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Agora: A Marketplace of Voice, Data, and Video Technologies

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Abstract

The Information Superhighway continues to be a desirable, but elusive, goal for many organizations. While the concept is attractive, information system professionals are encountering numerous obstacles in their attempts to merge and use voice, data, and video technologies. This paper outlines those obstacles, and then presents results from a case study of an organization which has experienced early success in its attempt to overcome them. Lessons drawn from this organization's planning and implementation process are discussed.

Introduction

As noted by many observers, the evolving capabilities of information technology (IT) have raised the stature of this corporate resource from the role of a supporting asset, automating everyday operations, to a strategic asset, capable of capturing and sustaining a favorable position within the competitive marketplace. Therefore, it is not surprising that many leading organizations are devoting even larger amounts of time and monetary resources towards researching and forecasting how various classes of IT (communications, processing, storage) will change patterns of work and competition. Perhaps the most discussed, but yet least understood IT-based innovation in this domain is the so-called Information Superhighway. This large-scale integration of the three classes of IT, coupled with the ever-expanding capabilities of each, promises to make more information available to more sites at faster speeds and in richer formats. In essence, the popular metaphor of this electronic entity suggests that firms not on the verge of exploiting it will be "left on the off-ramp", or even worse "roadkill".

Such popular connotations and their implications raise a number of complex issues regarding both the development and use of network-based technologies. For instance, what types of services will be offered and to whom? Does the technological and social system have a purpose? Unfortunately, it is these important issues which tend to be

ignored by many organizations seeking to find their place on the Information Superhighway. Yet, without due consideration of these questions, the user community within organizations can splinter into groups of "haves" and "have nots" and the creation and usage of information products can become unfocused resulting in lost productivity and frivolous expense.

Project Agora

At Boston College, a framework has been developed which will allow the University to deliver all of the technologies of the Information Superhighway (data, voice, video) through an integrated networking solution at about 50% of the cost of a local phone bill. Importantly, this network will provide services to all members of the user community eliminating the issue of "haves" and "have nots". Further, the delivery of these disparate technologies through a common telecommunications and software platform will make their integration transparent to the user. For this reason, the project has been dubbed "Agora", the Greek word for marketplace, in contrast to the rather impersonal Information Superhighway. This concept, along with the technological and managerial "lessons learned" from its planning and implementation offer many significant guidelines regarding philosophy, implementation, and technology for other organizations seeking to design appropriate architectures for the electronic marketplace. The focus of this research is to document the evolution of this innovative initiative in an effort to better understand the complexities facing analysts and IS executives as they introduce the emerging electronic marketplace to their community of users.

Obstacles In Realizing The Electronic Marketplace

Ideally, the electronic marketplace should be a reliable and useful assortment of information products which is easily accessible to each member of the user community. However, many obstacles stand between this ideal and the current reality.

Technological Issues

Cable companies and network providers are now installing high speed lines to homes as well as universities and corporations. In addition, phone utilities are attempting to expand their reach into home networking and value-added products. However, major issues regarding the depth and breadth of network access for home users as well as the limited technological capabilities of many existing telecommunications infrastructures have yet to be substantively addressed. Further, the form and source of front-end programs (e.g. Mosaic, Gopher, Netscape) which would be used to navigate the network remain unresolved. These issues coupled with the even larger issue of protocols have created an environment of technological uncertainty and inhibited the full realization of the electronic marketplace.

Economic Issues

Along with technological issues, many network providers are grappling with the economics of integrating voice, data, and video. Major players are currently battling over which vendor segment (and legal entity) will control the network. Issues of pricing for various user segments (home, education, commercial) also cloud the economic horizon of the electronic marketplace.

Regulatory Issues

The regulatory structure of network providers represent another level of complexity in the integration of voice, data, and video. Phone utilities have 24 hour uptime and are regulated by State utilities commissions. Unfortunately, these networks typically cannot handle the high speed load required for data and video traffic. Cable networks can handle this load; however, their track record of uptime is dismal. Adding further complexity to this mix, cable corporations are regulated at the town or city level. In addition, the FCC, numerous federal agencies, and state legislatures offer numerous challenges to developers seeking to integrate the technologies of the Information Superhighway.

Agora: The Merging Of Voice, Data, and Video

Clearly, significant obstacles are involved in realizing a practical and useful merger of the three major classes of IT. However, in attempting to do just that, Project Agora has been well received throughout its planning process, and has experienced notable success in the early stages of implementation. Major milestones realized to date in the initial phases of this innovative undertaking are enumerated in the following sections. While much remains to be done, the lessons learned thus far provide interesting insight into the initial planning and execution of these particular projects.

The Road To Realization

1. Regulatory Changes.

If the law says voice transmission cannot be carried over cable lines, then that is the reality. Unfortunately, until recently, the regulatory climate has been one of separatism. However, with the FCC deregulation of cable in 1994, the opportunity has finally been presented to transmit multiple types of traffic over single lines. At Boston College, this has meant partnering with a large Cable TV company to use their existing infrastructure for transmission of voice, data, and video signals.

2. Technological Progress

Such regulatory permission is useless without technological capability. Asynchronous Transfer Mode (ATM) provides this capability. ATM is the most talked about subject in the communications industry because it is the first technology to merge voice, data, and video communications into a common format that is equally and equitably efficient for each. It is a tremendous improvement over past approaches, which were optimized for one type of traffic and provided only marginal service for the other. ATM is the first

technology to provide a common format for bursts of high-speed data and the ebb and flow of the typical voice phone call. In addition, the format it uses is equally at home in any network -- local, wide-area, public or private.

Planning the infrastructure was the first phase of Agora. Instead of allowing a quick fix or "Band-Aid" mentality to permeate the project, an ATM backbone is being installed throughout the campus which supports both Ethernet and ATM speeds. This network will be used in conjunction with the Cable Company's architecture to act as a flexible backbone for the campus, one which will be able to accommodate transmission needs of the foreseeable future.

3. Economic Justification

Top ATM speeds require fiber optic cable, which is expensive to purchase and install. However, with segmented ethernets and optimal positioning of wiring closets (70 meters apart as opposed to the traditional 100 meters), Boston College can accommodate ATM transmission over copper wires. In the interim, when ATM speeds might be inappropriate, Ethernet speeds can continue to be used. This flexible design allows for full transmission capability while utilizing previous capital investments.

An SL-100 telephone switch has been purchased by the university, which eliminates the Regional Bell Operating Company's financial control over the university's telephone service. "Breaking" of the switch computer code is a technological nightmare, but once done allows the usage of the university's mainframe to manage the switch, a model easily emulated by other organizations.

Boston College has entered into partnerships with major corporate players from four critical IT segments: Telephone Switching / PBX, Cable, Long Distance Service, and General IT. Companies were chosen based on their high national and regional profiles, and a demonstrated economic commitment to the region. The partnerships are based on mutual gain, and have resulted in discounts for many of the services planned to be offered.

Details of the Three Classes

The above mentioned progress has allowed the following specifics:

Voice

The purchased telephone switch is designed to operate without failure and provide phones in a cost effective manner for *all* 13,000 employees and undergraduates on the campus. This switch can grow to service 30,000 people if needed. In support of this expanded service the university has secured two additional telephone exchanges and has applied for a third to allow assignment of individual phone numbers to students. These numbers will stay with the students throughout their Boston College stay, regardless of their movement on or off campus. Further, the switch will allow for students to take

advantage of on-campus services such as registration and other university systems while reducing cost to the university for supporting lines from the Regional Bell Operating Company. Each student will get "free" local dial-tone and access to a discounted long distance plan from the university. Finally, the installation of Personal Communications Systems (PCS) over the two main campuses will provide a lower cost alternative to the approximately 50 cellular phones already used by campus staff. PCS phones will work as desktop extensions allowing staff in positions requiring a high degree of mobility to move freely without requiring a second telephone number.

Data

As mentioned, an ATM backbone with high speed data access is being installed throughout the campus. The cable network will be used to deliver high speed Ethernet access "to every student's pillow". Having such a network will allow for the elimination of the university's slow speed modem pool (2400 bps and below). The network will start off at Ethernet speeds and be expanded through low speed ATM (25 Mbps) to full ATM (155 Mbps) as demand grows.

Video

Video will be transmitted on the nation's first 720 channel digital interactive cable system. This system will start with 50 channels and be expanded as growth demands. The channel line-up will consist of a mixture of Educational, cultural and entertainment channels as well as four channels for internal Boston College use. The cable system will have the ability to broadcast radio signals over the channels as well and have an emergency broadcast system for the campus police department.

The university has negotiated a contract that allows for an extremely inexpensive cable-TV bulk rate plan, contingent on certain factors (e.g., The university must pay for all capital additions --including new channels; The university does first line maintenance, the cable company does all other maintenance, etc.).

As one of the first fully two-way interactive cable systems and the first on a major college campus, new services can be developed in a cost effective manner and used as a model for organizations throughout the country. The interconnection of distance learning, full interactive TV and extreme high speed data throughput will allow for access to data banks and bulletin boards, with the goal being the increase in productivity of all members.

Final Thoughts

What makes this project unique is the merging of the three main technologies of the NII (National Information Infrastructure), not for technology's sake but for the sake of the services being provided in a cost effective manner. While networking technologies currently change about every three months, studying the planning process and realization of Agora at Boston College nonetheless offers many general guidelines for both planning

and implementation. These guidelines can be used by organizations planning to take all of their members for a drive on the Information Superhighway.

REFERENCES

Available from Charles E. Downing upon request.