

MILLENNIALS, MILLISECONDS AND THE NEXT WAVE OF CREATIVE DESTRUCTION IN EDUCATIONAL CONTENT

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1. Introduction - Schumpeter's Gale

Across media ecosystems in education, as well as publishing and entertainment, a host of new technologies and new applications are transforming human interaction with media content. The shift from static print to interactive digital content, new generative platforms, and increasing accessibility, are changing the nature of who contributes content and how they do it

This transformation is causing unprecedented economic distress – “growing pains” that are upending revenues, even within the context of growing demand. Music revenues have suffered from unbundling (people buying singles rather than albums), streaming, and piracy, but not from a sudden mass preference for silence. Magazine and newspaper advertising has been undercut by an explosion of online media outlets as barriers to entry have collapsed, and by declining readership as people turn to online alternatives—but people have hardly lost interest in news. While the television audience keeps growing older and older, the millennials clearly like TV shows as well—they just prefer to watch them online. The realm of education is not exempt: witness daily investments, mergers and acquisitions among traditional publishers and new digital media, while MOOCs and mobile learning have spread throughout the world.

As articulated by the economist Joseph Schumpeter, the “perennial gale of creative destruction” is an essential feature of modern capitalism, “incessantly destroying the old” economic structure, “incessantly creating a new one.” While many of our captains of industry seem as intent on avoiding the inevitability of these transformations as they do death and taxes, there are growing networks of leaders in commerce, entertainment and education who not only want to anticipate the transformations but also help create them.

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In the context of Silicon Valley's legacy of innovation, **mediaX at Stanford University puts business relevance into the framing of academic research questions**. What are the implications of a world in which anyone anywhere can publish online to an audience that is global and potentially infinite? What future does such a world hold for "content" in all its forms? What are the social conventions, technologies, and business models that will enable us to leverage the positive aspects of these changes? In Schumpeterian terms, which insights can help us predict the direction and velocity of the gale while hurtling through it?

In both education and publishing, This is evidenced in the steady stream of new devices, platforms, mobile applications and services. It is evidenced in the growth of self-publishing and open publishing. Increasingly, technology is empowering organizations, institutions, business and individuals to create personalized and interactive content, and this is transforming media creation and consumption experiences as well as pedagogical techniques. Unqualified answers are difficult to come by, and future business models are known only after they've proven themselves successful. Yet, in the interim, **business and education leaders seek to address the most fundamental challenge: how to make the transition from the economics of (information) scarcity to the economics of (information) abundance**.

2. The Economics of Abundance

The scarcity of physical and information resources was an essential underpinning of mass media and education, beginning with the first mass-circulation newspapers in the mid-19th century and continuing with public education and then with movie studios and broadcasting networks in the 20th. A comprehensive education in arts, letters and the sciences was available to a select few until the industrial economy required large numbers of workers with skills that could be taught more efficiently in classrooms than by an apprentice relationship. Digital technology hasn't entirely eliminated scarcity as a constraint—there's still a limit to wireless bandwidth, for example—but it has altered the picture dramatically and provided global access to knowledge and expertise. In education, entertainment and commerce, we find ourselves in a world in which almost anyone can be a publisher and almost anyone can be a student or even an instructor.

Existing educators and media companies must change their thinking if they are to survive in such a world. It's not merely a question of adopting new technologies. Television networks,

newspaper and magazine publishers, and educational institutions have been experimenting with the Internet for two decades now, yet for the most part remain hobbled by an assumption that the practices and business models of the industrial age somehow constituted the natural order of things. In fact there was nothing pre-ordained about the mass media and educational institutions of the 20th century—school systems, newspaper chains, music labels, movie studios, television networks, cable and satellite systems. They were an accident that occurred at the intersection of economics and technology. **Those accidents are now being cleared by the inexorable forces of creative destruction, and new systems are taking their place.**

To survive the wreckage, educators and media executives need to understand not just emerging technologies but the changes in behavior and expectations that these technologies induce. The relational capital patterns of innovation ecosystems in the emerging educational technology sector reveal new value chains that are driven by intersecting markets and risk-taking at the startup, growth and enterprise levels (Russell et al. 2014). Organizations scanning the horizon for advanced technologies that might someday disrupt their businesses are frequently looking in the wrong place. **What matters most are the learning practices and technologies that people actually adopt, because these cause people to expect something different from what they've been getting before.**

A couple of decades on the World Wide Web have given audiences, younger ones in particular, a number of new expectations. They want to in some way participate in the content that's being offered, not just passively consume it—to take part in a dialogue, to exchange ideas, to act as distributors through social media. They expect to be able to immerse themselves, to delve deeper into a story than a typical movie or TV show will allow – while they are multitasking by the millisecond (Yeykelis et al. 2014). And increasingly they insist on the ability to access any type of content at any time, on any device, from anywhere in the world. Involvement, immersion, intelligence, and infinite choice are becoming the new baseline for media enjoyment – and for education as well.

It's obvious why this would be so. The Internet has collapsed the planet in a way that television threatened to/promised to? but never managed. Under the old rules, movies, TV shows and classroom experiences could be subjected to an artificial scarcity whenever rights holders were able to maximize their profits through licensing deals. But when every video on YouTube

can be viewed anywhere in the world while many shows from CBS or ABC or TF1 remain unavailable through legitimate channels, it creates a cultural dissonance that alienates audiences and invites piracy. Media enterprises face a difficult choice: They can either abet piracy through inaction, or they can move away from the still-lucrative economics of scarcity before the practice becomes too entrenched to fight. Educational institutions find themselves in an analogous situation. When Internet connectivity enables 500 million learners around the world to access a broad scope of instructional content through online lectures and courses, traditional educators face a difficult choice: They can try to defend established structures and credentialing hierarchies, or they can move away from traditional teacher/learner roles into new models such as open learning communities, distributed intelligence, and crowd-sourced expertise.

3. Key Factors: Copyright, Open Access, and the Voice of Science

The fact that creative destruction is inevitable doesn't mean we have no say over the form it takes. There are multiple factors that will help determine the future of content. Three of the most critical involve various aspects of access to content – **in the form of copyright, which restricts access to creative works; closed vs open access to scholarly research; and the ability for science and scientists to articulate and influence society's agenda.**

There is a strong case to be made that copyright, long ago established as a carrot to stimulate creativity, has instead become a stick that beats it back. In the UK, for example, even limited recommendations for reform – such as those provided in an official report by Ian Hargreaves (2011) of Cardiff University recommendations to permit access to “orphan” works (those for which a rights holder cannot be found), backup copies and file format transfers - were met with opposition from Members of Parliament who feared the measures would privilege technology companies at the expense of the important creative sector.

The difficulties of loosening unreasonable copyright restrictions are mirrored by an ongoing struggle for public access to academic research. In this case, the professional journals that charge as much as \$30,000 for an annual subscription stand to lose income, and in a much more direct and obvious fashion than the music labels and other enterprises that oppose copyright reform.

The problem, as Stanford's John Willinsky (2009) has pointed out, is a failure to make the very basic distinction “between learning and Lady Gaga.” A leader of the Open Access

movement, Willinsky bases his argument – that academic content should be less restricted than creative content – on a long tradition of treating scholarly intellectual differently from other forms of IP. This tradition can be traced back to the universities and monasteries of medieval Europe – cloistered settings consecrated to learning and devotion – and though it clearly encourages the circulation of knowledge, it was unfortunately never formalized. Today, the Internet empowers scholars to spread academic IP widely and freely outside of academic communities. This should be embraced and normalized, both in order to foster the spread of knowledge and because many of the universities in which scholarly research is conducted have been set apart as tax-exempt institutions.

Meanwhile, the scientists who contribute much of this research have lost their voice. In the field of science, mediaX Distinguished Visiting Scholar Davis Masten (Azar 2013) maintains, the communication of ideas has become an afterthought at best. Many scientists are suspicious of marketing and fear their results will be tainted if they in any way try to “sell” them. So while American businesses spend upwards of \$1 trillion annually to tell their story, science spends less than \$1 billion – yet scientists have a far more critical story to tell. Only scientists, for example, can tell us how to think about climate change – an issue that is going to affect every business, not to mention every human, on the planet. Masten suggests that the field of science and its practitioners reconsider their approach to sharing findings and insights with decision makers, thought leaders and engaged individuals.

4. Storytelling as an Engineering Problem

One of the newest and most important debates about media content involves not scientists but engineers: What role should engineering have in the content business? Engineers at Netflix, YouTube and Amazon are using data to compute what people would like to watch. Virtually every other company that serves up media online keeps track of user “events” – meaning anything the audience does while engaged with content – in millisecond increments. Starting, pausing, rewinding, stopping entirely and never coming back – all count as events, and all are duly logged and matched against other events to get a startlingly fine-grained picture of user behavior. This gives Netflix an “addressable audience,” in the words of chief content officer Ted Sarandos (2013). Experiments in massively open online courses, or MOOCs, provide a similar

opportunity to educators. The large trove of data on user “events” opens new opportunities for research and experimentations on data-driven storytelling, instruction and – perhaps – commerce.

David Cavander (2014), who works with data as principal scientist at Adobe Digital Marketing, argues that we’re going to see much more of this kind of input – that stories will become not so much told as engineered. When we let machines mediate our experience, he maintains, we stand at risk of being manipulated by whatever “data buttons” we’ve made available. Both collectively and individually, we surrender control.

It’s worth noting that both “media” and “mediate” stem from the Latin word “medius,” for “middle.” Media stand between us and the world. Newspapers, magazines, movies, television, the Web – they all mediate our experience. But until now, no matter what technology was employed, the actual mediation was done for better or worse by fellow humans, creatures with whom we share an unspoken understanding of life and all it entails. Likewise, for many centuries, teachers were human beings, and learning was done by people. In the 21st century, for the first time, that may no longer be true. Machine learning algorithms are on the threshold of using data-driven information streams to guide and control avatar behavior in virtual worlds (Won et al. 2014). Here in particular, creative destruction is leading us into virgin territory.

5. Creative Destruction as a Catalyst for Discovery

In this environment of change, mediaX at Stanford University serves as a catalyst, investigating content creation, customization, consumption and curation – recently, exploring innovations and the conceptual, technological and business opportunities in K-12 education and Publish on Demand technologies. These investigations are enabled by contributions from members and partners in the business community. They have been varied, diverse and interdisciplinary, drawing expertise from the sciences and the humanities, exploring requirements and metrics, developing tools and prototypes, observing user behavior and roles and evaluating motivation, information retention and user engagement. A few examples follow⁴.

5.1 Involvement

⁴ Adapted from presentations at the mediaX Conference on the Future of Content in a Publish on Demand World, February 4, 2014, Stanford University.

“Science needs to be personal, just like computation is,” suggest Blikstein and Riedel-Kruse (2013), leaders of the Hybrid Tangible Interface project. which leveraged bimodal learning models to combine physical experiments with a remote, online science laboratory. The HTI project enabled the large scale personalization of scientific investigation and education, using hybrid tangible interfaces to merge wet labs and online interaction, and create interactive programs and remote, scalable science labs.

Another team, led by Barron (2013), sought to better understand, in the world of user-generated content, how contributing content actively to online communities can help learners develop social networks, a sense of agency, technical skills, content knowledge and confidence in one’s ability to create. The experimental study contrasted ways to stimulate content creation, investigating differences among three types of motivation and participation incentives for online engagement - chance, competition and altruism.

5.2 Immersion

In real research labs, knowledge does not come pre-digested as in most online videos or traditional lectures; it presents itself to learners in complex empirical projects. The Stanford Clinical Anatomy Scans project, led by Srivastava (2103), explored the benefits and requirements of using layered, augmented media content to support instruction. By making high resolution, volumetric, 3D anatomical CT scans from Stanford’s Clinical Anatomy Library available through a web-based system to middle and high school students, the project evaluated student and teacher interaction with the system, identifying interface and delivery requirements for media distribution to a range of devices for both individual and group instruction.

The notion of ‘participatory design’ stimulated an exploration of how technology can become involved in instruction and creativity (Nass 2013). Conducted under the direction of the late Cliff Nass, this study explored how learning motivation, engagement and information retention are influenced by student interaction with a personalized, socially responsive agent embedded in the learning technology itself. By studying how new physical media can help create highly motivating K-12 learning experiences, the team discovered that socially-active and interested devices can improve learning activities.

5.3 Intelligence

Intelligent systems help streamline academic article production for both authors and publishers.

By introducing standardization and efficiency into the complex scholarly publication process, intelligent systems help streamline the production of academic articles. The Smarter Scholarly Texts project, led by Willinsky (2013), improved scholarly workflows by developing an online parsing, editing and reference checking system, creating a scalable, sustainable approach to scholarly workflows and enabling the transformation of authors' individual approaches into consistent, production-quality documents. The project used open-source technologies to facilitate rapid, industry-standard development and to integrate the service with Public Knowledge Project platforms, such as Open Journal Systems.

The Webzeitgeist project, led by Klemmer (2013), addressed the tension between the web designers' preference for consistency and standardization and hardware manufacturers' drive for "new markets," systems and features. The research team developed a unique algorithm that uses "design-based machine learning" to identify, label and categorize webpage design elements. The automated system leveraged human decision-making to improve the overall effectiveness of the tool, helping designers, manufacturers and researchers understand design demographics, automate design curation, and support new data-driven interactions.

5.4 Infinite Choice

Increasingly, technology — publish-on-demand, in particular — is empowering educators to move from a 'one-size-fits all' education to a more personalized approach, including innovations such as adaptive computer programs, 'flipped' classrooms (in which typical lecture and homework elements of a course are reversed) and continuous performance assessments. To date, digital textbooks have been simply print textbooks recast into a digital format, leveraging few of the opportunities available with a truly interactive and collaborative approach and failing to take advantage of the vast amount of high-quality, publicly available, primary source material accessible in archives and other institutions. Founded on the understanding that an active engagement in building stories of history helps students evaluate information sources and better understand the perspectives from which history is written, the Recasting the Textbook project, led by Wineburg (2013), leveraged the benefits of publicly available primary source documentation and interactive technology. High school students accessed a database of primary documents (culled from national archives, local libraries, and their own historical records) to build their stories, discussing the viewpoints of their selected sources and exploring how

selecting alternative documents could change the narrative. The experience combined primary source materials and digital technology to create a multimodal, personalized, on-demand, collaborative collection of historical narratives generated by the students themselves.

6. Summary

Taken together, these projects provide insights that not only contribute to science but also enhance user experiences, promote deep learning, advance teaching methodologies and optimize business infrastructures. They offer inspiration and innovative pathways for the unfolding digital transformation of legacy education and publishing industries. They foster collaborations between academic and business researchers.

The media and learning industries, caught between one era and another, continue to grope for a response. Yet all too often, the long view goes unaddressed. If existing media and education empires are to survive, they need to carefully and continuously balance short-term bottom-line considerations against evolving audience expectations that are shaping the future. Copyright needs to be returned to its original purpose of protecting new ideas rather than stifling them. Pools of scholarly knowledge need to be sheltered from the commercial maelstrom rather than swept into it. Scientists need to learn how to communicate lest they be marginalized in a world that is ever more dependent on the understanding they provide. Education, and the wondrous sense of discovery that has formed the basis of human learning from the beginning of time, needs to be nurtured, and protected from an approach which would treat it as a mechanical and engineering problem that can be handed over to the machines.

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