

D _ T _ E N _ _ N _ E D _ E _ _ N _ N G !



*MARCUS SPECHT
PROFESSOR DIGITAL EDUCATION
DIRECTOR LDE CEL*

DATA ENHANCED LEARNING!



*MARCUS SPECHT
PROFESSOR DIGITAL EDUCATION
DIRECTOR LDE CEL*

#1 DATA IN EDUCATION,
LEARNING AND
EDUCATIONAL RESEARCH

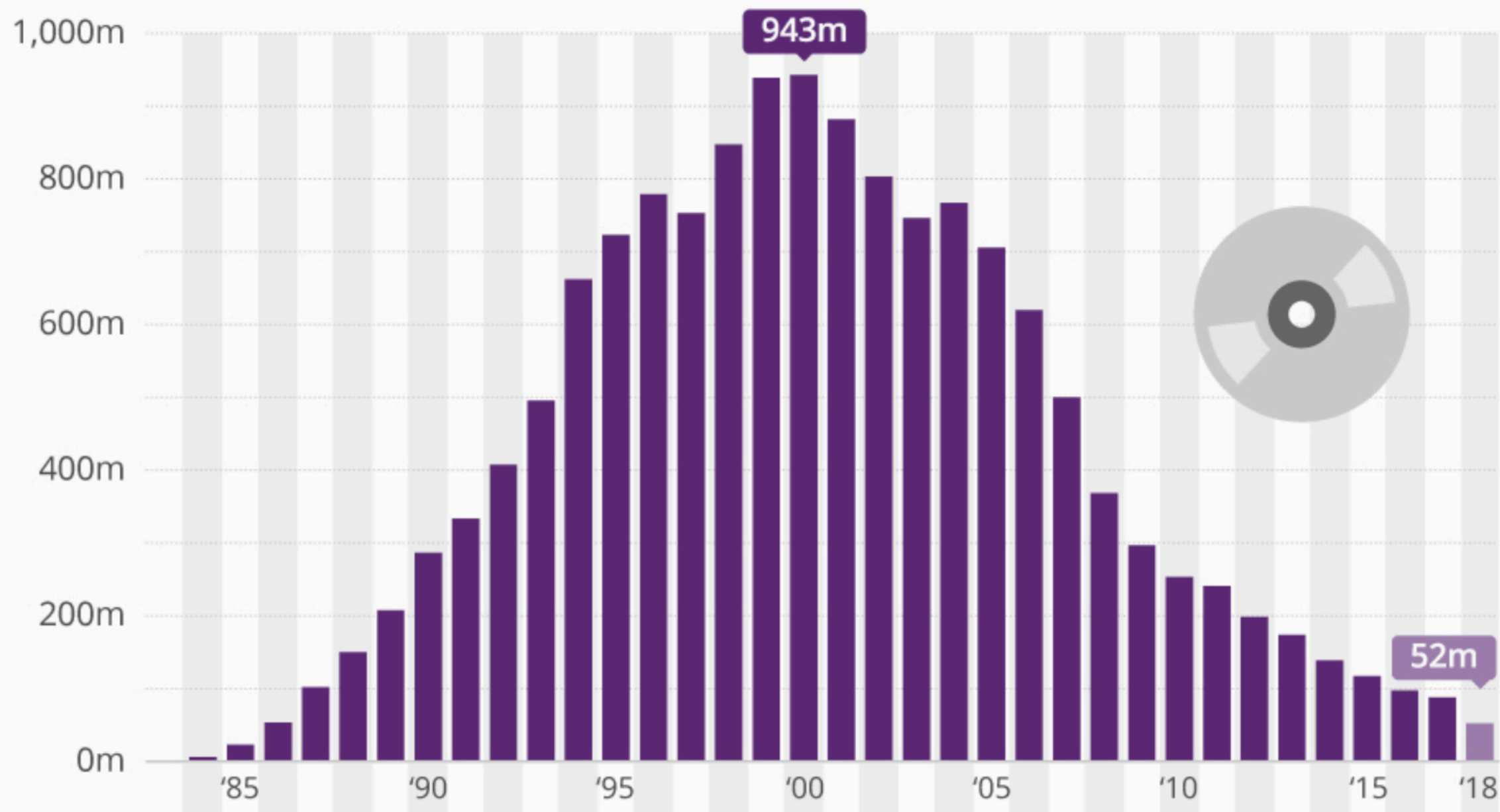
WHAT KIND OF DATA DO WE COLLECT IN REGULAR EDUCATION?

- **Assignment results, tests**
- **Teacher evaluation of participation**
- **Teacher assessment of social skills**
- **Student self assessment**
- ...

WE DO NOT COLLECT
VALUABLE DIGITAL DATA
ABOUT LEARNING IN OUR
CURRENT EDUCATION SYSTEM

The Rise and Fall of the Compact Disc

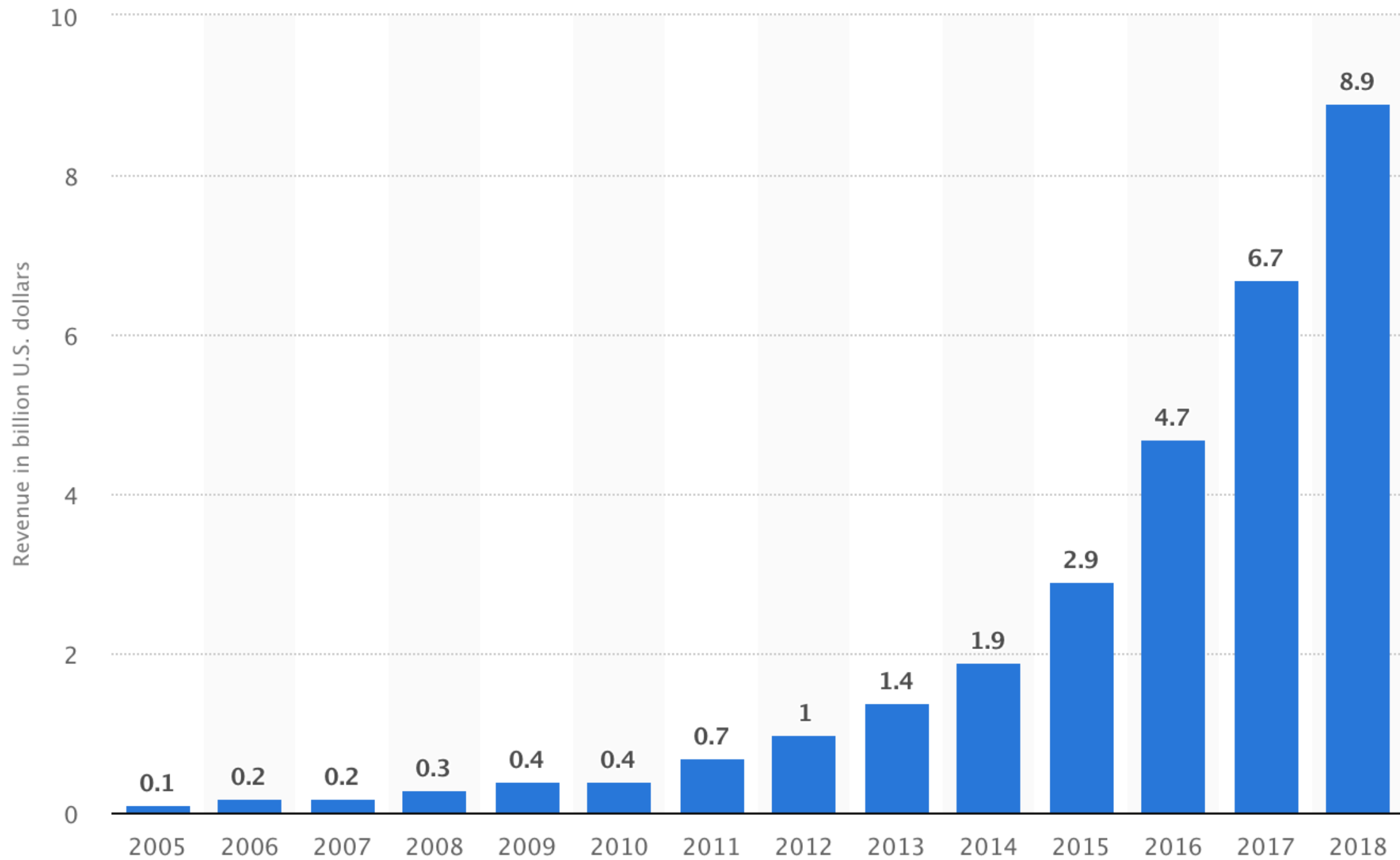
CD album sales in the United States since 1983 (in million units)



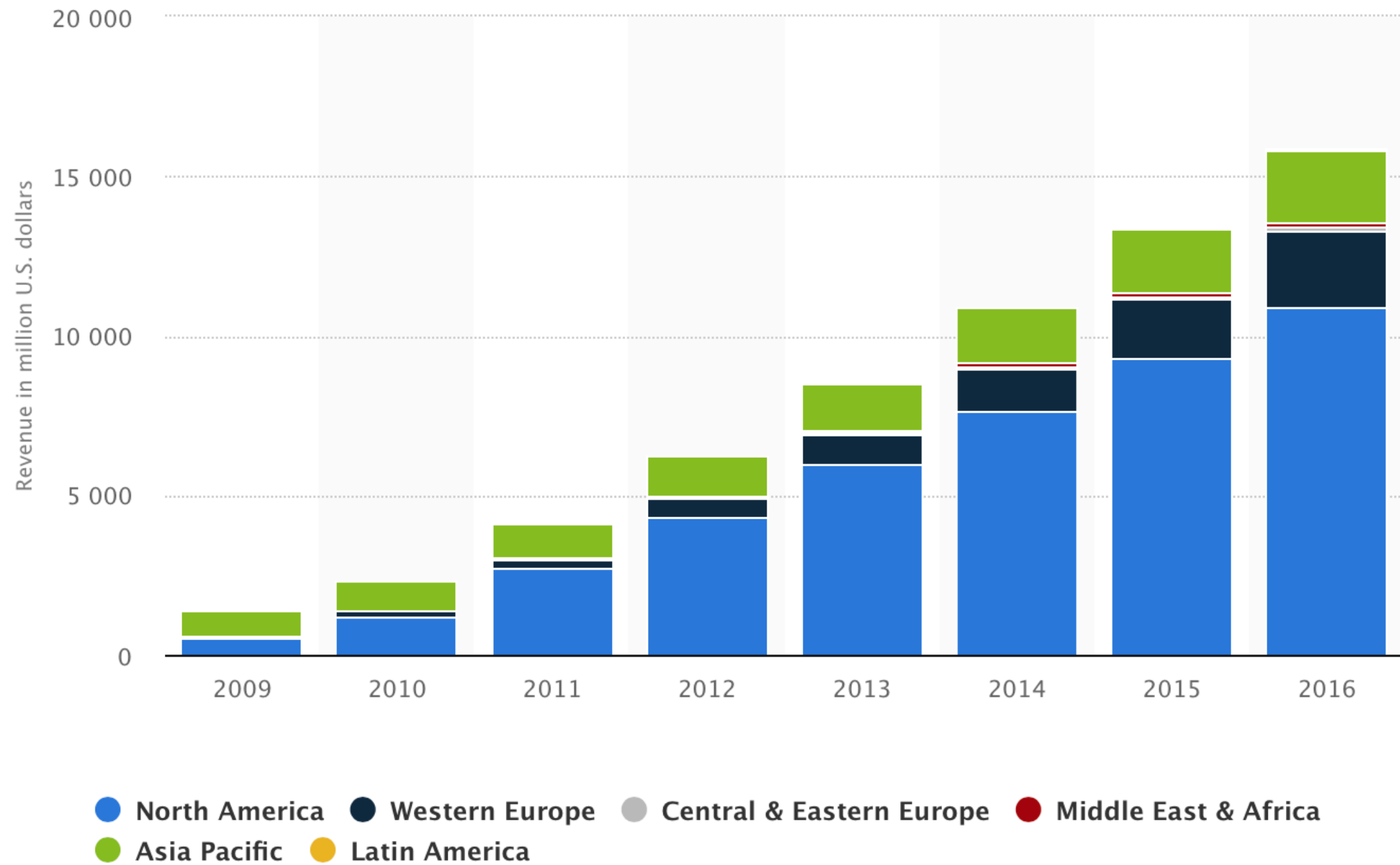
@StatistaCharts Source: RIAA

statista

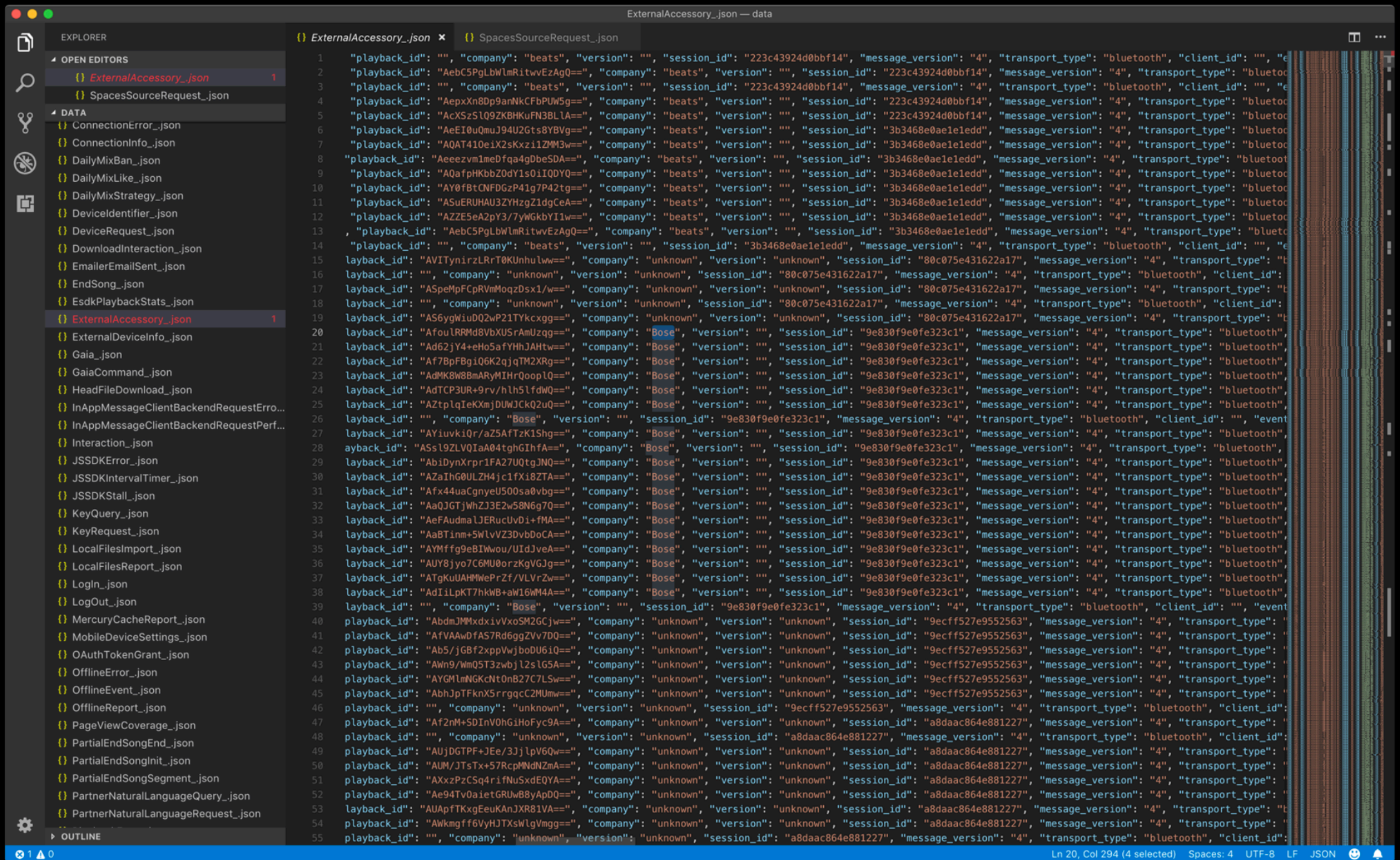
Spotify revenue



eBook revenue



Tracking in Spotify



The screenshot displays a code editor interface with a sidebar on the left and a main editor area on the right. The sidebar contains an 'EXPLORER' view with a tree structure of files. The 'OPEN EDITORS' list shows two files: 'ExternalAccessory.json' (selected) and 'SpacesSourceRequest.json'. The 'DATA' section lists various JSON files, including 'ConnectionError.json', 'ConnectionInfo.json', 'DailyMixBan.json', 'DailyMixLike.json', 'DailyMixStrategy.json', 'DeviceIdentifier.json', 'DeviceRequest.json', 'DownloadInteraction.json', 'EmailerEmailSent.json', 'EndSong.json', 'EsdPlaybackStats.json', 'ExternalAccessory.json' (selected), 'ExternalDeviceInfo.json', 'Gaia.json', 'GaiaCommand.json', 'HeadFileDownload.json', 'InAppMessageClientBackendRequestError...', 'InAppMessageClientBackendRequestPerf...', 'Interaction.json', 'JSSDKError.json', 'JSSDKIntervalTimer.json', 'JSSDKStall.json', 'KeyQuery.json', 'KeyRequest.json', 'LocalFilesImport.json', 'LocalFilesReport.json', 'Login.json', 'Logout.json', 'MercuryCacheReport.json', 'MobileDeviceSettings.json', 'OAuthTokenGrant.json', 'OfflineError.json', 'OfflineEvent.json', 'OfflineReport.json', 'PageViewCoverage.json', 'PartialEndSongEnd.json', 'PartialEndSongInit.json', 'PartialEndSongSegment.json', 'PartnerNaturalLanguageQuery.json', and 'PartnerNaturalLanguageRequest.json'. The main editor area shows the content of 'ExternalAccessory.json', which is a large JSON array of objects. Each object contains fields like 'company', 'version', 'session_id', 'message_version', 'transport_type', and 'client_id'. The data is organized into a table with columns for these fields. The status bar at the bottom indicates 'Ln 20, Col 294 (4 selected)', 'Spaces: 4', 'UTF-8', 'LF', 'JSON', and a search icon.

```
ExternalAccessory.json — data
1  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": "", "event": "playback_id": "", "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
2  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
3  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
4  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
5  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
6  "company": "beats", "version": "", "session_id": "223c43924d0bbf14", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
7  "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
8  "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
9  "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
10 "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
11 "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
12 "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
13 "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
14 "company": "beats", "version": "", "session_id": "3b3468e0ae1e1edd", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
15 "company": "unknown", "version": "unknown", "session_id": "80c075e431622a17", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
16 "company": "unknown", "version": "unknown", "session_id": "80c075e431622a17", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
17 "company": "unknown", "version": "unknown", "session_id": "80c075e431622a17", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
18 "company": "unknown", "version": "unknown", "session_id": "80c075e431622a17", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
19 "company": "unknown", "version": "unknown", "session_id": "80c075e431622a17", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
20 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
21 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
22 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
23 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
24 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
25 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
26 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
27 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
28 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
29 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
30 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
31 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
32 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
33 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
34 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
35 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
36 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
37 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
38 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
39 "company": "Bose", "version": "", "session_id": "9e830f9e0fe323c1", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
40 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
41 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
42 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
43 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
44 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
45 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
46 "company": "unknown", "version": "unknown", "session_id": "9ecff527e9552563", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
47 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
48 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
49 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
50 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
51 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
52 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
53 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
54 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
55 "company": "unknown", "version": "unknown", "session_id": "a8daac864e881227", "message_version": "4", "transport_type": "bluetooth", "client_id": ""
```

#2 DATA AND DIGITAL TECHNOLOGY FOR LEARNING

THE THINGS
THAT MAKE ME
WEAK AND
STRANGE GET
ENGINEERED
AWAY

Cory Doctorow

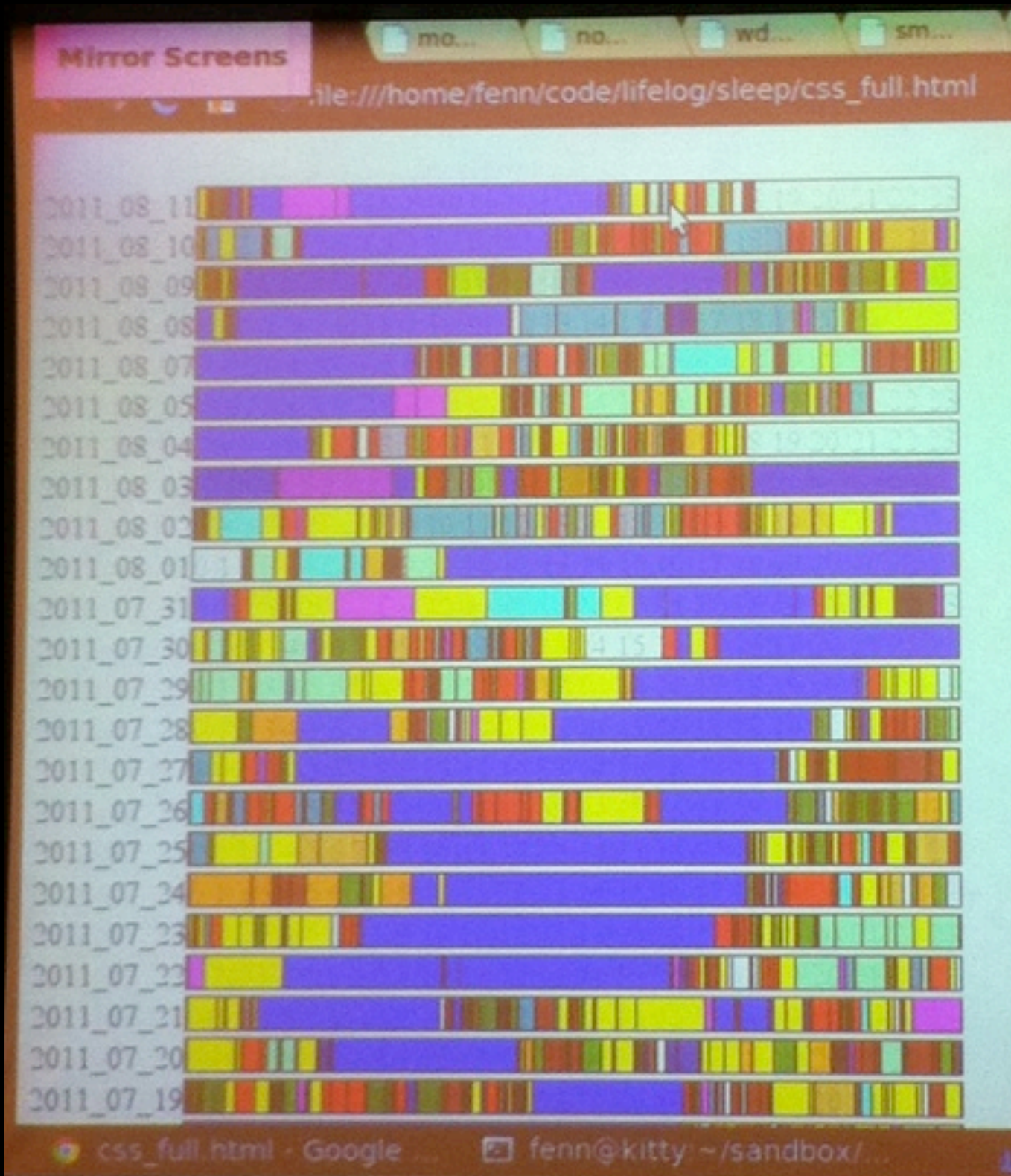
<http://craphound.com/category/walh/>



THE QUANTIFIED SELF



- Questioning
- Awareness
- Self Experimentation
- Measuring
- Data Collection
- Behaviour Change



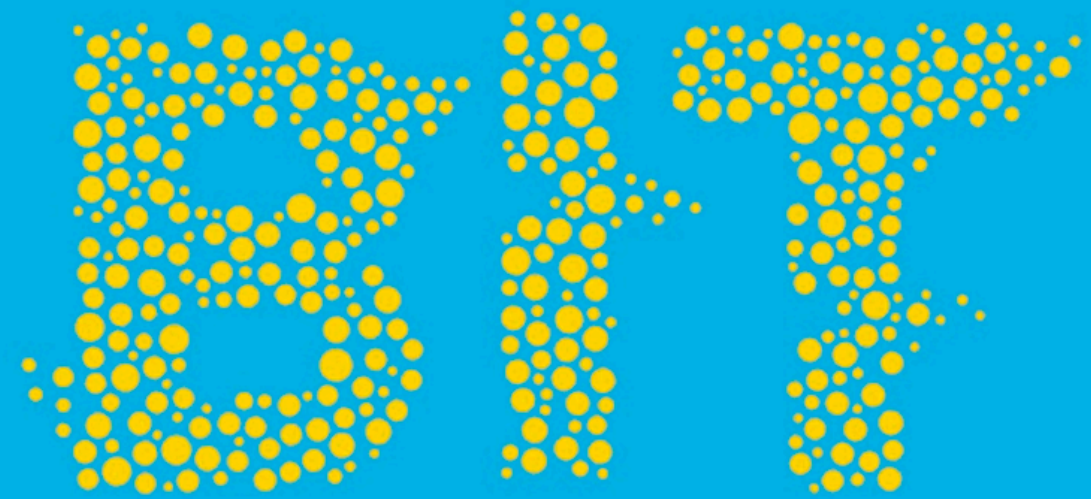
WHAT KIND OF DIGITAL DATA?

- **Instructional design data** for learning content and **Metadata** for learning content like LOM
- **Social and user generated data** like in annotations, likes, comments, discussions, and personal content collection with mobile devices
- **Tracking data of user activities in online systems** often used in Learning Analytics, mobile tracking, cross-platform tracking
- **Sensor data** from user interactions and **contextual data from of IoT** systems and user interactions

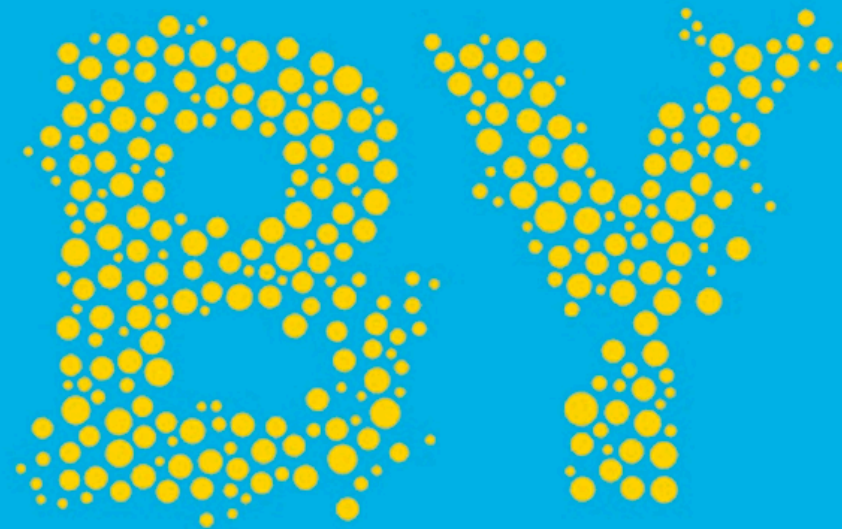
WHAT KIND OF DIGITAL DATA?

- **Reading data** from electronic readers and eye tracking, **writing data** from tracking pens on tablets
- **Movement and activity** data from installations and body worn sensors (**for teachers and for students**)
- **Reasoning data** from problem solving and student collaboration and dialogue analysis
- **Open data and public data sets**

ENHANCING
SOCIAL
RESEARCH WITH
OPEN DATA AND
NEW STUDY
DESIGNS, IN-
SITU DATA
COLLECTION
AND OPEN
ACCESS DATA



SOCIAL RESEARCH



in the DIGITAL AGE



• MATTHEW J. SALGANIK •

#3 DESIGNING ENHANCED LEARNING WITH DATA AND TECHNOLOGY

DATA FOR ENHANCING #1

- **Personalisation** of learning and instructional design: time and pace, sequencing, difficulty, learning paths, content
- **Assessment of learning and processes** ... from summative to formative and understanding processes
- **Reflection** on personal data and performance of others to **support metacognitive development**, also development of SRL skills based on data

DATA FOR ENHANCING #2

- Learning Paths, **Repetition** and **testing** (Learning Strategies) for knowledge based on tracking data, introduction of solutions linked to analytics in materials
- Exploration of **Simulations and Games** for deeper understanding of conceptual models, or supporting the building of conceptual models by rubrics or audio-visual material
- Immersive experiences with VR/AR for expertise development in situ, **real-time feedback** based on sensor data or **expert-models**

#1 WE DO NOT HAVE DATA
ABOUT OUR CORE BUSINESS

#2 DIGITAL DATA CHANGES
EDUCATION

#3 THERE IS EVIDENCE HOW
IT WORKS, START TODAY
AND GET YOUR DATA.



THANK YOU !

PROF. DR. MARCUS SPECHT
M.M.SPECHT@TUDELFT.NL

