

INTERNET BREAST CANCER EDUCATION: APPLICATION OF JMP® SOFTWARE IN THE ANALYSIS

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ABSTRACT

In this information and technology age, the enormous amount of information that health care consumers must evaluate has forced the development of new approaches to patient education. For example, a new advance in technology, illustrated by the emergence of the Internet as an application development platform, has accelerated dramatic changes in our approach to breast cancer education. Breast cancer is the most commonly diagnosed nondermatologic cancer among women and the leading cause of death for women 15 to 54 years of age. It is believed that fear and ignorance are the primary reasons many women do not seek breast care evaluation. Remoteness and lack of community outreach programs may leave women feeling isolated and removed from necessary treatment and supportive information (Rendina, 1997).

This presentation explains the architecture and the client/server development of the Breast Cancer Awareness and Solutions Network (BCASN) on the Internet and touch screen kiosks. The BCASN is a project undertaken jointly by the Lead Agent Office (TRICARE Region 3) and the Center for Total Access (CTA) at Fort Gordon, Georgia. Program personnel have created a web site and kiosks to provide accurate health-related information to the female population in a format that is easy to use and have thus addressed the urgent need to disseminate preventive educational information to the broadest possible

audience. Plans for data collection and analysis focus on the use of JMP® software.

INTRODUCTION

Beliefs, values and traditions held by women play an important role in seeking health care services. Previous research indicates that many women do not enter the healthcare system until they are faced with disabling symptoms. The first objective of the BCASN is to increase awareness and educate female beneficiaries on the proper techniques to early detection of breast cancer, monthly breast self-exams, annual clinical breast exams, and mammography. The second objective of the BCASN is to educate healthcare providers in the proper techniques for a clinical breast exam. Emphasis is also placed on instructing patients about Breast Self-Exam (BSE). The mission of the BCASN is realized through different modalities, including the Internet and a regional Intranet. Ronald LaPorte, one of the strongest advocates of the Internet as a public health tool, wrote, "much of public health and prevention depends on the transfer of information, which telecommunications systems provide very cost-effectively" (LaPorte, 1994). In the case of the BCASN, the Internet serves as a home resource for women in rural areas to use who may have limited access to hospitals. Using both of these interactive modalities, we will collect specific data to measure the demographics of the users and the effectiveness of the education materials. It is recognized that there is no substitute for qualified medical

information from a physician. However, this project advertises to the female consumer to become informed and thus more empowered.

OVERVIEW OF THE ARCHITECTURE

The architectural design of the BCASN (See Figure 1) emphasizes access for the female beneficiary population and the health care provider population of the Department of Defense (DoD) TRICARE Region 3. This region encompasses all of Georgia and South Carolina and the majority of Florida. The Southeast Region of the DoD health care system is home to a very large beneficiary population, including active duty military, family members, and retirees. There are sixteen military treatment facilities (MTFs) within this region. Health care providers staff the sixteen MTFs (hospitals and clinics).

Information is decimated directly to all 16 of these sites by way of a large Intranet, called the Southeast MEDNET. Design and implementation of the BCASN is done at the CTA, Fort Gordon, Georgia. The interactive HyperText Markup Language (HTML) based content is loaded into a Cheetah Video Server by the multimedia staff of the CTA. This information is then downloaded to the other sites through the Southeast MEDNET (via T1 communications). Each mirrored remote site has an additional Cheetah server, which is connected to the MTFs. Local Area Network (LAN). Both patients and health care providers utilize the educational materials over the LAN. Patients utilize a touch screen kiosk with an internal MPEG card to view the multimedia content, which includes still images, 2-D and 3-D

animations, audio and full screen, full motion video. The entire multimedia package is housed in an HTML framework. Healthcare providers may also access all of the patient education materials. However, the workstations at the provider desktop do not have touch screen monitors, and they are controlled with a conventional mouse. In addition, providers may log in and view digitized videos for Continuing Medical Education (CME) credits and receive news and updates on changes in healthcare policies and the latest research findings.

As both the patient and the provider access the BCASN network, interactive feedback is recorded about each session. Demographic data is gathered on the site visitor as well as their response to questions pertaining to their medical history. These data are recorded to the video server at the MTF, and then the data are uploaded over the Southeast MEDNET back to the development server at Fort Gordon. Data are stored in a Microsoft® Access centralized database for analysis.

The Internet site, www.bce.army.mil, is available globally, but advertising efforts are targeted to TRICARE Region 3. Information for both patients and providers will be available over the World Wide Web in a manner virtually identical to the Intranet content. Data collection will be stored in the same Microsoft® Access database at the CTA.

The Web-based Data Integration System encompasses a master database stored on the Cheetah Video Server at the CTA, with the Breast Cancer Web Server component connection through the CTA's LAN (See Figure 2). The passage of data is transmitted by TCP/IP

protocols. A common scenario would allow the home user, using their local Internet Service Provider (ISP), to connect to the breast cancer web server (www.bce.army.mil). The home user can begin a new session, or continue a previous session initiated at a MTF kiosk. The video server at the MTF utilizes the video server Intranet connectivity. The web server processing uses Microsoft® Internet Information Server, giving the developers access to Active Server Pages (ASP). Exposed ASP data objects allow the developers a means of transmitting from the client browser Microsoft® Internet Explorer to the Microsoft® Access Database stored on the Cheetah Video Server at the CTA.

The Microsoft® Access Database holds the entire Internet and Intranet visitor demographic data and query information, as illustrated (See Figure 3). Quiz responses are obtained specifically from two pre/post tests on breast cancer risk factors and the surface anatomy of the breast. Pre/post test responses for health care providers, a prerequisite for CME credits, are also stored in this database.

Multimedia content development is a dynamic continuum rather than a static process (See Figure 4). Based on the data collection and direct feedback, all of the educational content will be evaluated for business process reengineering. Updated data analysis will occur at regularly scheduled interviews throughout the life span of the Breast Cancer Awareness and Solutions Network. Based on the data collected, assessments can be made regarding the effectiveness of the teaching methods used in the interactive learning. Early data may suggest that

the content is very effective for an audience which has obtained a high school education, but ineffective for an audience with a lower educational background. If this were found to be the case, a second package of information would then be generated for users identifying themselves as having a lower level of education.

All the interactive media development devices are illustrated in Figure 5. Medical illustrators create artwork and special effects, including 2-D and 3-D animations. A digital audiovisual engineer oversees all audio and video content. These elements are then integrated into an HTML framework through a team effort by the webmaster and database designer. All medical information is reviewed by a panel of medical subject matter experts through every step of development.

DEBUGGING

Winn (1995) calls debugging a process by which coding errors in a computer program are identified and corrected through a sequence of activities. There is virtually no support for the ASP code written in the Microsoft® Visual InterDev Environment. There are plans for future integrated coding environments to support debugging and error checking for the new web-based ASP code. VB Script programmers know the difficulties of programming for the client-side browser. They are familiar with the inadequate error messages the browser spews out. For example, a misspelled word results in a type mismatch. Microsoft recently released a script debugger that is a plug-in to their Internet Explorer. Since VB Script is embedded into ASP files, the programmer still has access to the Err

object, which contains information about the last occurring error that the interpreter encountered (Homer, et al., 1997). This object can be used to send a more friendly error message to the client. Also, using the **On Error Resume Next** statement, the programmer can have the interpreter skip known problems without causing the interpretation to cease. This paradigm shift causes "the great debugger" to keep abreast on his error prevention skills.

Coding for the server-side is even worse. With no means of debugging, and virtually no way to "look under the hood," one can often be forced to spend a great deal of time looking for errors as simple as a missing semicolon. With more than 50% of the programmer's time spent chasing such minute "needles in the haystack," this becomes a rather formidable foe.

There is yet another hurdle for the Visual Basic (VB) developer to overcome. Coming from the wealth of the VB language to its subset, Visual Basic Scripting Language (VB Script), forces the developer to "unlearn" much of his Visual Basic vocabulary. For example, the programmer uses familiar and beloved VB commands in the Microsoft® Visual InterDev environment only to discover that they didn't make it into the subset of VB Script. Optimistically, the debugging errors have been recognized and solutions are forthcoming. One potential problem in the development application model was discovered. For example, ensuring the sequential data ID during Logon to a globally accessible database did not upset any other Logons that were performed concurrently (Homer, et al., 1997).

HYPOTHESES

One major purpose of this educational program was to design a multimedia approach to increase female awareness on breast cancer by increasing their knowledge and access, at an acceptable cost, using the latest technology. In that endeavor, conscious strategies were initially developed to answer potential research hypothesis. Search of the previous medical literature as well as data mining capabilities would guide the analysis. Data mining would be used to explore the data structure of the Internet and the Intranet databases (data marts). For example, factors that increase the risk of breast cancer may be closely linked to factors that keep patients from seeking care, i.e. social and economic (Riegelman, 1996) would be compared with time-dependent covariates (like race and TRICARE enrollment) as well as predictor variables (Income or Education). This illustrates data mining techniques, employing advanced statistical methodology. Another example would entail analyzing the factors that contribute to the early exit of site visitors. These hypotheses are analyzed once sufficient data has been collected.

DATA METHODOLOGY

JMP® software version 3.1 has a unified approach, by its integration of statistics with graphics, and has methods of handling all combinations of the three basic modeling types of data: continuous, ordinal, and nominal (Gjertsen, 1995). Schmidt (1997) suggests a data modeler use a conscious strategy initially to describe the domains, attributes, relationships, and classes to describe the data enterprise. In

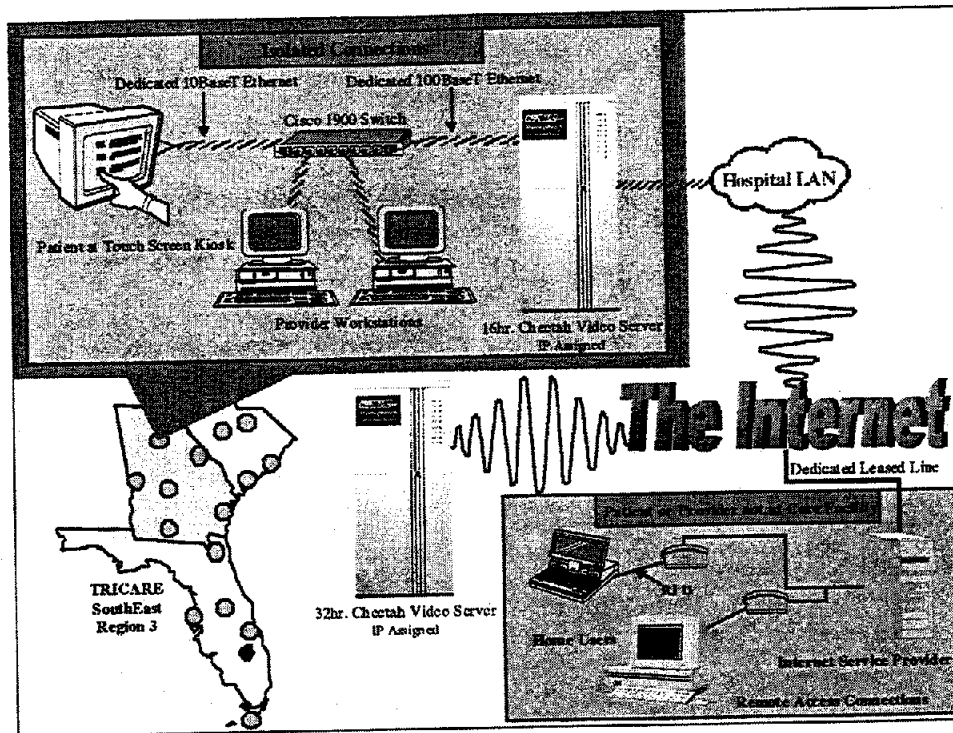
this case, the D-Optimal design facility in JMP will allow the data analyst to search for choice models to identify separate groups. This would facilitate a break down in the number of users in rural versus urban areas. In contrast, when both the response and the factor are nominal or ordinal, such as with educational level and had instruction, data are summarized by frequency counts (JMP™ User's Guide, 1989). The analytical capabilities in the JMP® software will allow the statistical navigator, by the point-and-click method, to rapidly highlight and view the data structure for critical differences among the elements. Furthermore, the navigator can identify and select the specific effects and factors and perform data hypothesis tests.

CONCLUSION

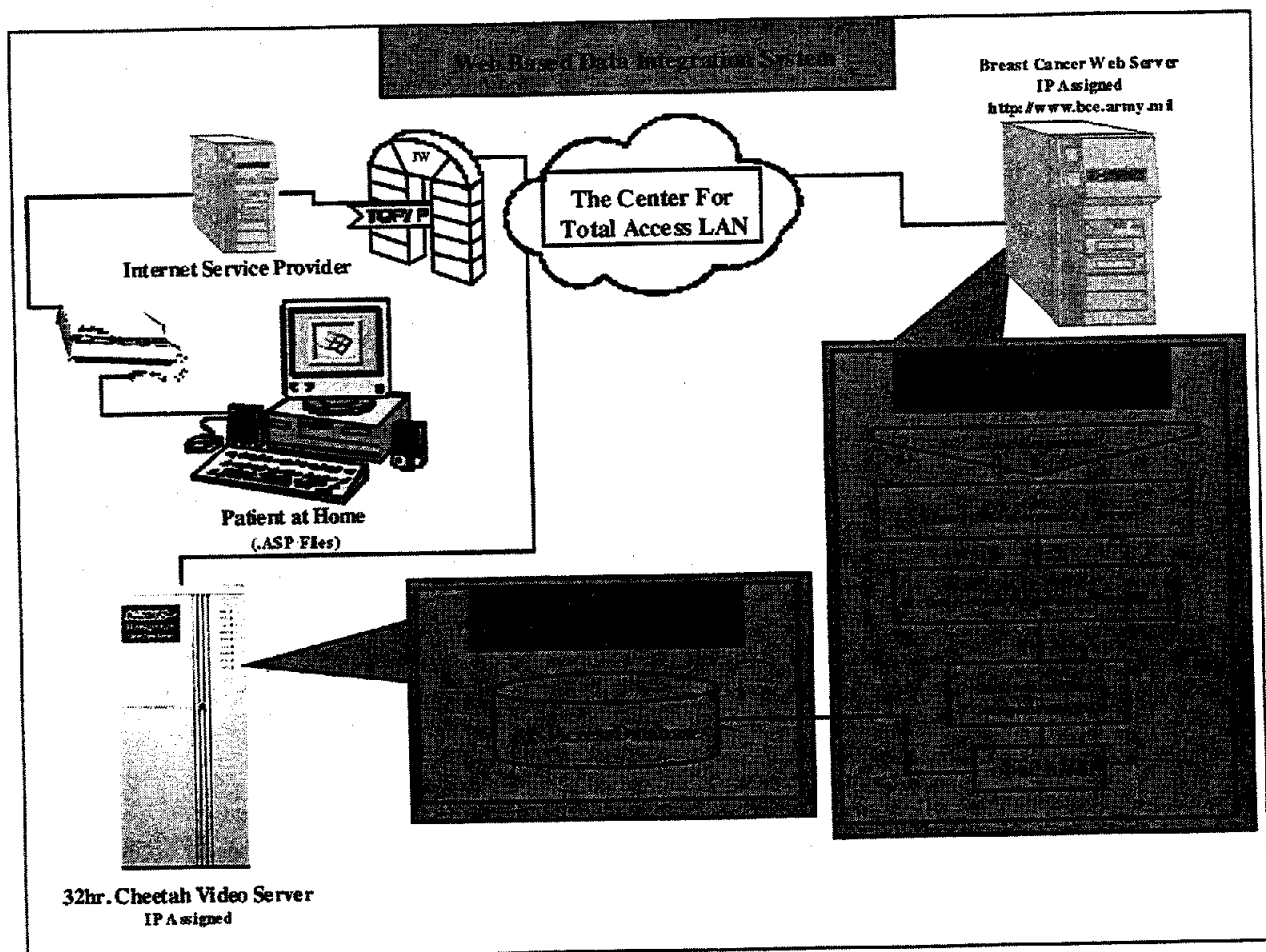
The role of the Internet, especially innovative ways of message delivery, is ripe for

the exploration and marketing of novel strategies in the reengineering of health care systems. The design of this preventative educational program, described in this paper, is one effort to improve female access and to increase their breast cancer knowledge by the multimedia modalities. This dovetailing of telecommunications and a preventative educational program may achieve the stated objective of increasing the likelihood of the female seeking access to a health care provider when conditions are warranted. Data analysis, over time, should provide the answer if the education material presented on the Internet and Intranet were effective. The data collection process and the data analysis were succinctly described with the special note that no data existed at the time of the submission of this article.

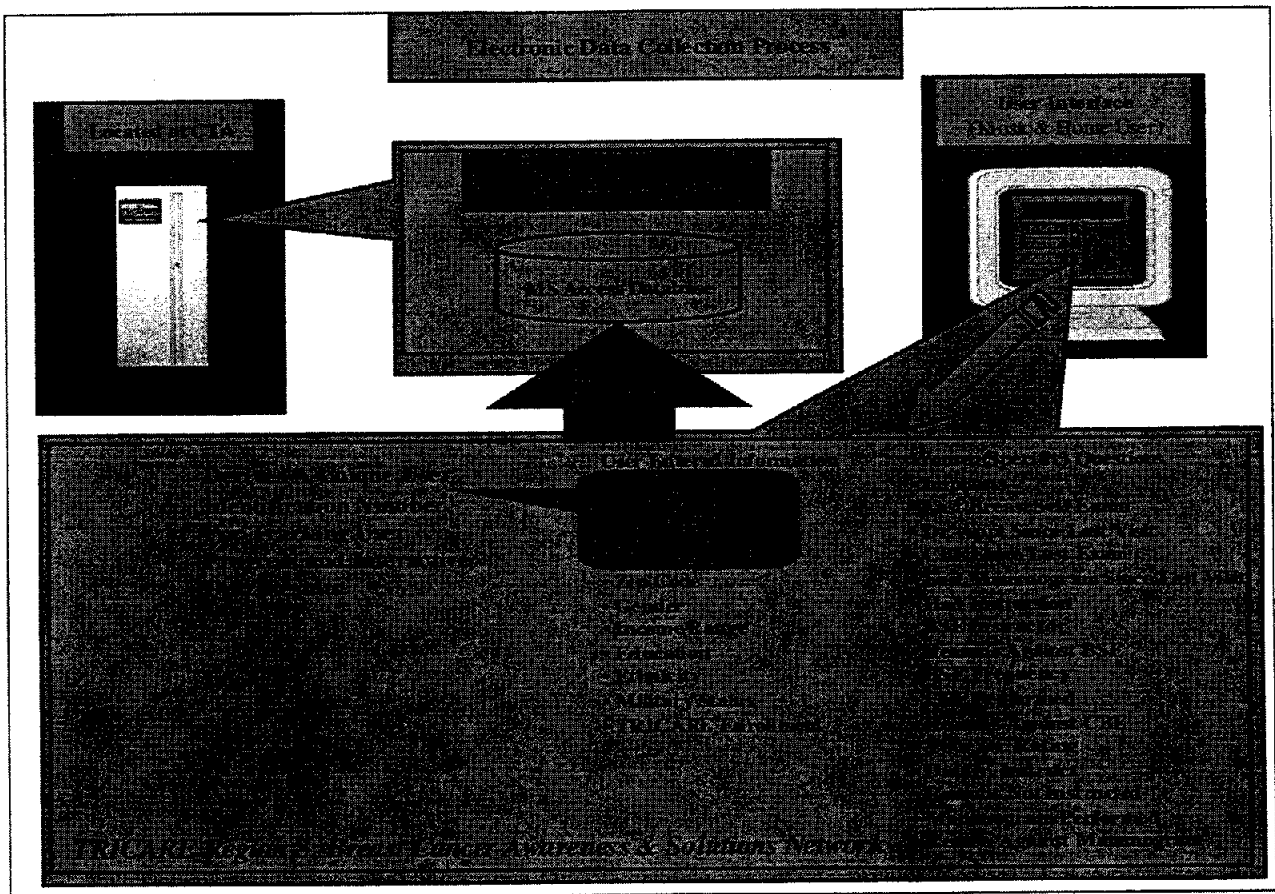
Appendix 1



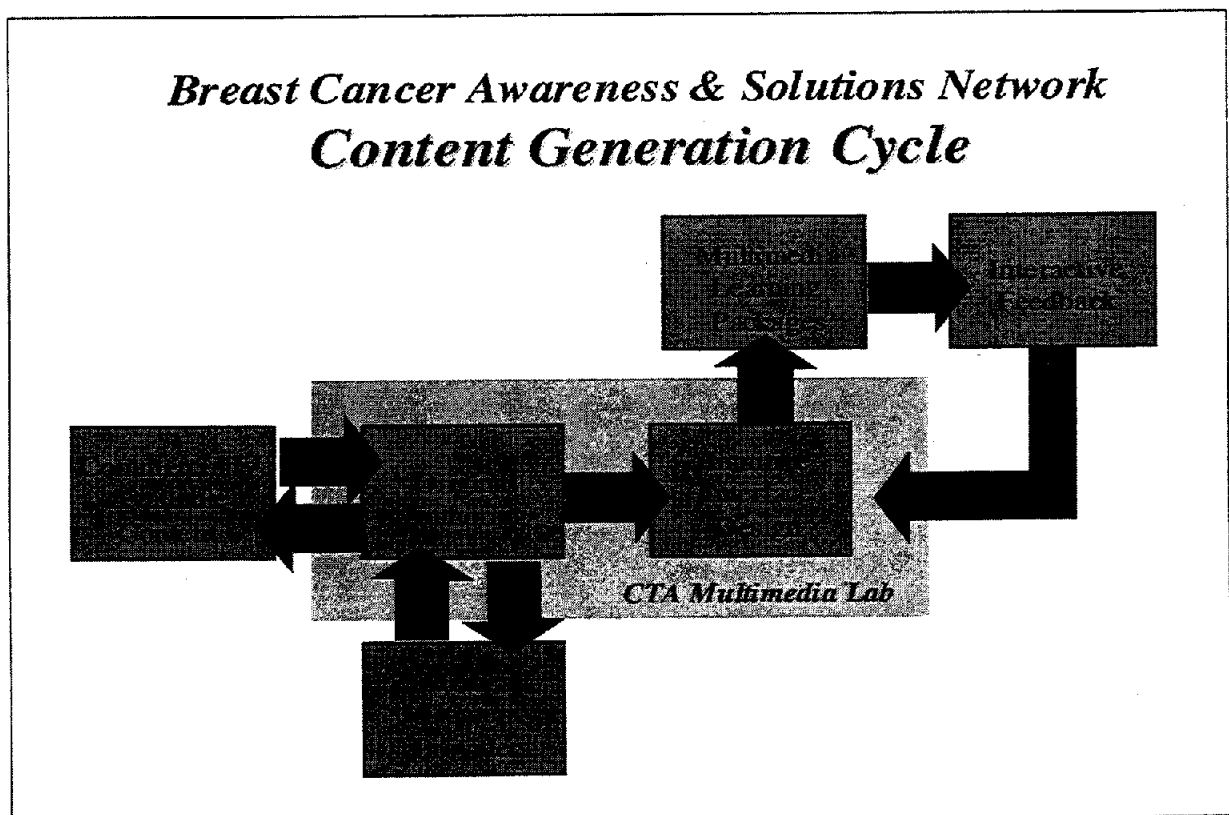
Architecture of Remote Connections [Figure 1]



Web Based Data Integration System [Figure 2]

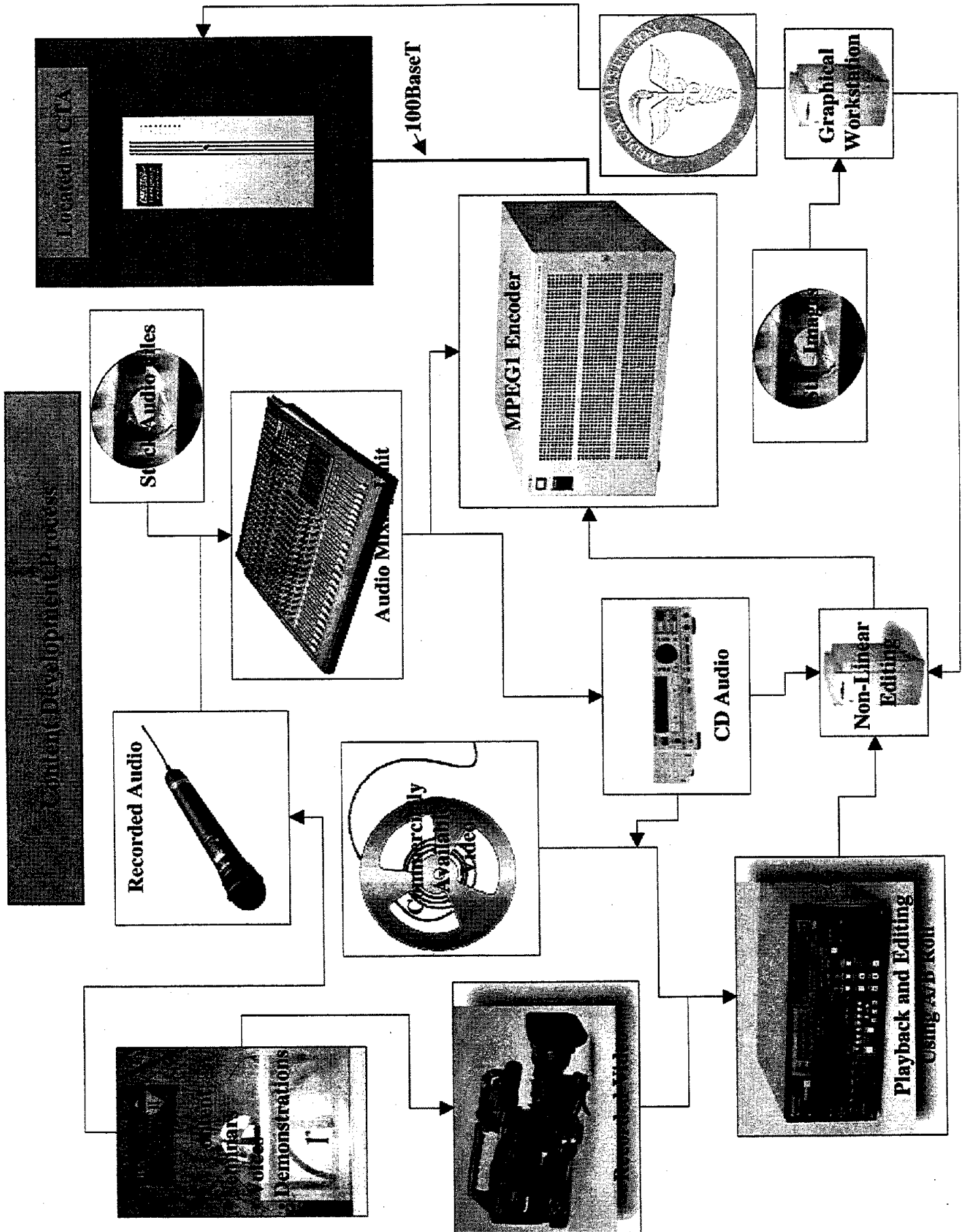


Electronic Data Collection Process [Figure 3]



Content Generation Cycle [Figure 4]

Content Development Process [Figure 5]



REFERENCES

- Callahan, E. (1997), Microsoft® Access 97 Visual Basic Step by Step. Redmond, Washington: Microsoft Press.
- Casey, B. (1996), "Performing Web Magic with CGI," NetGuide. March. 101-102.
- Gjertsen, W. (1995), "An Introduction to JMP Software®, Release 3.1, SAS Institute's Statistical Visualization Software for Both Macintosh and Windows," SUGI 20. 391-397.
- Hirsch, R. and Riegelman, R. (1996), Studying a Study and Testing a Test. Boston: Little, Brown and Company.
- Homer, A., Enfield, A., Gross, C., Jakab, S., Hartwell, B., Gill, D., Francis, B., and Harrison, R. (1997), Active Server Pages. Birmingham: Wrox Press Ltd.
- LaPorte, R. (1994), "Standards for information systems in the global health network," Lancet: 344 (8937): 1640-1641.
- Patrizio, A. (1997), "OLTP On The Web," Information Week, July. 1A-3A.
- Rendina, M. and Zadinsky, J. (1997), "Technology Applications of Breast Cancer Education to Scattered Populations," Technology for Distance Education UNC Workshop proceedings, September. 101.
- Sall, J. and Lehman, A. (1997), JMP Start Statistics: A Guide to Statistics and Data Analysis Using JMP® and In® Software. Duxbury Press: SAS Institute, Inc.
- SAS Institute Inc. (1989), JMP™ User's Guide. Cary, NC: SAS Institute Inc.
- Schmidt, B. (1997), "A Taxonomy of Domains," Database, September. 95-99
- Tittle, E. and Stewart, M. (1997), "More than one way to Intranet," NetGuide, August. 81-86.
- Viescas, J. (1997), Running Microsoft® Access 97. Redmond, Washington: Microsoft press.
- Winn, T. (1995), "Debugging SAS Macros," SUGI 20, 346-352.
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