multiple OS	Multiple languages	Plug-in web navigator	Optimized presentation	Save snapshots	Visualization modes	Annotation	Virtual pointer	Virtual whiteboard	Share screen capture	Share applications/desktop	Remote control	Make/save personal annotations	Simultaneous web browsing	File transfers	Presence control	Chat	VoIP	VoIP multipoint	VoIP to IP telephones	Videoconference	Videoconf multipoint	Integration business env.	Timetable management	Role of instructor	Several instructors	Watch student screen	Division working groups	Questions/polls/voting	Instantaneous feedback	Recording on server	Individual recording clients	API/SDK	Secure comms
WebEx	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•
Centra	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Live Meeting	•		•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•		•	•		•	•	•	•				•	•	•	•	•
NetMeeting		•		•					•		•			•	•	•	•		•	•					•	•	•	•	•
Interwise	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Adobe Connect	•		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•			•	•	•				•	•		•	•
LearnLinc	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•	•	•	•	•	•	•	•	•	•	•	•
SameTime		•	•		•	•		•	•	•	•		•	•	•		•		•	•	•	•		•	•	•	•	•	•	•	•
Live Classroom	•		•		•	•	•	•	•		•	•		•	•	•	•	•	•	•	•		?	•	?		?	•	•	•			?	•
Elluminate Live	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•	•
Raindance	•			•	•		•	•	•		•	•		•	•	•	•	•	•	•	•		•	•	•				•
Marratech	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•				•	•	•	•
e/pop	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•
Groove	•	•			•	•	•	•		•		•	•	•	•	•	•	•	•	•				•	•	•
MegaMeeting	•	•	•		•				•	•	•		•	•	•	•	•	•	•	•				•
VoxWire	•	•		•	•		•			•	•	•	•	•	•			•	•	•		?
HotConference	•			•		•	•	•	•	•		•	•	•	•	•	•	•	•		•	•
PictureTalk	•	•	•		•		•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•		•	•
Wave Three		•	•		•		•	•	•		•	•	•	•	•	•	•	•	•	•		•	•
WebConference	•				•	•		•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•		•	•

I. CONCLUSION

Today, there is a large set of tools that can be used to support a synchronous distance e learning in an effective manner. This set is continuously enlarging, and the simpler tools are constantly improving their functionality, converging all the tools to an excellent functionality level, far enough to support complex synchronous e-learning processes.

However, the tools that can be used for synchronous e-learning can be classified in two large groups as a function of its design objective.

The first group includes the tools that were specifically designed for synchronous e learning, many of them to complement already existing distance e-learning platforms. All the tools of this group provide a complete set of functions to support synchronous e learning processes efficiently. Examples of these tools are: WebEx, Centra, LearnLinc, Live Classroom and Elluminate Live.

The second group includes the tools that have been designed for web conferencing, but with the progressive addition of functions for the presentation of multimedia contents to the participants in a video conference, they can be used as tools to support synchronous e learning processes.

But in this second group it is possible to consider two subgroups. The first subgroup includes all the tools that have added a great set of functions and therefore are appropriate for synchronous e learning. Examples of these tools are: LiveMeeting, Interwise Connect, Acrobat Connect, Raindance, Marratech, e/pop Web Conferencing, HotConference, PictureTalk and WebConference. The second subgroup includes the tools that still provide a limited functionality to support a synchronous e learning process appropriately. Examples of these tools are: NetMeeting, Same Time, Groove Virtual Office, Megameeting, VoxWire Web Conferencing and Wave Three.

As a final conclusion, this evaluation work shows that the functionalities of the synchronous e learning tools and the web conferencing tools are converging progressively, and therefore, their potential number of users is enormous and continues growing. This huge market is attracting the interest of the most important companies of the software and telecommunication sectors, probably because web conferencing enhanced with the sharing/presentation of rich multimedia contents will partially substitute the traditional telephony market in the near future.

Finally, it is interesting to remark this incorporation of big companies to the synchronous e learning market, usually acquiring smaller companies with well-proved technological solutions. Examples of this trend are: Adobe acquired Macromedia to get the Flash technology; Cisco purchased WebEx to integrate a web conferencing and e learning platform with its networking services; and Google acquired Marratech to start a business line on web conferencing.

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