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Joseph A. Sellinger, S.J.
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MULTIMEDIA FOR SPONTANEOUS INTERACTIVE LECTURING -- THREE PLATFORMS COMPARED

WRIGHT AND LARSON

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John Larson
Professor of Economics
Loyola College in Maryland

George Wright
Assistant Professor of Management Information Systems
Loyola College in Maryland

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Abstract

Classrooms are an emerging, demanding, and important environment for multimedia. We compare IBM PS/2, Apple Macintosh II, and Commodore Amiga as multimedia platforms relative to support requirements for college lecturing-and-discussion settings in which high levels of interaction occur. Technical, economic, political, and operational feasibilities are considered. Each platform is found to be an excellent tool for developing and presenting linear and hypertext presentations, but at present only Commodore Amiga fulfills the more demanding support requirements associated with spontaneous question and answer sessions. Multitasking and interprocess communication capabilities are the platform's pivotal features.
Multimedia for Spontaneous Interactive Lecturing
Three Platforms Compared

1 Introduction

Multimedia technology is becoming more productive and accessible to classroom lecturers. Our intent here is to consider multimedia for its usefulness in lecture-and-discussion settings where a prime requirement is computer support of spontaneous responses to unanticipated questions. This requirement seems beyond earliest notions of multimedia, and even hypertext, but fully consistent with the newest multimedia developments.

Newness and growing capabilities lead to an evolving definition for multimedia. Only a few years ago, multimedia was called a collection of technologies that may one day be joined together. Soon easier parts of the puzzle were solved. Elementary animation, sound, and video became possible additions to our traditional presentations containing text and graphics, with slides and transparencies being replaced with computer screens and projectors. In this context “space-based” graphics, text, and images were being supplemented with “time-based” data, such as digitized voice, animation, and video. Now it is becoming essential to view and use multimedia technology as means to integrated solutions. Multimedia must unite and exploit the best features of information flowing from personal computers, compact disks, video cameras and cassette recorders—the best-selling consumer electronics innovations of the past decade. Newest definitions of multimedia extend beyond integration of text, graphics, sound, and video. Presently, the multimedia objective is to have software for designing, producing, and controlling presentations on a single hardware platform, using a single user interface. In our consideration of three multimedia platforms we find the critical evaluative factor to be this ability to integrate: to use as needed the specialized capabilities of hardware and software components.

IBM PS/2, Apple Macintosh II, and Commodore Amiga are compared as multimedia platforms relative to support requirements for college lecturing-and-discussion settings in which high levels of interaction occur. Technical, economic, political, and operational feasibilities are considered. Each platform is found to be an excellent tool for developing and presenting linear and hypertext presentations, but at present only Commodore Amiga fulfills the more demanding support requirements associated with spontaneous question and answer sessions. Multitasking and interprocess communication capabilities are the platform’s pivotal features enabling the ability to form integrated solutions.

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1 This paper was supported by grants from the David D. Lattanze Center and the Loyola Institute for Business and Economic Research of Loyola College.
2 Is Multimedia Worth the Investment?

Breadth of the multimedia toolkit imposes a large price tag, often more important in terms of the time investment dimension than actual dollar outlay. Routine use of the tools implies an investment in familiarization time and development time. How can that investment be justified? Is the payoff large enough?

One justification is that multimedia presentations are more engaging. Students are often said to demand entertainment along with educational content. Multimedia, we believe, goes beyond mere entertainment. It offers the potential for a rich learning environment that stimulates students to absorb more and retain information longer, especially where concepts are extensive, complex, and visually representable.[8, 3] Many traditional instructional methods offer such richness. These methods as well as multimedia are sensitive to the fact that today's technically sophisticated, graphics oriented students demand more than a linear discussion, illustrated simply with chalk diagrams.[15]

Another justification is that multimedia can help distill information from masses of data. An unexpected finding made vivid or a new graphical comparison can provide that element of surprise which can help distinguish information from data. Using the interactive tools of multimedia, students and teachers can quickly reinforce lessons with data explorations that encourage further questions, answers, and intellectual growth. Queries can be addressed spontaneously, thus encouraging students to be curious and quickening a classroom's "information metabolism."[9] The importance of this is why newest definitions of multimedia stress the need for new ways to access an underlying database of facts, whether stored as graphics, videos, sounds, or numeric tables. More sources of information can be accessed; technical roadblocks to information access can be reduced.

Obviously these two justifications are related. Any technique which streamlines a lecture, focuses it on the audience's interests, and facilitates audience interaction will stimulate, engage, and sometimes entertain as well. What platforms will do the job? Is any one better than the others?

3 Multimedia Requirements

To consider what platforms might do the job, we must first take a closer look at what the job actually is. Our multimedia objective is not simply to supplant traditional classroom visual aids with high-tech substitutes. We want to achieve the interactive lecturing environment just introduced. Since hardware and software choices should always be driven by requirements, let us consider our requirements more deeply.
3.1 Multimedia in the Classroom

Our primary requirement is interactive lecture support. We are not interested in computer-based training instruction or self-paced tutorials. We want to assemble a set of multimedia tools to allow individual classroom teachers to enhance their own classroom presentations. This goal leads to several objectives.

3.1.1 Interactivity

There is no question that the venerable transparency supplement to classroom lecturing can be improved with multimedia technology. An authoring package plus a large file of on-disk images ease lecture preparation, improves content, and promotes periodic refinement of visual aids. The folder stuffed with transparencies hastily culled from last semester's folder can be replaced with a floppy disk of images drawn from hard disk.[5]

As useful as such technology is, we still want more than just a high-tech transparency emulator. We want two key features for classroom multimedia support: hypertext interactivity and spontaneous data manipulation.

Hypertext interactivity links words or groups of words to related information, graphics, or video. The lecturer is no longer constrained to linear flow. By activating the hyperlinks, audience interest in a given topic can be explored by following the linked hypertext; the lecturer controls the path and the timing through the material. Interactivity is available on the IBM platform through the Audio Visual Connection (AVC), an IBM software product for creating and controlling multimedia presentations. On the Mac, similar control is available through MacroMind Director version 2.0 (MMD), a product of MacroMind, Inc. The corresponding product on the Amiga is AmigaVision (AV).

Spontaneous data manipulation is a much more exacting requirement. Hypertext provides answers to anticipated questions, but we want to field the unanticipated or spontaneous question. This is the key point.

The following scenario communicates what we mean by this.

1. A macroeconomics professor uses a multimedia platform to present the circular flow of economic activity. The fundamental diagram shows how labor and other resources owned by households flow through the marketplace to firms where goods and services are produced for sale to households. In this easily animated economic circuitry it is visually evident that quantities of labor and products flow in one circular direction while cash flows associated with market transactions between buyers and sellers flow in the opposite direction.

2. A student asks about the relationship between unemployment and consumption expenditure.

3. The professor uses the multimedia tools to display a graph of the specified relationship.
4. The professor then modifies the graph to display inflation adjusted consumption.

5. Further graphics, e.g., plots of linear combinations, mathematical transforms, etc., are displayed as the discussion dictates.

While this may seem a demanding requirement, it is certainly a legitimate one in any business school. It seems almost indispensable in a business graduate curriculum. It would also seem that any multimedia platform capable of meeting this requirement could meet less stringent requirements a fortiori. We find that the interprocess communication requirement, which enables spontaneous data manipulation, rules out the Mac and IBM platforms.

3.1.2 End User Accommodation

Our spontaneous data manipulation scenario recognizes that our target users, academic lecturers, have already learned to use software tools in all their activities. For most business school lecturers, the software tool of choice is a spreadsheet. IBM users almost exclusively use Lotus 1-2-3, with Quattro beginning to make an appearance. Mac users use Excel. Lecturers use these tools for database management, analysis, and presentation graphics. They want to continue to use these tools, rather than adapt themselves to the data management, analysis, and display capabilities offered by multimedia software. In the first place, they do not want to invest the time in learning new tools. In the second place, multimedia packages do not generally offer the same capabilities as specialized packages.

We therefore require a tool-based multimedia platform: one that, in addition to its own capabilities, provides access to the capabilities of other software tools. In other words, we do not want to be limited by the capabilities built into the multimedia authoring package. We want to be able to draw on the capabilities of spreadsheet software tools we have already mastered. If, for example, a professor uses a spreadsheet program to plot macroeconomic data, the ideal multimedia platform should support this same plotting strategy.

3.1.3 Off-the-Shelf Availability

Our orientation to the individual classroom lecturer leads us to conclude that multimedia development require a minimum of programming. We recognize this requirement might conflict with our desires for power and flexibility. Nevertheless, we believe that multimedia for lecture support will succeed best if the lecture supplements are prepared by the individual lecturer. Our target users are not interested in a platform which requires them to program in a high level language.
3.1.4 Simple Flow Control

Business faculty want more than keyboard-based flow control for multimedia lecture support. Our primary lecture audience is executive MBA students. This audience is an experienced and demanding one. Discussion sessions are no less electric than executive meetings in a corporate board room. A professor interacting with them in a lecture should not be tied to elaborate keyboard sequences for multimedia flow control because of the potential for error, certainly, but also because accumulated experience with classroom computer usage shows that keyboard control tends to be relatively slow. Mouse-driven control is speedier than key stroking, and acceptable as an important augmentation of the keyboard. Touch-screen control is even faster and is almost error free in some applications. For an application suited to touch-screen control we find the mouse to be just a device residing between the finger and the screen icons.

Within the application scenario we are using a large-screen display is well positioned in the classroom for easy viewing by all students, driven from a console controlled by the lecturer/discussion leader. The discussion leader must not be tied to attention-absorbing hand motions. In the high-pressure give-and-take of discussion with executive graduate students, even the hand-eye coordination necessary for mouse manipulation is thought to be too demanding.

3.1.5 Ambient Light Display

Note-taking remains a part of our academic environment. Any projection technology to be used for lecture support must allow ambient light sufficient for note taking. It is no less important to have lighting at a level which enables interacting people to visually communicate with ease.

3.2 Test Scenario

In order to examine all the foregoing factors in a realistic setting, we use the macroeconomic lecturing example presented in section 3.1.1. We use a graphics package to construct simple line drawings illustrating the circular flow of income. A multimedia authoring package is used to develop a linear presentation similar to what an instructor would use in a series of overhead transparencies. In conjunction with this we use a spreadsheet package to store a database of macroeconomic data taken from *The Economic Report of the President*. The spreadsheet package is also used to prepare plots of economic variables versus time and one economic variable versus another.

The major challenge for our multimedia platforms is to provide smooth integration of the linear presentation with interactive data exploration and analysis. Could the authoring package interact with the data management and display capabilities of the spreadsheet? If so, the lecturer could use the benefits of multimedia for interactive follow-up to the linear presentation, responding to
unanticipated questions. If not, the lecturer has no more than a high-tech alternative to overhead transparencies, albeit a more interesting one.

4 Standard Multimedia Platforms

We consider three multimedia platforms

- The IBM PS/2 model 80,
- Apple Macintosh IIcx, and
- Commodore Amiga 3000.

These machines are all "high end," but not necessarily the most comparable machines in the three vendors' product lines. Nevertheless, they are representative configurations, all considered by the vendors to be competent multimedia platforms. We treat them in order of their presence in the typical business school.

4.1 IBM

Like most business schools, we use IBM or DOS-compatible computers almost exclusively. For purposes of multimedia experimentation, we use an IBM PS/2 model 80, with an 80386-25 processor, math coprocessor, 18 megabytes of RAM, and a 300 megabyte disk. For system software, we use both OS/2 Version 1.3 Extended Edition and MS-DOS Version 5.0. For multimedia development, we augment the basic machine with IBM's M-Motion Adapter and Audio Capture Adapter. We use IBM's Audio Visual Connection (AVC) for graphics and multimedia authoring. We use Lotus 1-2-3 Version 3.1 for our spreadsheet.

The IBM platform is fast, colorful, powerful, and quite expensive. IBM equipment requires much more user configuration than the others. That is, multimedia use requires addition of the audio and video peripherals. This is quite easy to accomplish on the PS/2 product line. IBM's Atlanta multimedia operation is available for phone assistance in configuring the AVC software.

Unlike the Mac-based and Amiga-based authoring packages, IBM's AVC uses a text-oriented interface rather than a graphic, icon-oriented interface. We consider this a subjective factor, not an objective one. We must recognize that microcomputer technology is inexorably moving away from the text-based interface. Doubtless IBM will either upgrade AVC to a graphic user interface or replace it with some other graphic software product.

On a more substantive note, at present, we are unable to integrate off-the-shelf spreadsheets with AVC. It is possible to write a C language program which uses named pipes under OS/2 to communicate information among programs. There are two big problems with this. First, one of our goals is to achieve interactive lecture support without resort to high level language programming.
In the second place, Lotus, our off-the-shelf spreadsheet, is not compiled to respond to such interprocess communication. We began to explore controlling Lotus by having AVC write a data file to be read by an auto-execute Lotus macro, but we are not pursuing this. It involves more technical arcane than desired.

4.2 Macintosh

As a representative Macintosh platform, we use a Mac IIcx. This machine features a Motorola 68030 with math coprocessor, 8 megabytes of RAM, and an 80 megabyte hard disk. The operating system is System 6.0.7. Canvas 2.0 is used to create graphics and MacroMind Director (MMD) version 2.0 is used as the multimedia development and control environment. The Mac’s colorful, high resolution screen and its graphical user interface make it a pleasure to use. Mac applications, by the nature of the hardware, work well together under a consistent interface. Except for the following: Mac software does not provide the multitasking support necessary for spontaneous data manipulation. MacroMind Director is unable to call upon other Mac application software to supplement its own capabilities. Version 2.0 of MMD does provide an interface to external routines, but the routines themselves must be programmed to respond to MMD.

As of this writing, no otherwise useful off-the-shelf programs are so programmed. For example, MMD would not be able to request MicroSoft Excel to construct a plot of two variables. MMD documentation explains that the user can construct a routine that would do such a plot, but it would have to be programmed in a high level language, using MacroMind’s XObject Developer Kit.11

As our experimentation with multimedia continues, we are gradually turning away from the Mac. While it is an excellent platform for hypertext lecture support, it does not have the power to meet our user requirements for utilizing a range of software tools for spontaneous data analysis.

4.3 Amiga

The third multimedia platform we experiment with is the Commodore Amiga 3000/25. Like the Mac, this machine uses a Motorola 68030 processor with math coprocessor. It has 5 megabytes of RAM and a 100 megabyte hard disk. System software is Commodore’s WorkBench 2.0. We use DeluxePaint III as a graphics package, SuperPlan as a spreadsheet, and AmigaVision as the multimedia authoring software.

Amiga features a graphical user interface of its own, unlike either the Mac or the IBM presentation manager. The display is not as crisp as the Mac’s, but it does provide the standard 640x480 VGA resolution. And, with four colors (unless a lower resolution mode is selected), the display is not as colorful as a Mac’s.
The Amiga's strength as a multimedia platform lies in its system software, designed as a true multitasking executive.[7] As with the Mac's multifinder (or System 7.0) and IBM's OS/2, multiple programs can reside in memory, sharing the processor's time. Only the Amiga operating environment features an interprocess communication language. This language, ARexx, allows running programs to interact with each other. Since these multitasking and interprocess communication capabilities have been available since the Amiga's inception, all significant Amiga productivity software supports these features.

4.4 Costs

We do not use IBM, Mac, and Amiga hardware and software configurations designed to maximize cost comparability. Configurations used are those billed by the vendors as appropriate for multimedia development. This complicates cost comparison. IBM appears significantly more expensive, but note that it is our only platform with a tape drive. Amiga seems much more economical, but the "cost" of backing up its 100MB hard disk onto several dozen 800KB floppy disks is unstated.

Tangible costs of the examined multimedia platforms are summarized in Table 1. These costs are neither highest nor the lowest obtainable today, but they are what we paid for our equipment over the past year.

To reiterate, Table 1 is a list of what we paid, not a presentation of comparable or expected relative cost. Nevertheless, the table does suggest a pattern you are likely to experience with costs: IBM hardware and software is the most expensive; the Amiga and the Mac are cheaper. The most dramatic economic consideration is the much lower cost of Amiga software. For example, authoring software for IBM and Mac lists in the $500 range. AmigaVision comes bundled with the Amiga. We find that software incidental to multimedia development—such as animation, graphics, 3-D modeling, etc.—is so cheap for the Amiga that users could buy it themselves. Equivalent software for IBM and Mac is so much more expensive that users would seek other funding, thus delaying development at best.

5 Discussion

Some of our requirements may be irrelevant in choosing one platform over another. For example, the requirement for simple flow control does not distinguish among the PS/2, the Mac, and the Amiga: all respond to mouse control. The PS/2 and the Amiga also can be configured to respond to touch-screen control, if a touch-sensitive screen is available. The Mac using Macromind Director does not offer this capability, but this does not seem to be an overriding consideration given excellent mouse control. Similarly, the ambient light display requirement does not distinguish among the platforms. We find that liquid crystal display
Table 1: Multimedia Platform Costs

<table>
<thead>
<tr>
<th>VENDOR</th>
<th>ITEMS</th>
<th>COST</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>PS/2 mod 80</td>
<td>8,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M-Motion Adapter</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Audio Capture Adapter</td>
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<td></td>
<td>A/V Connection</td>
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<td></td>
<td>CD-ROM</td>
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<tr>
<td></td>
<td>Tape Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External Speakers</td>
<td>31</td>
<td>8,531</td>
</tr>
<tr>
<td>Apple</td>
<td>Mac IIcx*</td>
<td>3,081</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8-bit Color Adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor</td>
<td>419</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MacroMind Director</td>
<td>619</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canvas</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,327</td>
</tr>
<tr>
<td>Commodore</td>
<td>Amiga 3000/25-100, 1950 VGA Monitor</td>
<td>4,715</td>
<td></td>
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<tr>
<td></td>
<td>System Software</td>
<td></td>
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<tr>
<td></td>
<td>AmigaVision</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DeluxePaint III</td>
<td>99</td>
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<td></td>
<td>External Speakers</td>
<td>31</td>
<td>4,944</td>
</tr>
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</table>

*The Mac IIcx cost is a close-out price. The IIcx is no longer in production and, if found, can probably be obtained for less. A comparable Mac IIci, currently in production, lists for $6,169 with a $3,941 educational price.

plates for use with overhead projectors, such as the Telex MagnaByte 6000 or the Davis Transview Color, accommodate all three platforms with 640x480 resolution, full color, and enough speed to project animations and full-motion video without smearing—all with sufficient ambient light for note-taking.

Other requirements do distinguish among the platforms. The functional requirements for interactivity, end user accommodation, and off-the-shelf availability combine to mandate multitasking and interprocess communication. That is, our requirements are met best by the platform that best supports interaction among programs running simultaneously. Our target users, classroom lecturers, prefer individually to use different software tools: each wants to build his or her presentations around customary and preferred tools. Users prefer not to change software tools to accommodate the demands of a multimedia package. We can meet user needs only if the multimedia solution can spawn, call, or otherwise utilize the users’ favorite software packages.
5.1 Platform Feasibility

5.1.1 Technical Feasibility

Technical feasibility is the question of whether a given configuration can do the job by meeting requirements. Our functional requirements imply a technical requirement for multitasking and interprocess communication. Technically, the Mac cannot serve. While extensive, custom programming might be able to overcome this limitation, such programming conflicts with a requirement for end user accommodation.

The Amiga, designed for multitasking, is the most technically advanced. Its operating system and wide range of application software present all the multitasking and interprocess communication capabilities promised by Mac's System 7.0 and IBM's OS/2 Version 2.0. The ARexx language facility, bundled with the Amiga's system software, is the glue to bind the hardware, software, audio devices, and video devices together for seamless multimedia development and presentation.

5.1.2 Operational Feasibility

Operational feasibility is concerned with utility in actual, day-to-day usage. Will a particular configuration do the job for the target users? In exploring three multimedia platforms, we encounter several operational considerations. While the operational factors do not distinguish greatly among the platforms, they seem important enough to mention.

Touch-screen control is very useful. In lecture and discussion settings where the professor is standing and facing the students it can be much more ergonomically convenient to touch a screen than to concentrate on dragging the cursor to some point on the screen in a fluid motion. Keyboard control in an interactive lecture environment is a bit time consuming and error prone in comparison to the directness of touch-screens. A mouse is satisfactory, but often breaks the speaker's concentration and flow when the cursor has to be moved over long screen distances. Pointing at a touch-screen is as easy and natural as gesturing at a blackboard. The IBM and Amiga software we explore come with drivers for Elographics touch screens. We are unable to explore this technology on the Mac.

High resolution for graphics is not necessary and is sometimes even a drawback. The crisp, colorful graphics available on microcomputers, especially on the Mac, tempt the designer to try to make equally spectacular visual aids. We find in practice that low resolution—320 by 200—is adequate, especially if 256 or more colors are available for anti-aliasing. It is good to keep in mind that graphics captured from video tape and video still cameras are low resolution. The contrast between such low resolution graphics and high resolution computer graphics can be jarring. For another thing, projection technology cannot do justice to high resolution. VGA-capable LCD plates can handle any outputs,
but these devices are expensive, delicate, and scarce. More common are first-generation, low resolution LCD projectors. These cannot achieve more than 300 lines of resolution. Fine details wash out or, worse, appear to flicker. We find it best to limit text to no more than a dozen lines per screen. Single-pixel lines should be avoided entirely, especially if they are horizontal.

Image processing tools are required in any multi-platform environment, and shareware tools seem not only the cheapest but the most powerful. In trying to put together comparable presentations on various platforms, we find ourselves transferring graphics among the platforms. The tagged image format file (TIFF) seems to be the lingua franca between the IBM and Mac. The Amiga prefers the interleaved bit map (ILBM) format. Every graphics package on all three of the platforms seems to default to yet another format, but all can at least read either the TIFF or the ILBM. To convert among various formats, we use Alchemy, version 1.4, a shareware product. Alchemy not only converts among fifteen different formats but also offers Joint Photographic Experts Group (JPEG) compression and decompression. Alchemy is available from LISTSERV@RPIECS as PD1:<MSDOS.GRAPHICS>ALCHMY14.ZIP.

5.1.3 Financial Feasibility

Financial feasibility turns on costs when benefits are similar across platforms. Table 1 shows that there are two financial classes: IBM and other. Given the cost of multimedia-capable Macs now in production, the Amiga is cheapest, but this can be misleading. Most organizations considering multimedia development probably already have the most expensive component, either an IBM or Macintosh microcomputer system. Hardly anybody has an Amiga, so the marginal cost for multimedia may be greater on the Commodore machine.

There is another cost consideration with the Amiga. Ancillary software is much cheaper. We have begun to explore three dimensional modeling, rendering, and animation packages to spice up our material. As usual, IBM compatible software is the most expensive, Mac software is much cheaper, and the Amiga software is cheapest of all, with comparable capabilities. Most Amiga application software is literally an order of magnitude cheaper than its DOS counterpart. Which platform is likely to be of most interest to you for its three-D capabilities, the one where the software costs $3,000 or the one where it's $300?

5.1.4 Political Feasibility

Political feasibility pertains to a platform's fit in an existing organizational structure. Most business schools are IBM or DOS oriented. Business textbooks are invariably supplemented with DOS-based software. The Mac has a greater presence in Arts and Sciences programs. The Amiga's market share in higher education is minuscule. Does this matter?
One might argue that, if end-users are to be truly accommodated, a technically compelling solution—however elegant—can never be accepted if it requires wholesale change of hardware and software. This is indeed a valid issue, a basic economic principle for many organizations. Our requirement for multimedia-supported, spontaneous data manipulation and analysis within class discussion periods poses this issue. Many of our colleagues are not imposing this requirement at present and can accomplish their requirements with any of the platforms. While it is true that they must learn their platform's multimedia methodology and so on the political issue of what platforms the organization is endorsing vanishes. We believe our requirement for spontaneous interactivity will grow in importance within an increasing segment of academia and will become supported by all platforms.

There is also the political question of standards. DOS is a de facto standard. Windows is becoming one. The computer trade press is filled with speculation about future directions for multimedia. MicroSoft has published a minimal "Multimedia PC" specification. IBM and Apple have agreed to exchange hardware technology (IBM's RISC chip set) and software technology (Apple's next-generation operating system). With the big three of IBM, Apple, and MicroSoft promoting at least two standards, the market place is confused over future directions.[6, 13, 14] How long should users wait for a standard to emerge? How long will developers wait before producing applications?

While the giants fight it out, Commodore will continue along its totally non-standard path of Amiga development. Software developers will continue to turn out powerful applications at low prices. Users will accumulate operational experience, albeit with totally non-standard tools. Is this acceptable? The answer may differ between institution and individual. Institutions may well decide to wait for the market share and standards picture to clarify. As we work with the three platforms in our comparative research, we find we are using the Amiga for an increasing variety of tasks in our daily work.

Political reality is that the cheapest, most powerful, and easiest to use platform is also the least politically feasible. IBM is entrenched in business schools. Textbooks assume DOS availability. Faculty is comfortable using IBM. Support personnel are comfortable maintaining them. Apple has more presence in Arts and Sciences, and plans for QuickTime under System 7 show increasing interest in multimedia. Hardly anybody has heard of Amiga. The body of expertise and comfort level just are not there. Inexpensive add-in boards allow the Amiga to run both DOS and Mac software transparently. Nevertheless, the Amiga still has a reputation as a game machine. Projects like Georgia Institute of Technology's Amiga-based, 1998 Olympics multimedia show may dispel this notion. Until that occurs, decision makers also wonder whether Amigas will end up like orphaned AT&T or DEC PCs.
5.2 Conclusion

Any of the platforms—IBM, Mac, and Amiga—can provide excellent support for developing and presenting multimedia lecture support involving only linear or hypertext scenarios. Only the Amiga has the software base to support true multimedia spontaneous interactivity. IBM and Mac are limited to the capabilities built into their multimedia authoring packages. Amiga further allows the user to take advantage of any capability provided in off-the-shelf software packages supporting interprocess communication (and all of the significant ones do). For our purposes, this means that only the Amiga allows the lecturer to go beyond linear and hypertext lecturing. Amiga supports spontaneous analysis, exploration, and response to unanticipated student questions.

Developing for the PS/2 is complicated by the still unstable marketplace for OS/2, IBM's multitasking operating system. Interprocess communication capable development tools for OS/2 simply do not exist today. Developing for the Mac is complicated by Mac's new operating system, System 7, which requires all-new application software. The picture is complicated by the announced but not-yet-released QuickTime multimedia extension to System 7. IBM and Apple are uniting to compete directly with MicroSoft over, among other things, standards for multimedia. Applications for PS/2 and Mac will not be updated until the situation clarifies, and then expensive software updates will doubtless be required. While the situation with IBM and Apple clarifies, an existing Amiga platform allows us to explore the kind of multitasking and interprocess communication capabilities that will someday be available on the dominant platforms.

References


[5] Blake Bush. Hypertext in the classroom. Lt. Bush, an instructor at the U.S. Naval Academy, has done significant but as yet unpublished research in using hypertext presentations as lecture support tools. His research includes retrieval of graphics from an existing database, preparation of hypertext lecture outlines, testing of student comprehension after lecturing, and updating the graphics database to reflect test results.


