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Greg Tananbaum, Douglas Armato, and Kevin Guthrie, "I Hear the Train a-Comin': Switches, Cars, the Academy and the Web Train Network" (2009). *Proceedings of the Charleston Library Conference*.
<http://dx.doi.org/10.5703/1288284314722>

I HEAR THE TRAIN A-COMIN': SWITCHES, CARS, THE ACADEMY AND THE WEB TRAIN NETWORK

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The title of Greg Tananbaum's plenary session "I hear the train a-coming" was the inspiration for a metaphor that sets up this paper. The notion is to think about the digital network infrastructure as a new kind of train network. My hope is that this metaphor will provide a framework to help ground our thinking while also providing familiar imagery to help us to envision the impact of the changes coming as the medium for communication of knowledge shifts from the physical to the digital. The paper will discuss some of the challenges facing all of us – libraries, publishers, aggregators, content providers -- as we attempt to navigate the changes occurring as knowledge goes digital and moves on the network. It will briefly identify some of the major forces pressing on us due to those changes and offers some predictions for what we might face in the future.

The Metaphor

Imagine a new kind of train network. Instead of very limited train tracks running from city-to-city and station-to-station, imagine a train network that runs right up to every person's home. In fact, the tracks are laid everywhere you go, and an infinite number of self-propelled trains are constantly running on the tracks. You can stop the train wherever you are and get on. It is a kind of personal rapid transit system that can take you anywhere at any time. Some passengers are not in a hurry, and can get on any car that goes by, and they either know the routes and transfers they have to make, or they meander their way across the network from point-to-point. These users pay nothing to ride the train. Other users want to go to a specific destination at a particular time. They buy tickets for cars to come at an appointed time and are programmed to take them to a defined destination. Still a third type of traveler wants a specific kind of experience. They either choose to take a specialized train or they build a customized train car that they can ride to their destination.

Destinations are also in the business of attracting riders. They too can just wait for riders to come and get off at their "station" or they can send cars to pick up riders or even also build customized cars to bring people to their destination.

The purpose of this metaphor is to highlight the difference between the marketplace supporting access to printed works and the mechanisms for accessing knowledge now that the information can be transmitted in digital form over networks. Of course, like any metaphor, this one isn't a perfect representation, but there are three basic components I would like to highlight to illustrate the changes being brought by digital technologies and networks: 1) the supply of train cars is infinite – the energy that drives the cars around the network is the nearly zero marginal cost associated with transmitting digital information; 2) the ubiquity of the network – it doesn't only run on main train lines to a limited number of stations -- it is everywhere; and 3) passengers have varying needs and they may be willing to pay for transportation that fits their specific need, even though there are free options available to them and the costs associated with the transportation are nearly zero.

Thinking about this metaphor in the context of a changing information economy leads me to raise three themes to consider. They are:

1. Does the academy need customized trains or can it rely on the cars being developed and run by others?
2. If the academy does need customized cars, what do they look like and how does one ensure that they are available to the passengers that need them?
3. If you are maintaining one of the old beautiful stations that everyone used to have to go to catch a train, what is your role in an environment when tracks go everywhere and train cars pick up anyone, anywhere?

Our Changing Environment

We now leave the realm of fantasy to address the kinds of changes that are taking place as knowledge transmission moves to the network. Information is transmitted on a single infrastructure, all over the globe. In general, people are using the same toolset to search for information to support an academic argument that they use to find the nearest place to get a good slice of pizza. Professors and administrators are putting video of class lectures on YouTube that students access from dorm rooms or at home at all hours. Even librarians sometimes choose to search for books on Amazon rather than use library catalogs. Clearly, the old walls insulating the academic world from the commercial information marketplace have been breached, or are crumbling. An important question is whether that matters, or if the scholarly and education communities can be content that important values associated with scholarship, things such as reliability, persistence, trust and verifiability, will be assured through products designed and maintained by commercial entities to address commercial purposes. In his Romanes lecture, in October 2000, William G. Bowen said:

"So, for the purposes of this talk, I use "digitization" to mean the electronic assembling, disassembling, and transmitting of the basic elements of intellectual capital. These include words, sounds, pictures and data. The ability to take these sources apart, send them easily over distances, and reconstruct them renders the walls around the universities far more porous. Once these walls are pierced in this way – that is to say, once both the basic materials and the fruits of the work of academic institutions are easily gathered and sent – the very currency of the university becomes dramatically more accessible, and these institutions find themselves drawn increasingly into the realm of commerce."¹

And commerce is drawn into the realm of the economy. This is not to suggest that commercial entities have never been engaged in scholarly communications or with the academy. Obviously that has been the case; one need only look at the scholarly journal publishing industry which in the scientific, technical and medical fields, are dominated by commercial companies. But what is different is that for the most part these companies have developed products specifically designed to serve the needs of the academy. There are arguments that their pricing practices have not been in the academy's interests, but putting that aside, the fundamental work of commercial publishers is to support the interests of authors, editors and the publication of high quality reliable scholarly work. There is specialization. The reliance on Google for academic searches represents a break from that kind of specialization.

¹ William G. Bowen, Romanes lecture, October 17, 2000,
http://www.mellon.org/internet/news_publications/publications/romanes.pdf

The Importance of Scale and the Challenge for Not-for-Profits

The movement of knowledge to the network, because of the low marginal costs of delivery, creates great economies of scale. Thus, large organizations have an advantage. New companies have been created and have grown at unprecedented rates. Since its founding in 2008, Google has grown from \$0 in revenue to \$22 billion in revenue in 2008. That kind of growth is unprecedented. It has only been 10 years. This is a direct outcome of the economies of scale of the network, and naturally there has been great consolidation in the publishing industry in efforts to build scale to respond to such forces.

In the not-for-profit community, and among universities, it is difficult to build scale. There is comparatively very little consolidation (non-profits rarely merge and universities almost never do) and it is challenging to build collaborative services because of competitive forces and rivalries. If there are to be large-scale services specifically supporting academic pursuits, how are they going to be built and maintained? And at what intersection of institutions will these larger-scale efforts be built? Will they be collaborations of university presses, like Bibliovault? Or might they be library collaboratives, like HathiTrust? Or will they be independent collaborative enterprises like JSTOR or OCLC? Of course, the answer is probably all-of-the-above, but the point is that such collaborations are necessary if specialized services are to survive in this environment.

The Shift from Physical Infrastructure to Digital Infrastructure

Another implication of the digitization of knowledge is that all of the infrastructure that has been built to store, maintain and delivery physical objects loses value. With a defined number of printed copies stored safely for preservation purposes, it is simply not necessary to have buildings and shelves to store journals and books if that same information is available in digital form. This has great implications for the systems and staffing and legacy approaches that are currently in place at libraries and publishers. Libraries are no longer measured by the number of volumes on their shelves, nor can they depend on the central location of their building to ensure their importance in the knowledge distribution chain on campus. They do not purchase journals and books which they then own and maintain on their shelves; increasingly they lease access to those materials stored on a content providers' servers. Their constituents get access to information they need in many ways, increasingly with little library mediation. Libraries therefore have to now compete for the attention of their constituents with other resource providers who provide services directly to users. In effect, libraries no longer own the content they secure on behalf of their institutions, and neither do the scholars.

An Example Illustrating the Impact of These Forces

The potential impact of the possible changes coming to libraries is nicely illustrated through an example from the commercial world; the video rental business.

In the early days of VCRs, small retail shops opened to rent videos for in-home viewing. Before too long, Blockbuster emerged as a dominant retailer of video rentals, utilizing the franchising model to put thousands of stores all over the U.S. and the world. At this stage, this was fundamentally a bricks-and-mortar distribution business and Blockbuster's ubiquity, scale purchasing from studios, and brand recognition were great advantages. But in the end, much of Blockbuster's value derived from the physical infrastructure they had built to display and deliver the videos to a local clientele.

As the world shifted to DVDs, a new competitor, Netflix, emerged. Netflix reduced the emphasis on physical infrastructure, warehousing DVDs and introducing a new business model (unlimited rentals for a fixed monthly fee). Request the videos on your computer and they would be sent to your home. Just return your video and the next video would come. Some of Netflix value derived from an investment in bricks-and-mortar in their warehouses and a sophisticated inventory management system, but some also derived from the interface they created to select and queue the videos. Netflix offered recommender systems that helped customers find videos they would enjoy.

Almost as soon as Netflix was establishing itself, yet another competitor was in the game -- the local cable company. (The pace of change is relentless!) For an additional fee added to your cable bill, customers can retain a digital video recorder to download shows from television for local replay. In addition, video-on-demand became available right from the remote control on your television.

DVRs and video-on-demand complete the cycle, eliminating the reliance on physical infrastructure to get a video to a user. In the face of this transition, what are the prospects for Blockbuster? What are the prospects for Netflix? As it turns out, Blockbuster has struggled mightily, as the value of its stores fell and its services did not keep pace. Netflix, on the other hand, has continuously innovated and now delivers video streams to its members, while continuing to build its inventory of DVDs and deliver best-of-class customer service and an easy-to-use interface. While Blockbuster relied on its investments in physical infrastructure, Netflix has continued to build on its strengths and offer new services. In April 2005, the stock price for Blockbuster and Netflix were both \$10.00. In January 2010, Netflix stock price was \$54, while Blockbuster's was \$0.73. With network distribution, the value of physical infrastructure supporting movement of objects collapses and the value of other types of services becomes critical. It is a cautionary tale.

For the most part, libraries and scholarly publishers have navigated the transition from paper to electronic distribution for journals. Changes in pricing and the economic models still loom large, but new mechanisms for licensing journals, preserving them, and providing access have emerged. And scholars and students have been very well served with great increases in productivity. Libraries have been able to free up physical space for new purposes by moving little-used journals off-site or discarding them altogether. But even as those changes have occurred, because journals represent a very small portion of what libraries store and provide, the changes to how libraries operate have been on the margins. What will happen when all books are available in digital form?

Conclusion

The academy has made great and productive use of technology to improve productivity and effectiveness. But these improvements have been evolutionary, not revolutionary or truly transformative. When books go digital, everything will change. The transition from objects to bits, from the importance of physical infrastructure to services, will be comprehensive. The combination of the Google Book Search digitization effort with the growth in popularity of the Kindle and other e-reading devices signals that such a change is coming soon. When the commercial uses of these reading devices reaches a certain share of the reading market, the pressure on libraries and publishers to provide services supporting content on these devices will be enormous. Books in electronic form are soon going to change the world.