

# FROM CODEX TO BITS:

## Open Textbooks And Their Implications For Knowledge Production, Distribution And Reuse

Natascha Chtena

Departments of Information Studies, UCLA

achtena@ucla.edu

### 1. ABSTRACT

From devices such as tablets, e-readers and electronic whiteboards, to web-based technologies such as adaptive learning systems, MOOCs, and open textbooks, higher education has become increasingly digitized. Among these, open textbooks have received particular attention and praise from foundations, legislators, and college administrators as a potential solution to the crisis of affordability in American higher education. Yet, by all available measures, progress has been slow and the promise of open education resources remains unfulfilled. This qualitative research project addresses this question by investigating the implementation of open textbooks in colleges across California. Using in-depth interviews, participant observation and systems analysis, it investigates how the social (e.g., copyright, labor, economics) and technical infrastructure (e.g., software, standards, metadata) surrounding open textbooks is transforming the ways in which educational content is designed, developed and delivered. Drawing on a 1.5 year fieldwork study and using two open textbook providers as case studies (OpenStax, SmartHistory), my research analyzes the movement of content — from production and circulation to consumption — and its structuration through social and technical infrastructures to identify the points at which movement is constrained.

### 2. BACKGROUND

So far, much of the discussion on open textbooks has focused on their putative economic benefits and the hope that these resources will help increase access to education, in particular for low-income, minority and other at-risk students.



However, little attention has been paid to the technical and social challenges involved in the creation and implementation of open textbooks, and how these are shaping the physical form, interactive possibilities and pedagogical function of these tools.

#### 2.1 WHAT ARE OPEN TEXTBOOKS?

The term 'open' textbook entails two distinct meanings: open to access and open to change. The first means that a textbook is free to be accessed without any restriction, whether operational, financial or physical. The second, means that users are free to use or reuse the textbook for purposes including remixing, revising and redistributing.

#### 2.2 MODULARITY & INTEROPERABILITY

An important notion that underpins open textbook production is that of modularity, the degree to which a system's components may be separated and recombined [1]. In contrast with traditional textbooks, open textbooks favor a modular organization so as to support remix and re-appropriation, that is, the possibility of disassembling a textbook into its components, modifying one or more of these components, and reassembling the modified components into a different textbook.



Without proper interoperability, open textbooks remain fixed digital objects unable to fulfil their potential for remixing, reuse and customization of content to individual learners. Widespread adoption of open textbook is thus contingent, among other things, on the definition and adoption of technical standards supporting interoperability.

### 2.3 NEW ECONOMICS OF KNOWLEDGE

At the institutional level, open textbooks support a radically different division of labor characterized by decentralized intellectual collaboration, participation in the gift economy and the use and reuse of material for the collective benefit of the community. Currently, the majority of open textbooks are created by faculty with minimal institutional and financial support, while traditional publishers and other for-profit companies offer subscription models and value-added services (e.g., adaptive homework systems) that piggyback on existing open textbook content. More recently, co-operatives have begun to form to support the creation and sharing of open textbooks, and to explore the potential of an academia-center publishing model, with attendant interoperability challenges.

The stark discrepancy between the promise of open textbooks and their implementation on the ground point to the need to adopt as systemic approach that analyses the flow of content through the various components of the open textbook ecosystem and its structuration by various technical, economic, and institutional requirements.



### 3. RESEARCH AIMS & QUESTIONS

While a number of recent studies attended to faculty and student attitudes toward open textbooks [2], on student engagement with these resources [3] and on cost savings [4], the methods employed by these researchers have been confined to self-reported surveys and/or research in a single institutional or organizational context. In addition, no attempt has been made to map the structure of the open textbook ecosystem in the US, conflicts surrounding standardization of content, and the role of interoperability in structuring both systems and markets.

**1. Vision and discourse:** How is 'openness' interpreted and understood across different types of institutions, markets and stakeholder groups, and how do their goals for open textbooks differ? How are these different visions and priorities shaping how open textbook technologies are designed and implemented in California?

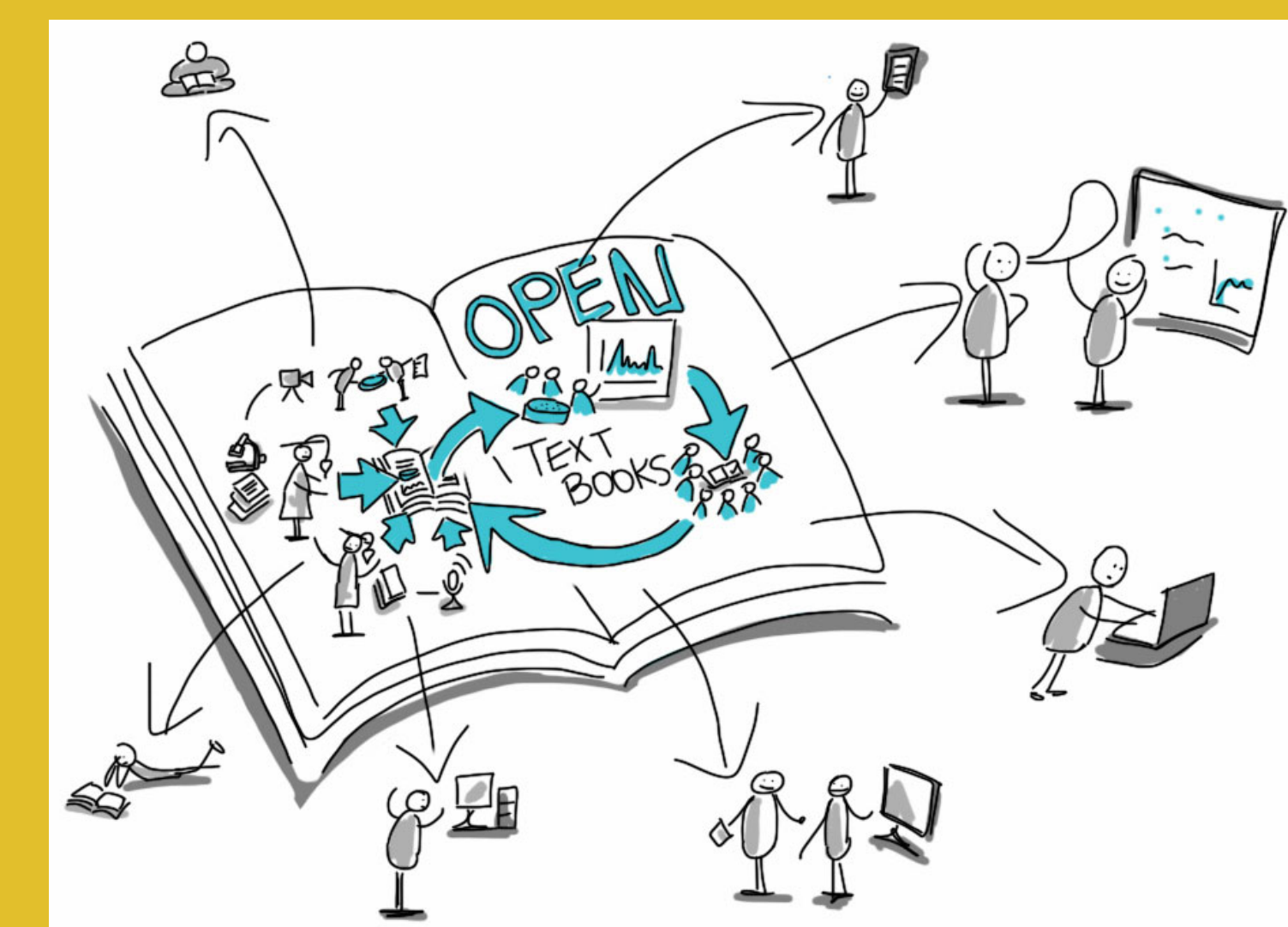
**2. Labor and infrastructure:** What sociotechnical infrastructure is required to produce, deliver, and sustain open textbooks? What forms of labor are needed to *do* open textbooks and how is that labor currently distributed among stakeholders? How durable is the existing infrastructure and what challenges to sustainability do open textbooks currently face?

**3. Openness and interoperability:** How "open" are open textbooks, technically, and in practice? How modular, interoperable and customizable are their components? What technical standards, if any, currently regulate the production of open textbooks? And to what extent are users taking advantage of open licenses to remix, adapt and redistribute them?

### 4. METHODS

In this dissertation, I take a systems approach to investigate the reasons behind the slow adoption and uncertainty surrounding open textbooks. Looking at the entire system of open textbook production and circulation, rather than isolated components, will help us identify areas of hindrance in the scalability and sustainability of open textbooks. My research methods consist of in-depth interviews with key stakeholders, ethnographic observations, and a system analysis of two open textbook platforms (OpenStax, SmartHistory), the purpose of which is to assess the modularity, interoperability, and durability of the different systems through which they are constituted.

My research sites include several community colleges and CSU campuses in the Greater Los Angeles Area, as well as a number of open education summits, training workshops for faculty and working group meetings across the state.



### 5. PRELIMINARY RESULTS

- Both creation and adoption of open textbooks is highly constrained by technical, economic and institutional barriers that prioritize affordability and practicality over goals of content sharing and remix.
- In particular, labor issues around "invisible hours" and lack of institutional rewards limit the extent of instructor engagement with creation of open resources.
- As well, faculty involvement in open textbook creation is strongly limited by technical parameters, e.g., copyright, accessibility, and interoperability issues due to lack of technical standards.

### 6. CONTRIBUTION

The results of this research will contribute to:

- (1) current debates in education research about the impact of digital technology on college education;
- (2) current debates in information studies about the materiality of digital objects;
- (3) educational understandings of how openness is impacting upon classroom pedagogy, scholarly production and institutional provision.

In addition to advancing scholarship on the topic, an important outcome of this project will be guidance for designers, educators and policymakers in the development, adoption and implementation of open textbooks and open educational resources more broadly.

### 7. REFERENCES

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