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Boyd Cycle Theory in the Context of Non-Cooperative Games: Implications for Libraries

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Thoughts on the Future of Library Computing: Implications of the Use of Handheld Computers for Library Service

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Introduction

The academic world is at the beginning of a major shift in the library computing paradigm. Librarians have participated in the movement from paper-based systems to mainframe computing. This was followed by the movement to personal computing based on ever more sophisticated and powerful personal computers. In the past few years we have begun to see the development of the use of portable laptop computing, first through the use of hardwired ports and, more recently, the use of wireless connectivity.

Is the laptop the final destination on this technological road? The answer, it seems, is no. Libraries have recognized the growth of laptop use and responded to it, but they have neglected the importance of an even more significant tool: the cellular phone. There are a variety of reasons for these attitudes, many of them grounded in a desire to manage the library environment, especially the noise level. This is commendable, but, despite reservations, libraries need to adapt to these new technologies. To do otherwise is to risk falling behind technologically as well as being marginalized in the university environment and in society as a whole.

The cellular phone is not that important in itself for library service. In fact, the library literature is practically devoid of any research on the subject. A search of *Library Literature* in July 2002 for "cellular phones" and "cellular telephones" found no articles. The response of many libraries has been to restrict the use of cell phones and call it good. The policy of the University of Memphis typifies this response in its statement that, "Cellular phones should be turned off and beepers set to vibrate in the Libraries' buildings. Cellular phone conversations are restricted to areas outside the building."[1]

What is missed in this response is the realization that cell phones – in their next iteration as intelligent devices – represent a coming dominant information paradigm. We have been trying to keep cell phones from ringing in our buildings without recognizing that the call is for us.

The Evolution of the Handheld Computer

Handheld computers began as relatively simple devices with limited memory that could serve as little more than basic storage devices for addresses or other simple textual information. With the development of more powerful devices such as the Handspring (www.handspring.com/) and the Palm (www.palm.com/) these devices approximated the performance of early computers, with the same limitations of size and speed. In the last two years, however, the market for handheld computers has become more mature, with a wide range of devices including those supported by Microsoft and running a limited version of the Windows operating system. The devices are much more powerful and, with the recent decision by Palm to replace its Dragonball processor one based on ARM (www.arm.com/) it appears that that Palm is positioned well to be competitive on the hardware front.

Palm and Handspring have much more software available, and are much cheaper than Pocket PCs, although Pocket PCs have been generally considered more substantial. Pocket PC users can use a trimmed down version of Microsoft Word and other Microsoft Office products as well listening to MP3 music files and even watching limited video. Pocket PCs have, for the most part, only color screens, which increases readability. However, product offerings from Palm and Handspring have caught up with and, in many cases, surpassed the Pocket PC.1[2]

A recent interview with Michael Mace (www.brighthand.com/), Vice-President of Product Planning for Palmsource (www.palmsource.com/), gives a good overview of where the handheld computer market is going:

> I think three factors matter most, and you have to trade off among them. The shorthand phrase I use is "simple, wearable, and connected."
>
> By simple, I mean that the handheld computers has to be totally intuitive, so dead simple that you can get to your information, or enter new information, with essentially zero wait time or fumbling. You never get all the way there, but it's the goal, and it's a much more exacting requirement than ease of use on a PC (I know, I used to work in that world.) By wearable, I mean that the handheld computers have to be really lightweight and have really long battery life—preferably weeks rather than days. If you miss on either target, people just won't carry it around all the time the way they should with a handheld computers. You end up with something you use like a tiny notebook computer instead. The Palm V was the first handheld computers to thoroughly hit that target, in my opinion. Connected means getting to your info anytime and anywhere you want it, which is why wireless access is so important. You can add lots of other features to a handheld computer, of course, but we've found out over the years that you dare not violate simplicity or wearability in the process. If you do, the sales fall off a cliff. Witness the Newton.[3]

Information Fragmentation

The importance of small portable computing devices becomes evident when one considers that the reality of the modern library is the fragmentation of information. Users are interested in research that often involves the collection and organization of selected facts, the creation of fragmented temporary information compiled during the information

search. A prime example is a book's call number. A personal intelligent device, such as combination cellular phone and handheld computer with wireless capability connected to the online catalog, is perfect for collecting, organizing, and storing these ephemeral information bits.

Obviously, one could collect that same information on a laptop computer. And, to be sure, there will be people who will do this. However, for most purposes, the laptop computer is overkill. If one considers the lifestyle and sociology of modern university students one quickly sees that they do not make a clear distinction between their social and student lives. Instead they combine them – going to class, socializing, studying. And, to some extent, their use of technology reflects this trend.

The Sociology of Computer Use

A student using a library computer (or even a personal computer/laptop) is not doing just one thing. In many cases the student is working on a paper or doing research, reading e-mail, and downloading information, either scholarly such as articles from e-journals or recreational such as MP3s. They also make great use of cellular phones Given students' disposable income, desire for innovation, and love of gadgets, it seems clear that there will be a rapid increase in the number of students using cell phones.

In fact, I would suggest that the primary reason that there has not been a greater development of cell phone use is the fact that, currently, cell phones in the United States have a fairly limited set of functions. When one looks at other countries, such as Japan, where additional more advanced services are available, one sees that the use is much higher. In economic terms we could express that the demand for cellular phones (and related devices) has been elastic: they have been seen as optional. In the future these items will be seen as necessities. The use of technology represents not so much a desire to enhance the educational experience, the prime rationale often given for investing in these efforts, as a desire to enhance the overall user experience, especially the social experience.

The Trend Towards Convergence

When the cell phone is combined with other functions such as a calculator, a calendar, or an MP3 player, it seems clear that its use will skyrocket. We are on the threshold of a convergence of separate devices such as the cell phone, the handheld computer, the pocket calculator, and the portable "Walkman" music player. This "Personal Assistant" will replace these devices in a single unit. The barriers to increased cell phone use are not economic, but cultural. People who do not have them have chosen not to get them because the devices lack functionality. For convergent devices, use follows function.

The Laptop That Will Not Die

This is not to suggest that personal computers, such as the laptop, will be done away with. For many purposes the laptop will remain important, although it probably will be reengineered into a more functional and portable tablet design. For high end or extended use as a productivity tool, the laptop makes perfect sense. However, for a

variety of applications the "Personal Assistant" will be the device of choice since in many venues, such as social settings, these devices will be more functional and less intrusive. The technology will be adopted en masse since, by its very nature, it respects the lifestyle of the users rather than attempting to reconfigure that lifestyle, as the laptop does. One could picture one device in two parts – the tablet with its larger screen, larger storage devices, peripherals, etc., and the handheld computer which is portable and functional as a separate unit. Such an arrangement also solves a longstanding security problem with PCs by allowing users to keep sensitive files and passwords physically with them and separate from the main unit.

Developing and supporting the use of computers has always been difficult for college and university administrators. Computing support is one of the most complex and expensive efforts in the higher education environment. To add an additional computing platform in an already stressed environment may be seen as a problem. However, it should be recognized that in the long run the use of handheld computers can result in cost savings by reducing the need for public computers for e-mail access and similar things. The lower cost of handheld computing devices relative to laptop or desktop computers can actually be used to push computing further into the academic environment, not as a replacement for computers as we currently use them, but as a supplement or stepping stone. In reality, in the context of the current overall cost of higher education, the cost of even a high end handheld computer is insignificant, and certainly much less than that of a laptop. The real need of the university is to keep in contact with students, not be fixated on a particular mode of delivery. We need to begin to view the computing environment (and indeed the university as a whole) as an information communication medium, not tied to the provision or service of hardware. As Engeldinger so correctly points out, "support for infrastructure will make it possible to produce information literate graduates."[4]

Understanding the Use of Information

While there is not one dominant paradigm, the ways that people collect and use information has fallen into one of several patterns. One of these patterns is what might be characterized as "research, copy, and dump" Students collect information by taking notes and then copy that information into the computer for final processing. Another model can be called the "online processing model" where the information is collected online and then processed. The obvious problem with this model is that students tend to rely on the electronic materials and ignore valuable printed sources. This "online processing model" has also tended to destroy the use of the "research, copy, and dump" model since, once again, students prefer to use electronic resources.

These patterns reflect the technological paradigm that has dominated the library community. To some extent, the growth of computing has not been accompanied by a corresponding growth in the ability of users to extract information from printed materials for use in an electronic environment. The amount of textual materials online, including both commercially available resources and other converted printed materials, represents a small fraction of the entire corpus of printed materials. The result is a body of literature asking whether libraries have a future, whether the book is dead, etc. Librarians have failed to recognize that the devices they despise are the source of their salvation.

The use of portable electronic devices, such as handheld computers equipped with pen scanners, would allow a much greater use of these printed materials by making it easier for users to convert materials for their research. In effect, the appropriate use of these portable devices could be a partial answer to the question of the value of print collections in a digital age. In short, we can view handheld computers, in a library context, aside from their use as portable wireless network nodes, as information harvesting devices that would allow users to collect the diverse kinds of information resources available in the library; a kind of digital combine, gathering everything in its path and dumping it into storage for later value added processing.

Leaving the whole issue of portable computing aside for a moment, librarians should be aware of the importance of larger technological and societal trends and their impact on how we conduct business. There are a wide range of technologies including broadband access, the use of XML and metadata, and digital rights management, to name just a few, which will be important in the coming decade. The growth of the use of PDAs, however, looks to be a major influence. Especially when one considers the recent alliances between major PDA manufacturers, such as Palm and IBM, which augur well for the increased importance of these devices in institutional computing environments.[5] More to the point, there are rapidly evolving patterns of social behavior that make the research behavior of students much different than past generations. Aside from increased computer use, students work collaboratively more than previously, often preferring to work in groups rather than alone.

The very nature of PDAs, in particular their ability to "beam" information from device to device, poses particular challenges. The Internet, as it has been developed over the past decade, is largely decentralized, but there still are mechanisms that make it relatively easy to control, at least in some senses. If an individual posts material, say a book manuscript, on a website, the item can be found and, if there are issues with copyright for example, there may be a webmaster or other contact person who can deal with the issue. The growth of a PDA culture, however, may represent the ultimate peer-to-peer network where individuals can exchange information without any intermediate information brokers. There is certainly great potential in this situation for the development of interpersonal relationships. The growth of the PDA culture also represents a paradigm where people may be able to recover some of the privacy that they have forfeited in their current use of the Internet. At the same time, however, such a completely individualized network represents a complex set of challenges for information providers such as librarians who have some interest in common standards and interfaces not to mention issues such as copyright and digital rights management.

How Libraries Can Cope

How can libraries deal with this trend? The key to success is planning. Libraries need to recognize the coming convergence and response proactively rather than, as in the present case of cell phones, reactively. Handheld computers need to be recognized and supported. Ideally, this recognition would be at the highest possible level of the organization so that standards could be developed. There must be an effort to ensure that there are practical supports for handheld computing users comparable to PC users, such as software download pages, help pages, etc. There is also the need for collaboration

between the library and the various computing endeavors existing on the campus. There must be institutional standards and policies to ensure that the greatest utility is leveraged from these emerging technologies.

Libraries must adopt policies that are handheld-computing-friendly. Given the coming convergence of the handheld computer and the cellular phone, current restrictions on cell phone use will increasingly be an issue. This will require the development of new social norms and more flexibility on the part of librarians. In reality, the people most sensitive to noise in libraries may be the librarians.

Libraries should recognize the use of handheld computing devices when doing webpage development or purchasing new online catalogs. Many vendors are beginning to support the use of handheld computers, with features such as wireless beaming of search results from the OPAC to the device, in their products. This issue should be raised and followed through from the initial request for proposal to the installation and operation of the product. For those with current OPAC installations it is important to ask the vendor when and if support for handheld computers will be available.

The same advice applies for individual database vendors. The support for handheld computers, especially for downloading materials, varies widely if it exists at all. Sadly, some major vendors, such as Netlibrary (www.netlibrary.com/), seem to be in no hurry to provide support for these devices. However, there are other places, such as the Aportis E-Book Library (www.aportis.com/library/) and the Electronic Text Center of the University of Virginia (etext.lib.virginia.edu/uvaonline.html), which do provide fairly substantial collections of electronic texts available for download and use on handheld computers such as Palm. In addition, there are various software packages available, which make it possible to view documents in Adobe's Portable Document Format (pdf) or Microsoft Word format. In sum, while the current availability of text materials is limited it can be expected to grow at a fast pace over the next few years.

Handhelds as Creators of Community

There is some resistance within the library community regarding the adoption of these new technologies. There is an ongoing debate regarding the value of these kinds of devices for libraries. There are a variety of reasons for these positions, related to issues such as budgets, technological overload, and the changing roles of librarians. Recent comments by librarian Paul Weiner typify this position:

> I fail to see what any of it has to do with libraries or librarians. For the last 5-10 years and possibly for another 10librarians have been and will be important enablers of the transition from assisted, location-based research to self-sufficient, virtual research. Librarians have always been excellent enablers. Soon they will cease to be of much importance to students or faculty - we all know this is happening - and if wireless/personal assistant/cellular resources start to dominate the culture they'll be rendered even less necessary. This has NOTHING to do with the value of libraries or librarians, or with the good intentions of librarians and educators, who have desperately sought to make their charges self-sufficient learners for decades. It's just the way things are going."[6]

To some extent this position is justified. Arguably, many technology advocates within academia have failed to make a compelling argument that such initiatives add value to the institution. In addition, there have been many instances in which technology-based projects have not been well-planned or implemented. The result has not always been the best for public service, as users and librarians have both had to cope with projects that were ill-conceived and poorly executed.

The key to the success of implementation of these devices is to realize that the essential issue in higher education (and libraries) is the provision of a good user experience. We are in an economic environment where people can and do receive their educational credentials from a variety of sources –online classes, traditional college classes, etc. On a traditional four-year campus, what people are coming for is not so much the education as the experience. A student may not choose Harvard because the teaching is necessarily better – it might actually be worse than one would get at a small liberal arts school such as Franklin College of Indiana. However, a student does choose Harvard for the experience, e.g., having a Kennedy for a roommate. We need to recognize that the role of technology, aside from improving the education, is to improve the connections between people because that is what they go to school for.

The value of a handheld computer is not so much in its power as a computer The handheld, by virtue of its cost, its design, and its flexibility is something of a democratizing element within the university. The laptop, by contrast, although it is more powerful, can also be seen as being somewhat elitist and also isolating. Handhelds are small. The user does not have a large laptop screen to hide behind. The handheld experience is also one of interruption – you use it look something up, write something down, etc. It is not a socially isolating experience like using a computer for hours on end. The handheld complements the social bonding experience rather than replacing it with a "virtual" one. The real value is in its ability to improve the quality of the student experience by creating bonds between people. By recognizing the power of the convergence of technologies, e.g., wireless connectivity, computing, and the printed text, we can give our users a better experience.

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