Database-Backed Websites

No screens

Prof. Lydia Chilton

COMS 4170

21 February 2018

Say your name

Goal 1

Build websites that suit the needs and abilities of users

The main goal of many websites is to
display information users need.

This website has no database

Columbia University

User Interface Design

COMS 4170 · Spring 2018

Home Syllabus Assignments Piazza

Part 1 Build websites that suit the needs and abilities of users.
Part 2 When the needs and abilities of users are uncertain, design systems by learning from iteration and experimentation.

INSTRUCTOR

Prof. Lydia Chilton
OH: Tuesday 3-4 pm, CEPSR 612
Please contact staff through Piazza only

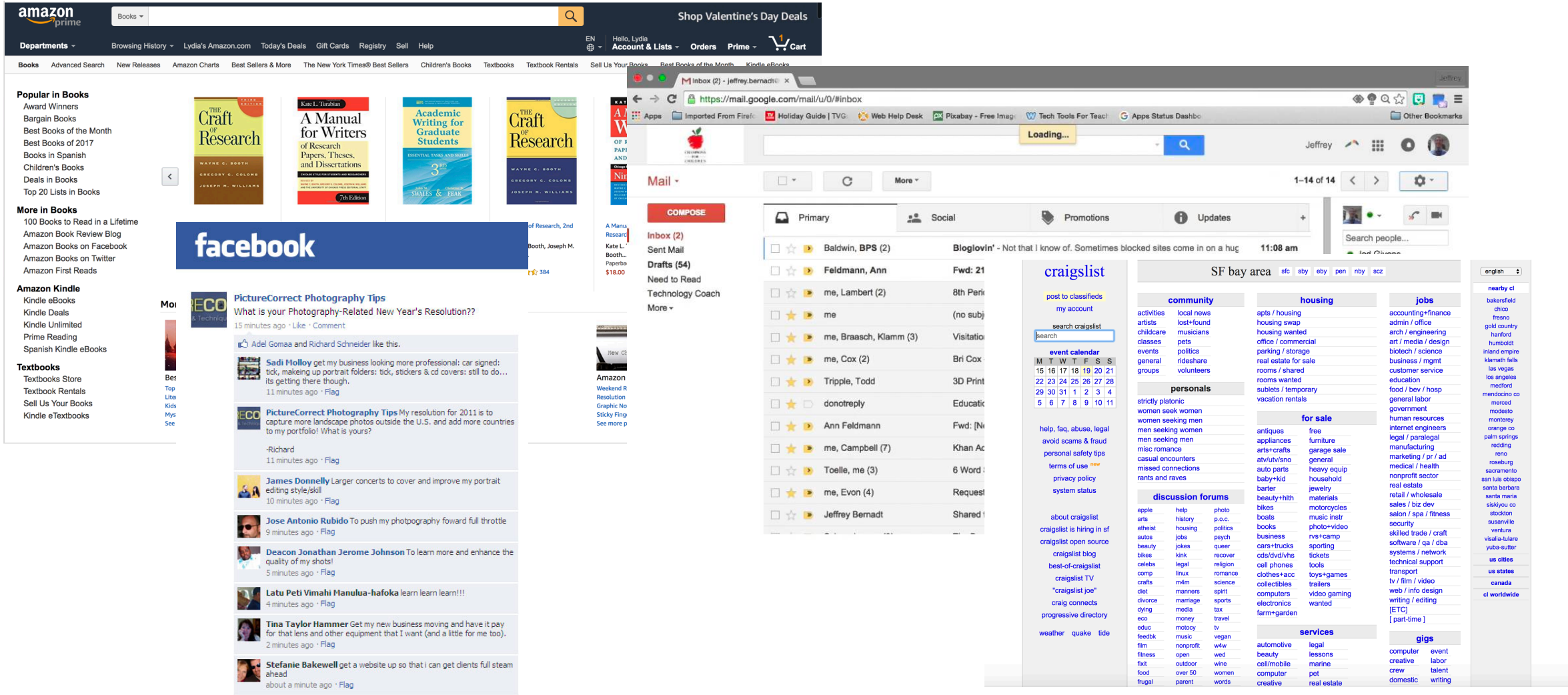
TAS

Tessa Hurr
Eleanor Murguia
Lucille Sui

WEEKLY SCHEDULE

Lecture
Mon, Wed 4:10–5:25pm, 413 Kent Hall

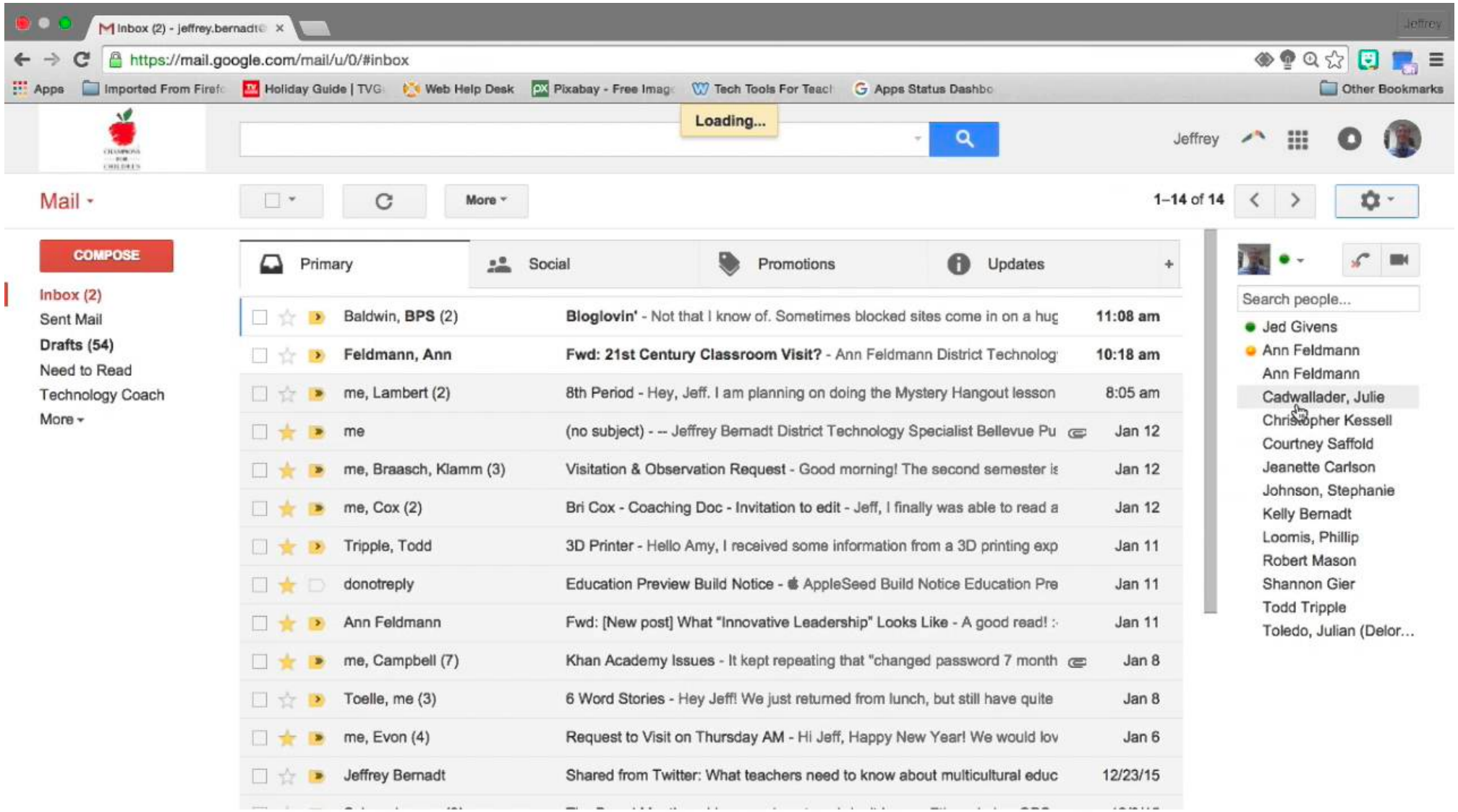
But all the other ones do



Amazon: Database of books

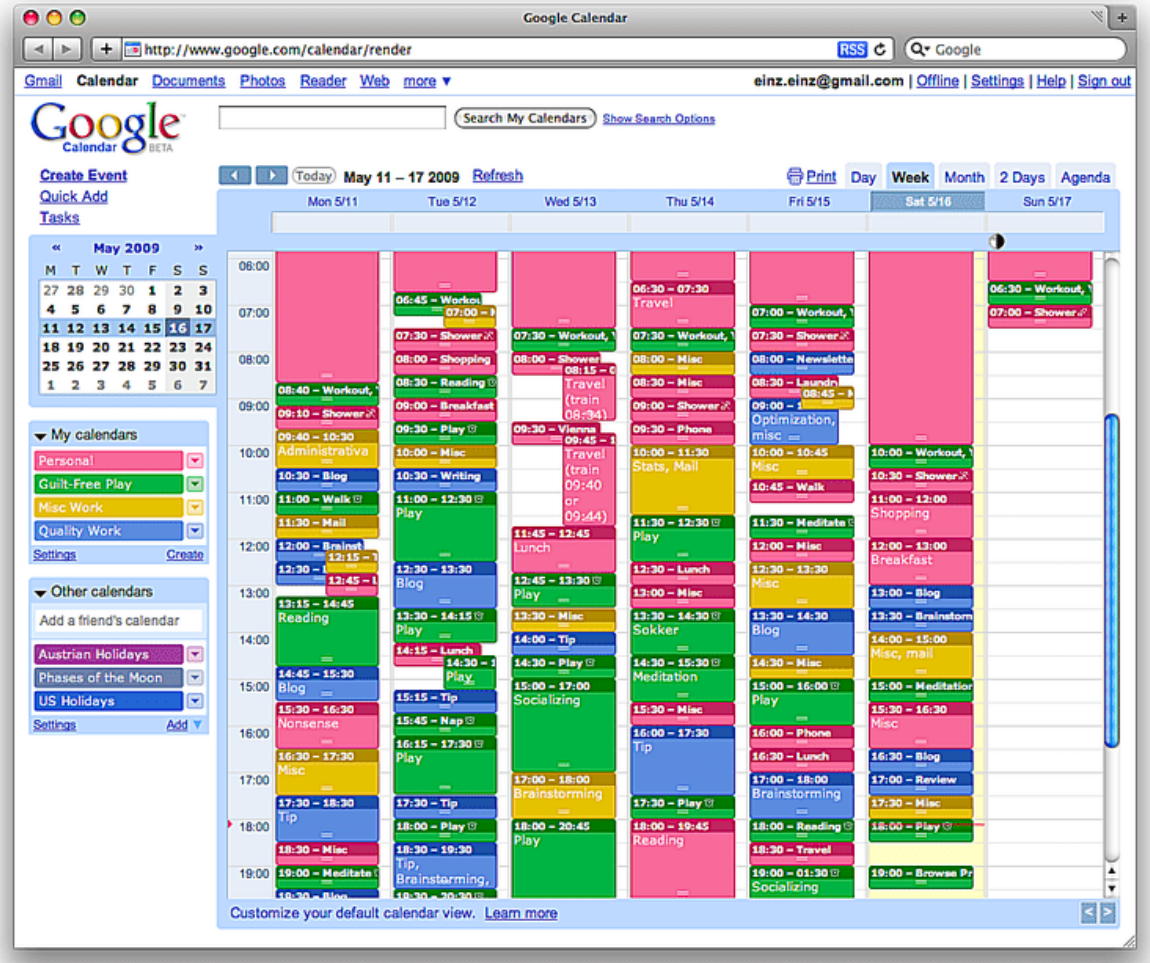
YouTube: Database of videos

GMail: Database of emails

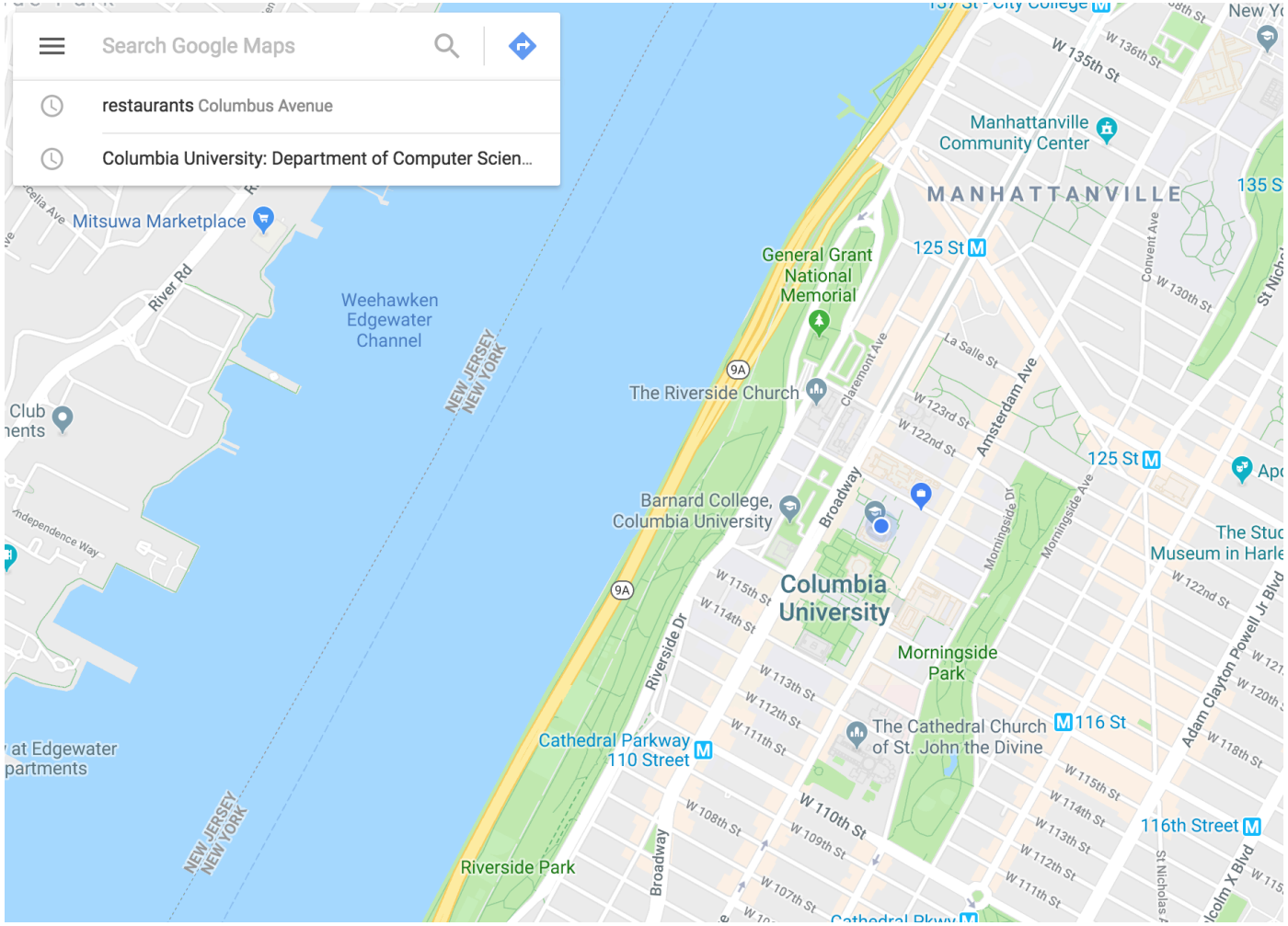


Facebook: Database of posts

GCalendar: Database of events



Google Maps: A database of locations



New York Times: Database of news articles

SECTIONS SEARCH hmslydia

ENGLISH 中文 (CHINESE) ESPAÑOL

The New York Times

Friday, January 19, 2018 | Today's Paper | Video | 34°F | S. & P. 500 +0.19% ↑

World U.S. Politics N.Y. Business Opinion Tech Science Health Sports Arts Style Food Travel Magazine T Magazine Real Estate ALL

Trump in Shutdown Talks With Schumer

White House Invites Democratic Leader to Negotiate a Deal

By THE NEW YORK TIMES
49 minutes ago

- The government will shut down at 12:01 a.m. Saturday if lawmakers fail to get an agreement on some kind of spending bill.
- With Democrats balking, President Trump canceled plans to travel to his Florida resort and contacted Senator Chuck Schumer, the Democratic leader.

· **Timeline: How Congress Got to the Brink of a Shutdown**
· **Right and Left React to Prospect of Shutdown**

"We are not going to desert these young people," he said, referring to DACA beneficiaries.

Senator Bernie Sanders of Vt.

How the Debate in Congress Breaks Down

By ALICIA PARLAPIANO and WILSON ANDREWS
Lawmakers have until Friday at midnight to pass a short-term spending bill to avoid a government shutdown.

Senate to Vote With Shutdown at Stake

By THOMAS KAPLAN and SHERYL GAY STOLBERG 44 minutes ago
Senate Democrats appear ready to block legislation to keep the government funded past midnight, gambling that Mr. Trump will offer concessions on immigration and other issues.
574 Comments

The Chaos President vs. His Iron-Fisted Chief of Staff

By MAGGIE HABERMAN and JULIE

VIDEO INTERVIEW

Opinion

EDITORIAL
Here's Another Fine Mess They've Gotten Us Into
Once again, Trump and Congress cannot perform a basic task, preventing a government shutdown.

· **Krugman: Doomsday Politics**
· **The Breakdown in Trust That Could Lead to a Shutdown**
· **Brooks: It's Time to Talk About the Power of Touch**
· **Goldberg: Is This the Collusion We Were Waiting For?**
· **Kristof: Swallowed by the Sea**
· **Leonhardt: A Warning for Democrats**
· **Egan: The Mad King**
· **The Shadow Safety Net**

FRANK BRUNI
Donald Trump's Radical Honesty
In his own wild way, this president is as truthful and transparent as they come.

Clubbable, but in the Worst Way
By MICHAEL GOLDFARB
Donald Trump is a man of his class — the nouveau-riche, country-club class.

· **How the Pro-Life Movement Has Promoted Liberal Values**
· **ICE Detained My Husband for Being an Activist**
· **Follow us on Twitter »**

TIMES INSIDER »
'I, Figure Skating Reporter': Full Circle With Tonya Harding

THE CROSSWORD »
Play Today's Puzzle

33m The **Justice Department wants to ask if you are a U.S. citizen** in the 2020 census. But public distrust of the government could lead Hispanic people to avoid being counted.

5h **Can software predict crime?** A study suggests that human amateurs are about as accurate as a popular software that many judges use to

Craigslist: Database of sales posts

CL new york > brooklyn > for sale > furniture - by owner

◀ prev ▲ next ▶

reply ✉ ☎ prohibited [?] Posted 12 days ago

☆ **Gorgeous new 6ft. tall throne chair - $1199 (Brooklyn)**

condition: **new**

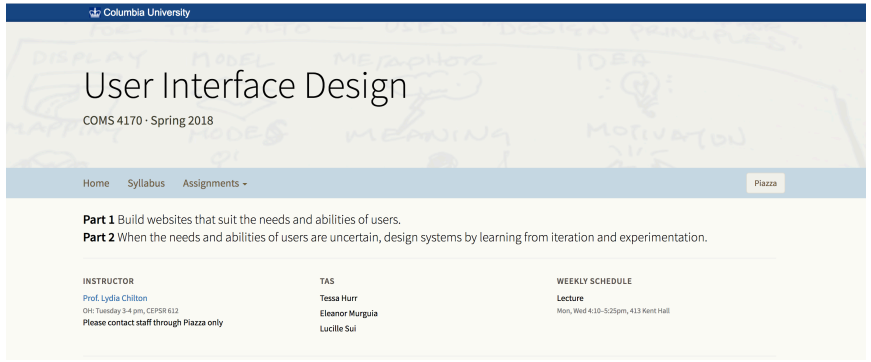
Gorgeous new 6ft. tall throne chair for $1199obo. I will deliver it to you!

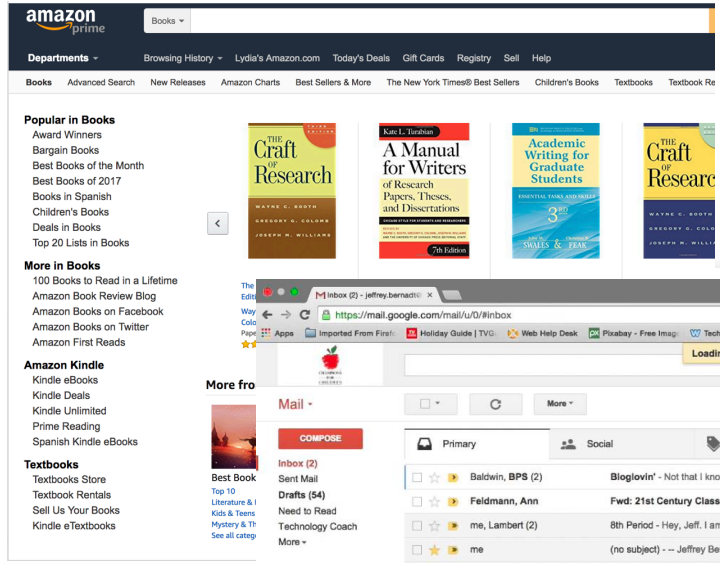
- do NOT contact me with unsolicited services or offers

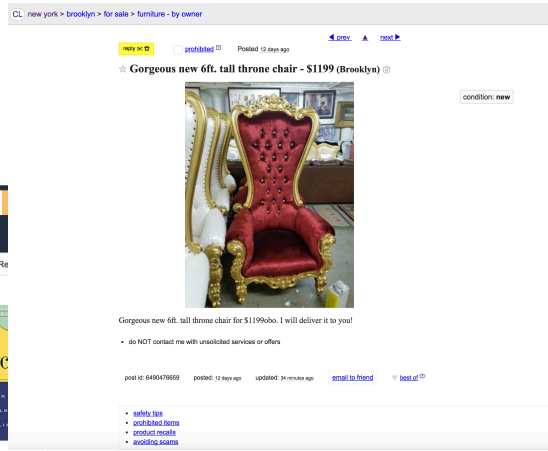
post id: 6490476659 posted: 12 days ago updated: 34 minutes ago email to friend ♥ best of [?]

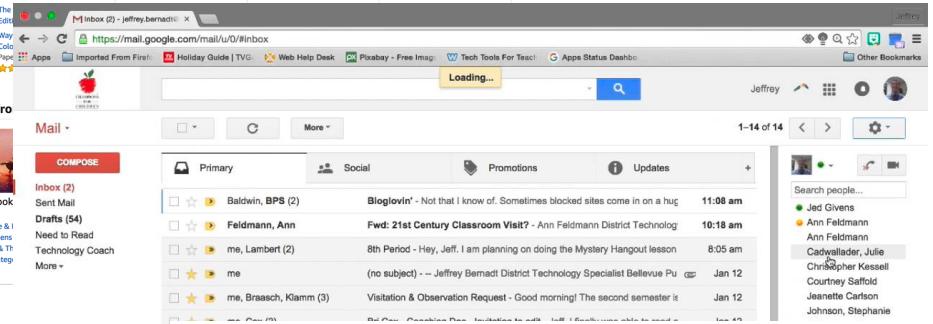
- safety tips
- prohibited items
- product recalls
- avoiding scams

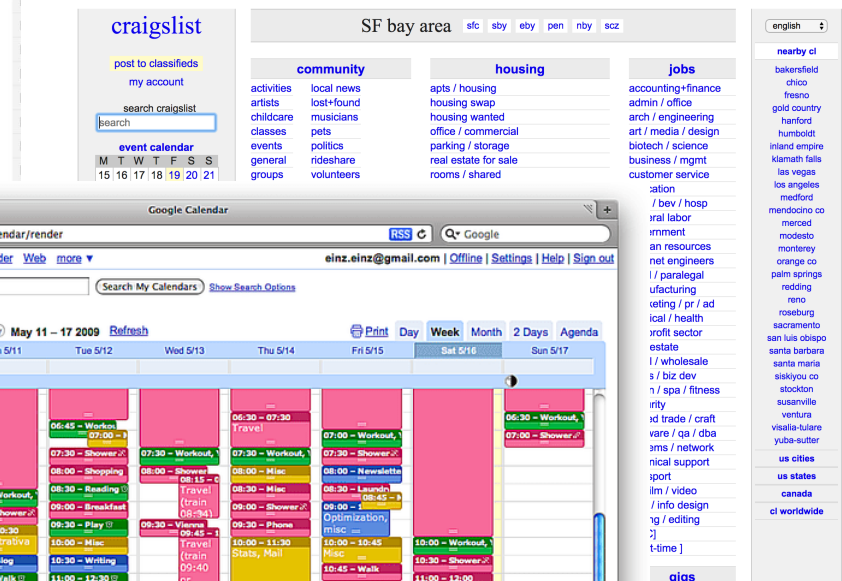
What's the difference?





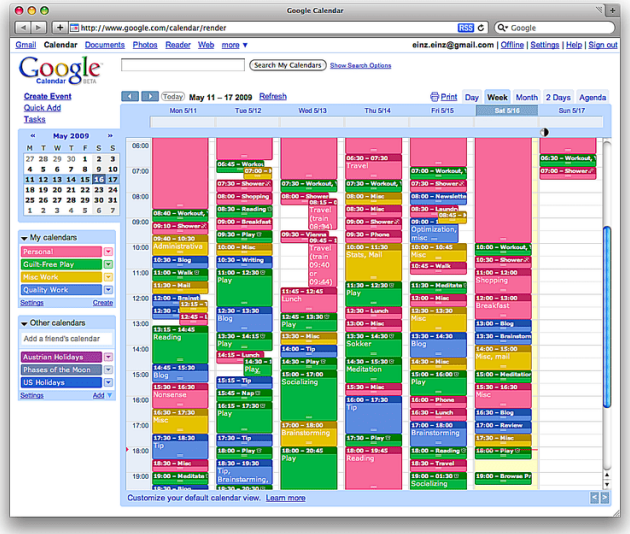


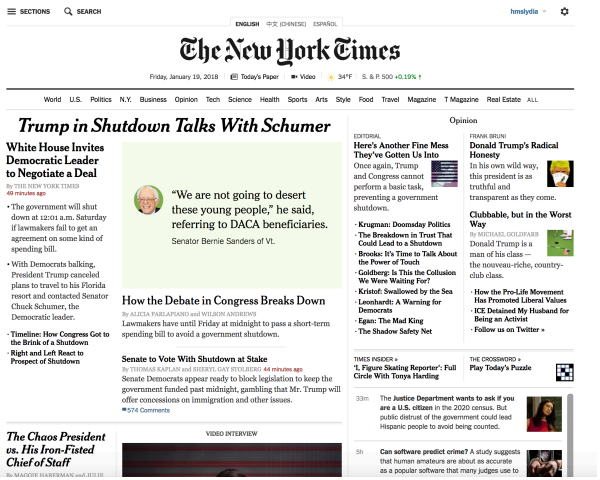


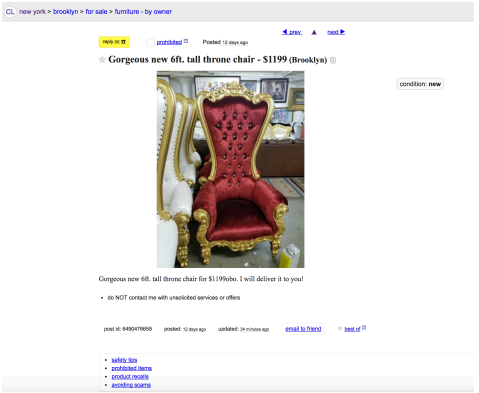


Database-backed Websites

This class is not about backend development





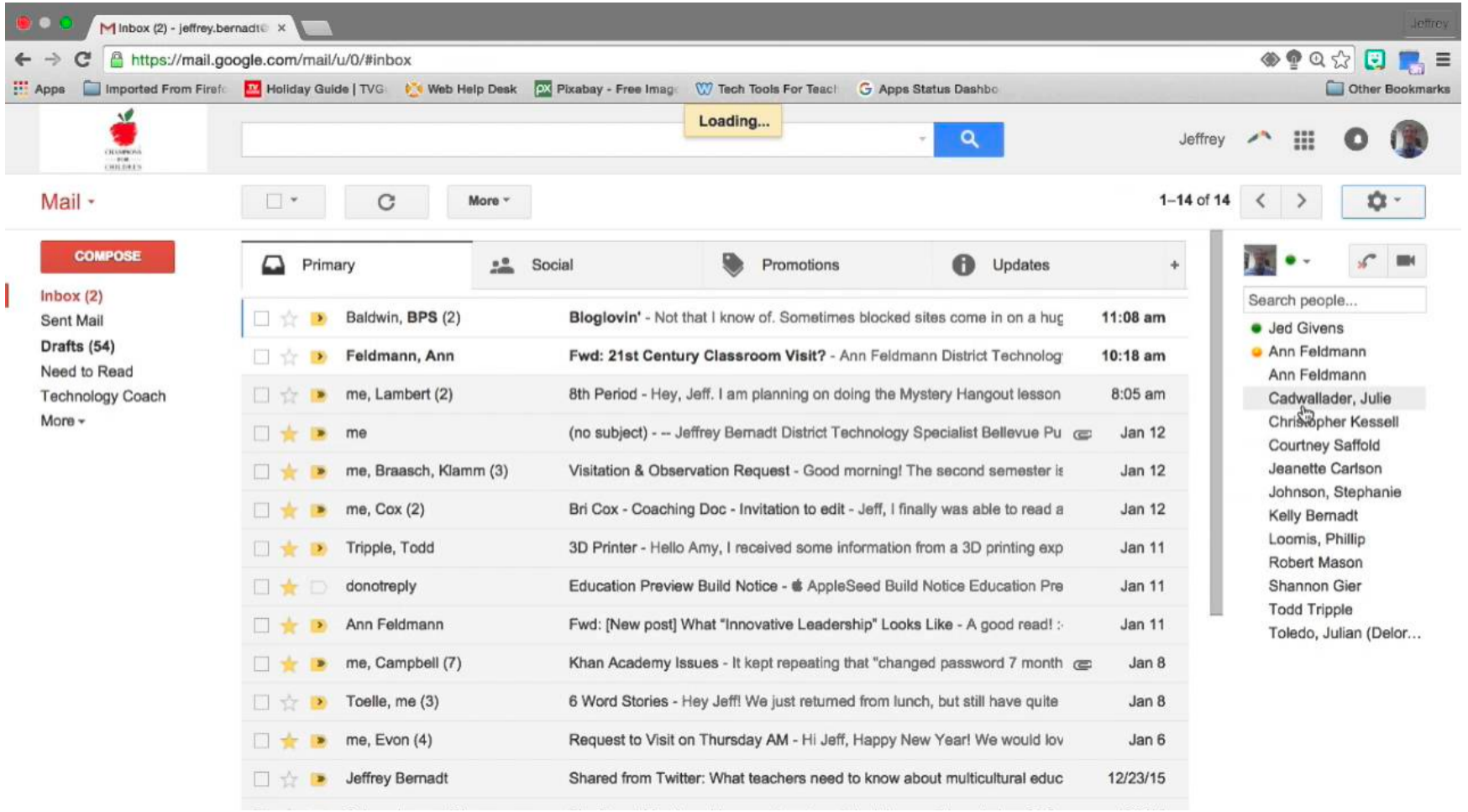


But front-ends and back-ends are tightly coupled.
So you need to know something about back-end databases
To create awesome websites

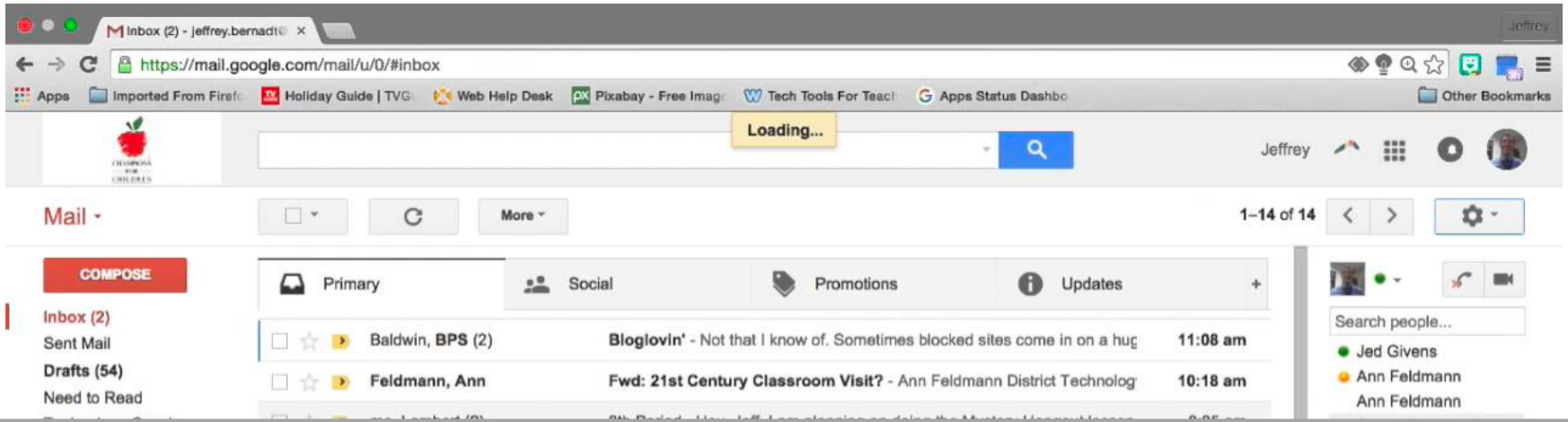
Interacting with Databases

CRUD: Create, Read, Update Delete

Gmail is a database of emails

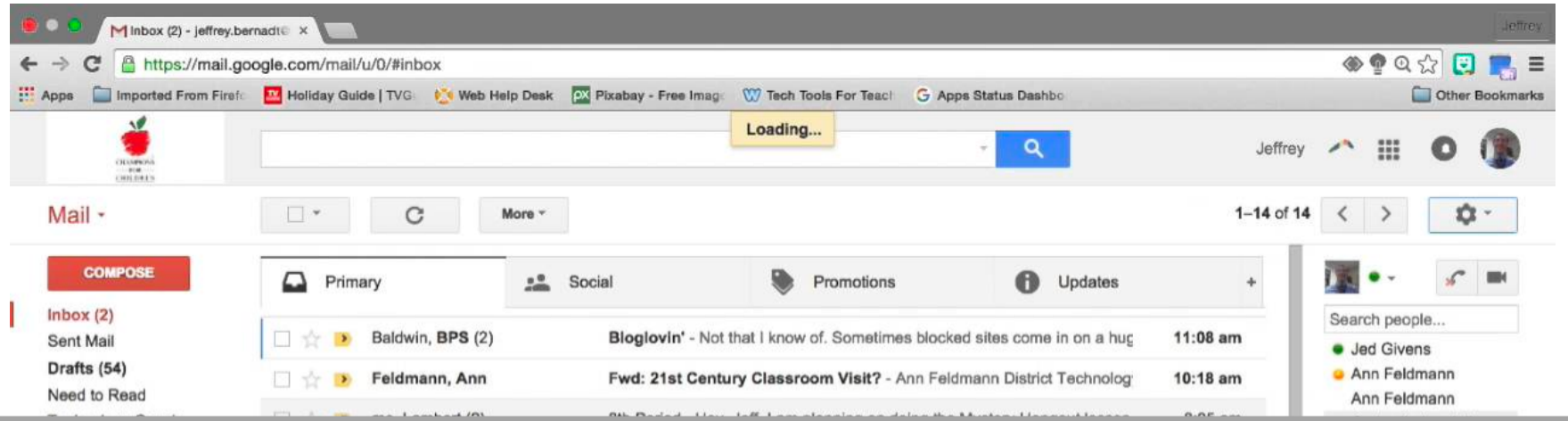


What are the key bits of information stored for each **email**?



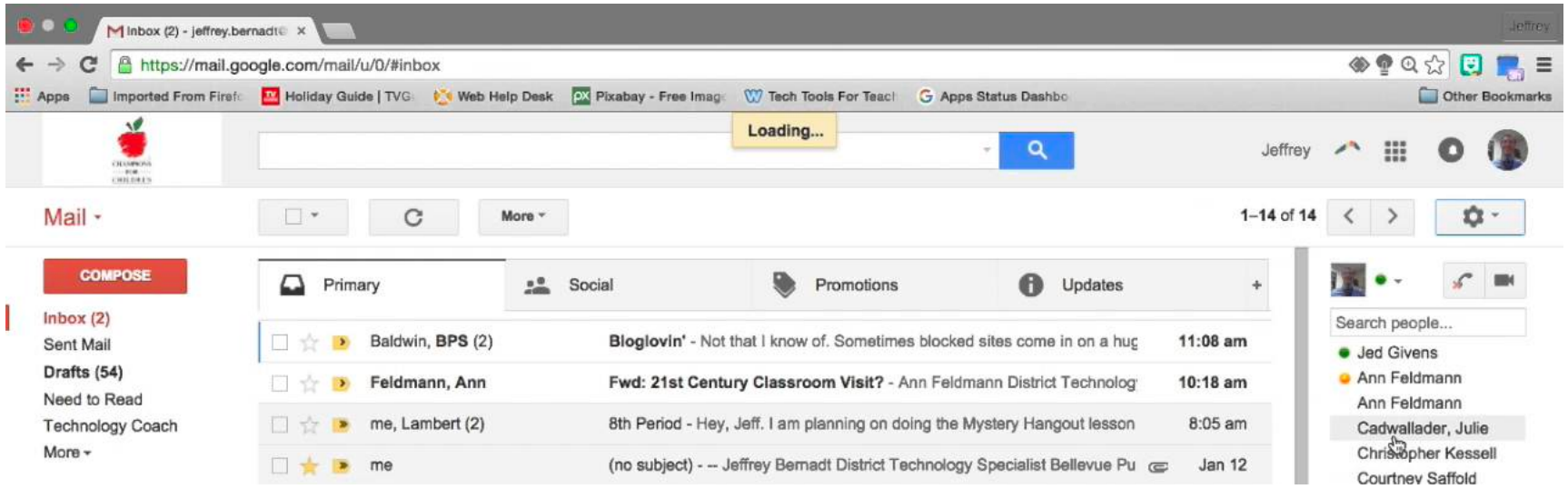
From	To	Subject	Body	Time
Baldwin	Jeffrey	Blogloving’	Not that I know of…	158904993585835
Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
…				

Remember: Multiple users' data stored in one database



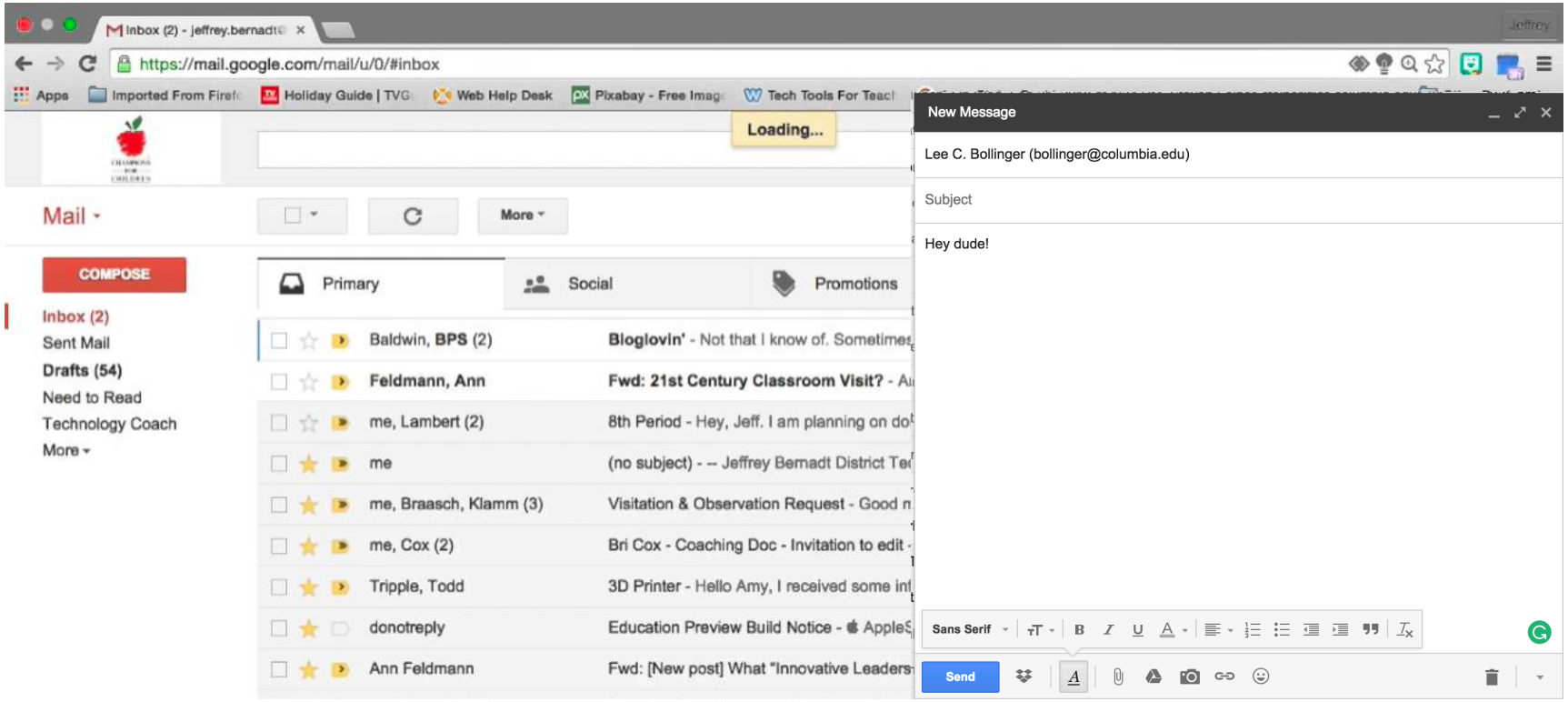
From	To	Subject	Body	Time
Baldwin	Jeffrey	Blogloving'	Not that I know of…	158904993585835
Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
Lydia Chilton	Lee Bollinger	Bowling tuesday	Hey dude! Donnie and I were thinking of going bowling…	158904993443772
…				

Most websites allow users to: **C**reate, **R**ead, **U**pdate, and **D**elete Data



From	To	Subject	Body	Time
Baldwin	Jeffrey	Blogloving’	Not that I know of…	158904993585835
Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
Lydia Chilton	Lee Bollinger	Bowling tuesday	Hey dude! Donnie and I were thinking of going bowling…	158904993443772

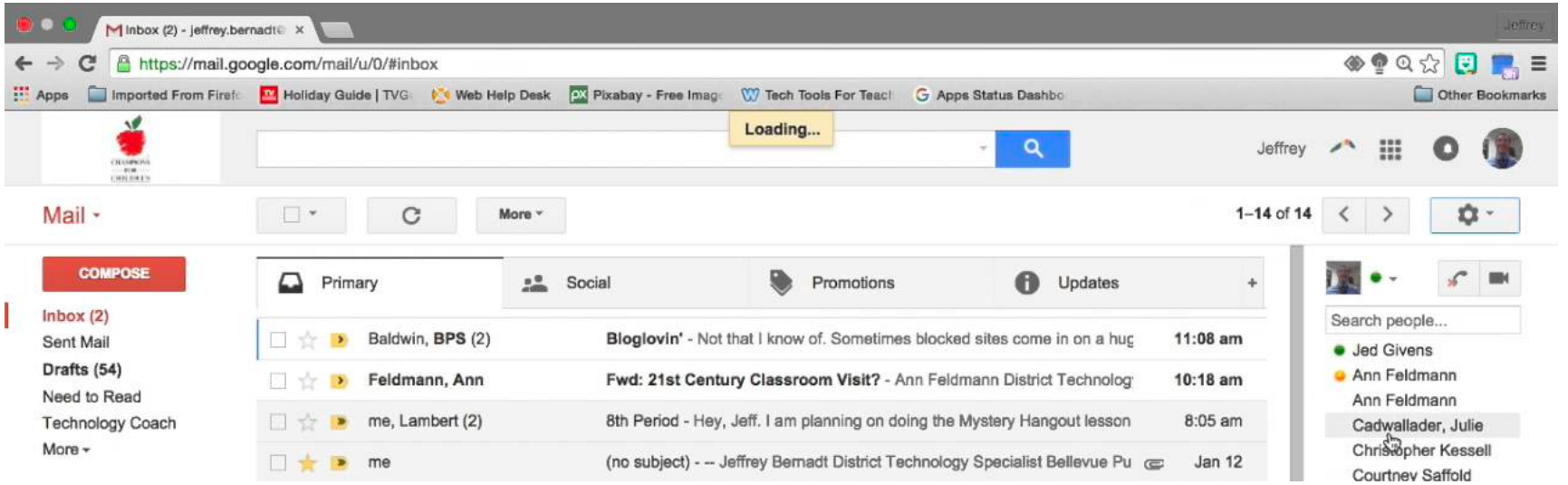
CREATE: How do users create data in GMail?



INSERT INTO emails (To, From, Subject, Body, time)
VALUES (“Baldwin”, “Jeffrey”, “Bloglovin’”, “not that I know of”, NOW)

READ: How do users read data in GMail?

How do they see different portions of the database?



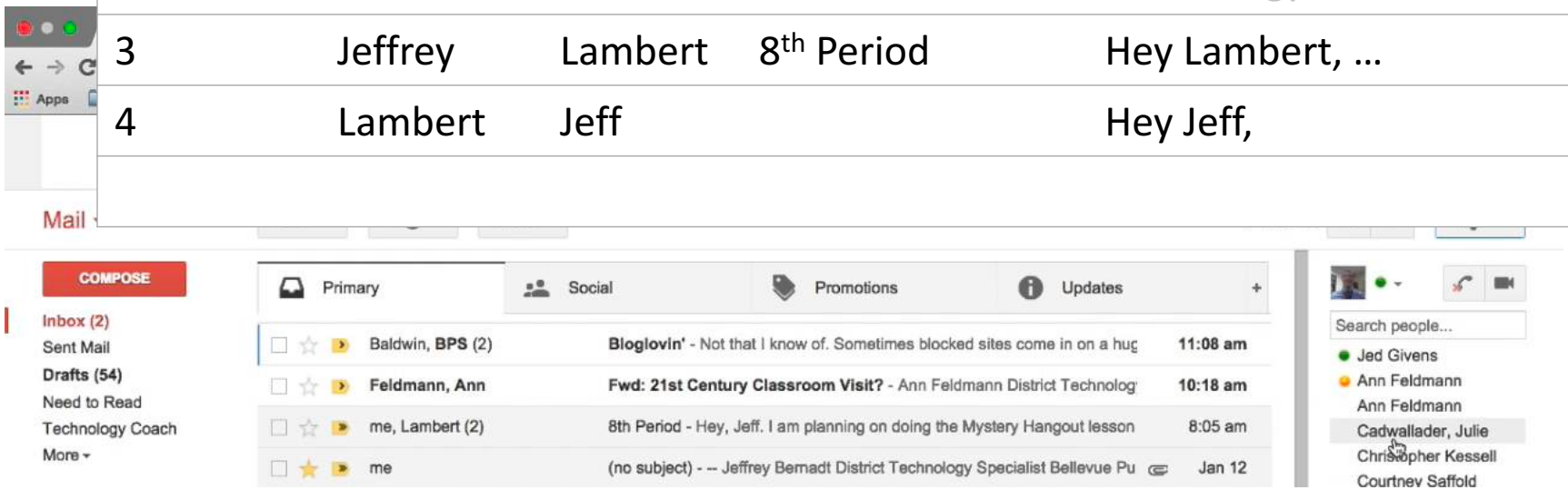
Select * FROM emails
WHERE (to = “Jeffrey”)
ORDER BY time DESCENDING
LIMIT 30

WHY NOT THIS?
Select FROM emails WHERE
(to = “Jeffrey” OR from = “Jeffrey”)

READ: How do users read data in GMail?

How do they see different portions of the database?

ID	From	To	Subject	Body	Response to	Time
1	Baldwin	Jeffrey	Blogloving’	Not that I know of…		158904993585
2	Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology		158904993585
3	Jeffrey	Lambert	8th Period	Hey Lambert, …	0	158904993589
4	Lambert	Jeff		Hey Jeff,	3	158904993599

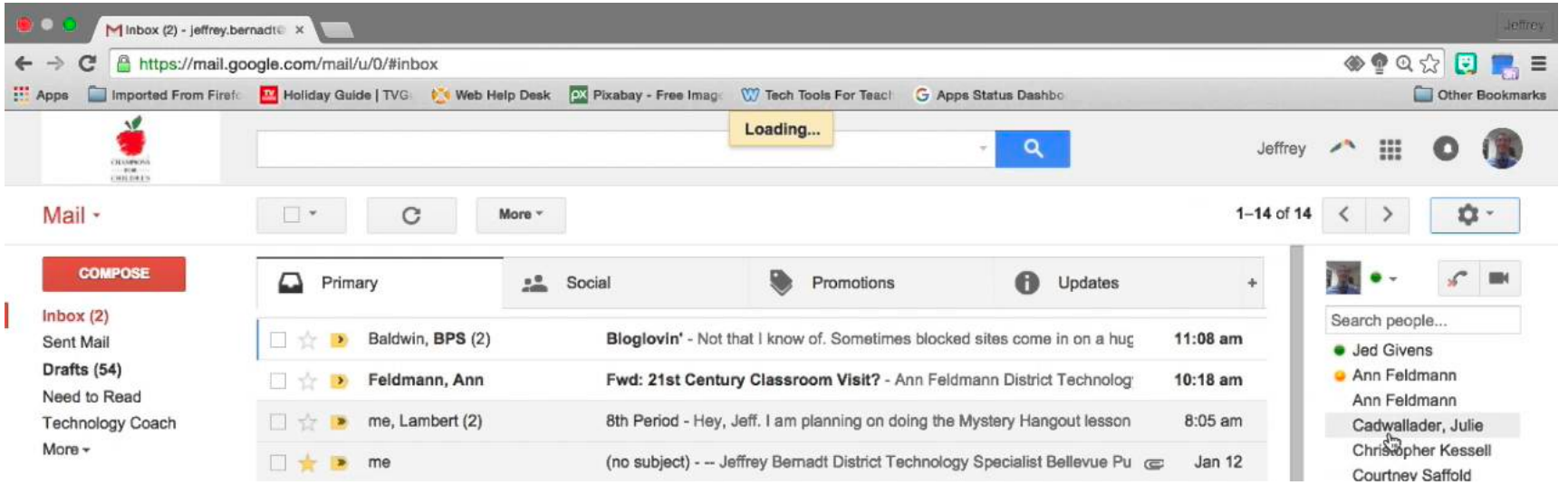


My_emails_id = Select * FROM emails WHERE (to = “Jeffrey”)

Select * FROM emails WHERE (responseTo IN My_email_ids)

UPDATE: How do users update data in GMail?

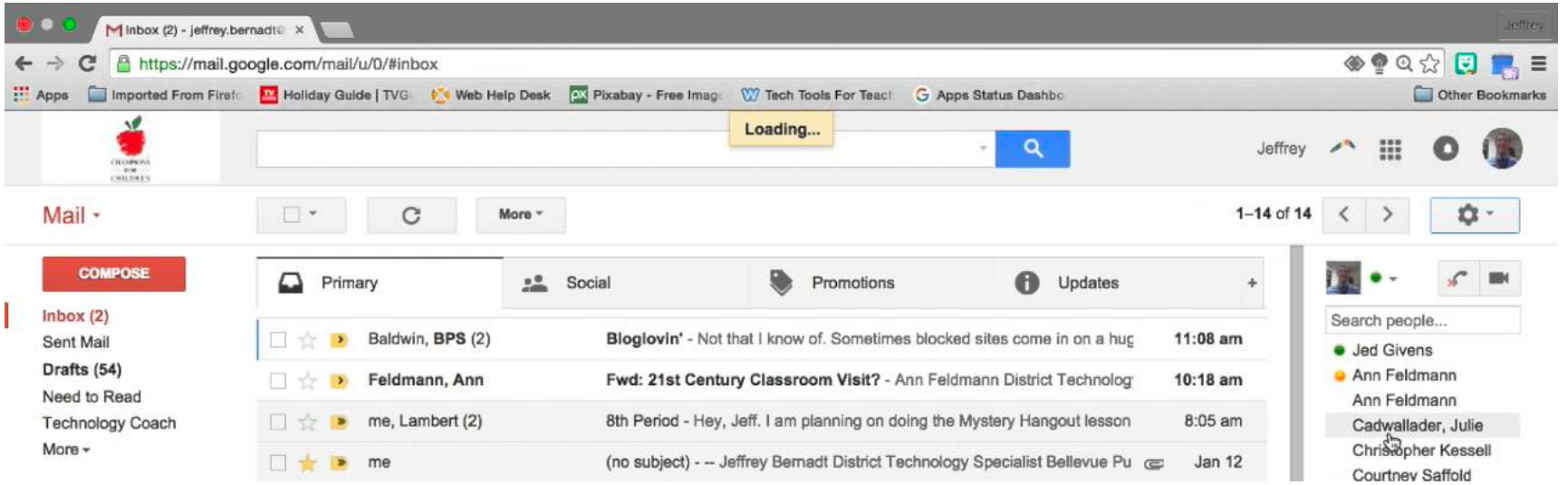
What do they update? And how do they do it in the interface?




```
UPDATE email_table
SET starred = True
WHERE email_id=”123456”
```

DELETE: How do users delete data in GMail?

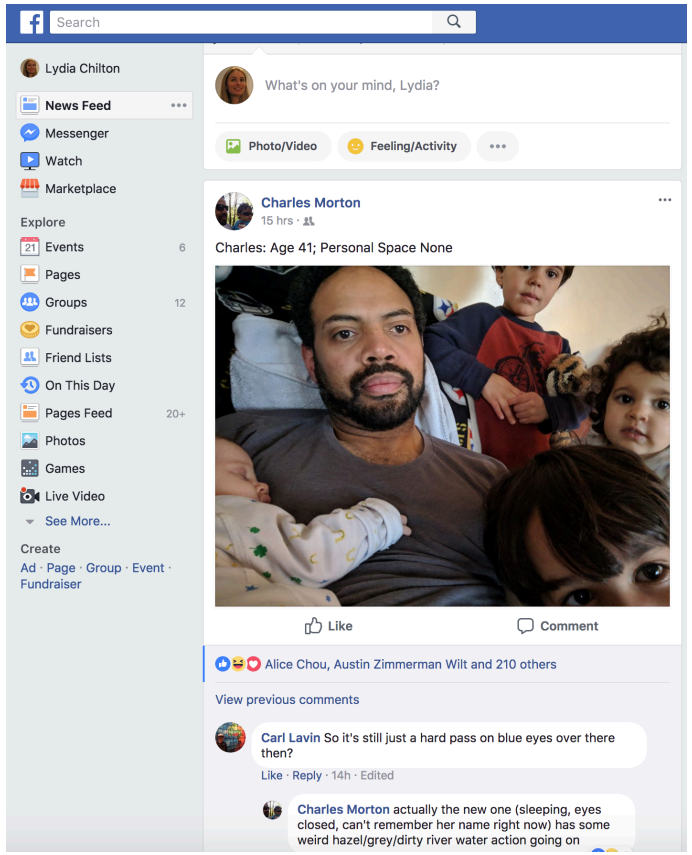
First, what objects can be deleted in GMail?



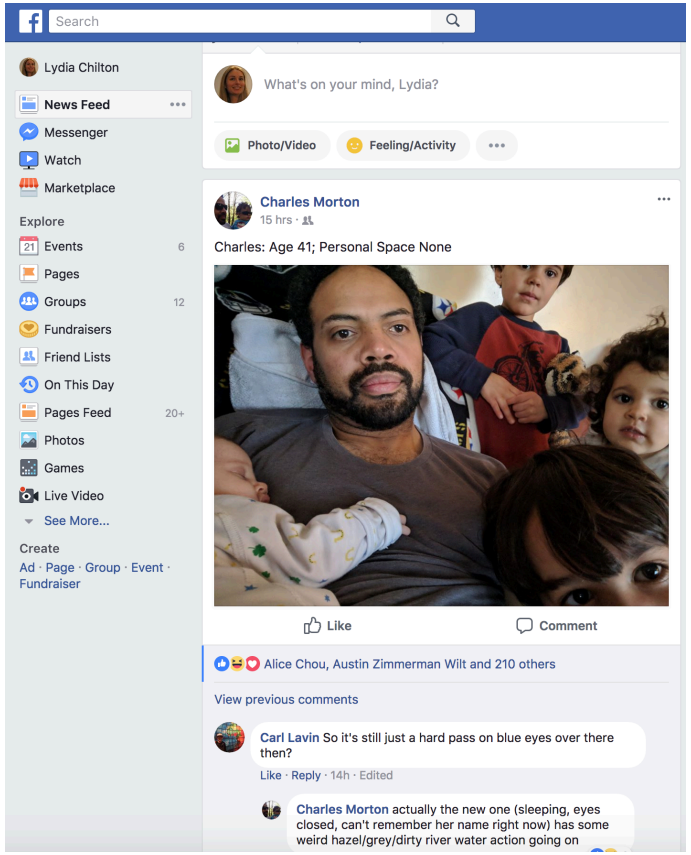
DELETE FROM email_drafts_table WHERE id=”123456”

UPDATE email_table
SET mark_as_deleted = True
WHERE email_id=”123456”

Facebook is a database of posts.

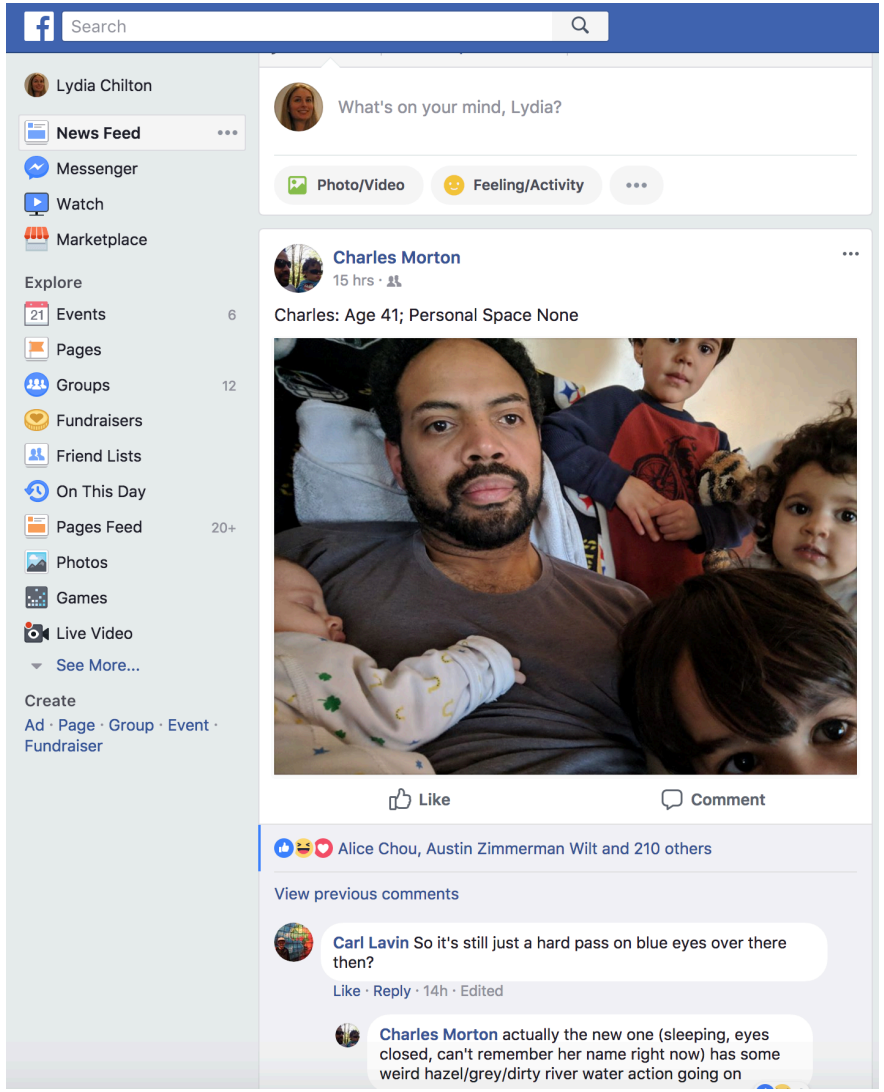


What fields are in the Facebook posts database?



creator	text	Likes	Time
Charles Morton	Charles Age 41: Personal..	210	1589049358

CREATE: How do users create data in Facebook?

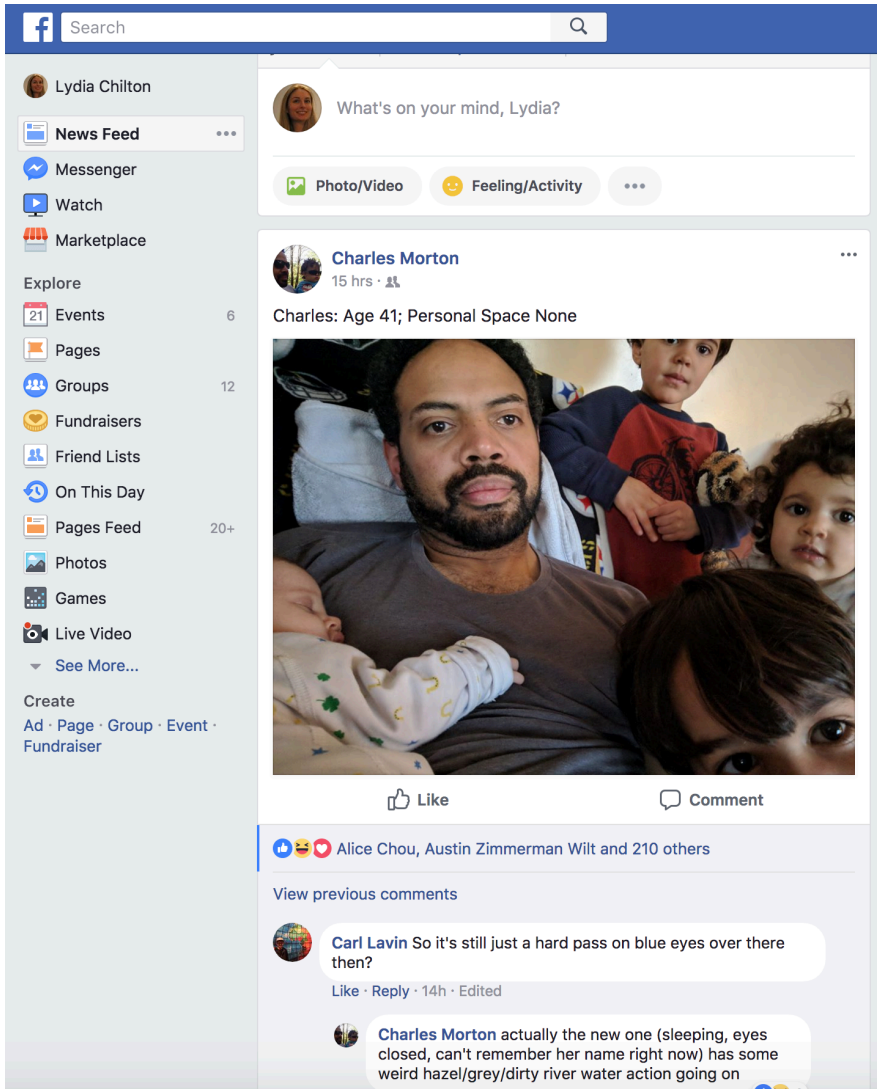


INSERT INTO
posts (creator, text, likes, time)

VALUES
(“Charles Morton”,
“Charles: Age 41: Personal Space None <img src=“”>”
0,
NOW())

READ: How do users read data in Facebook?

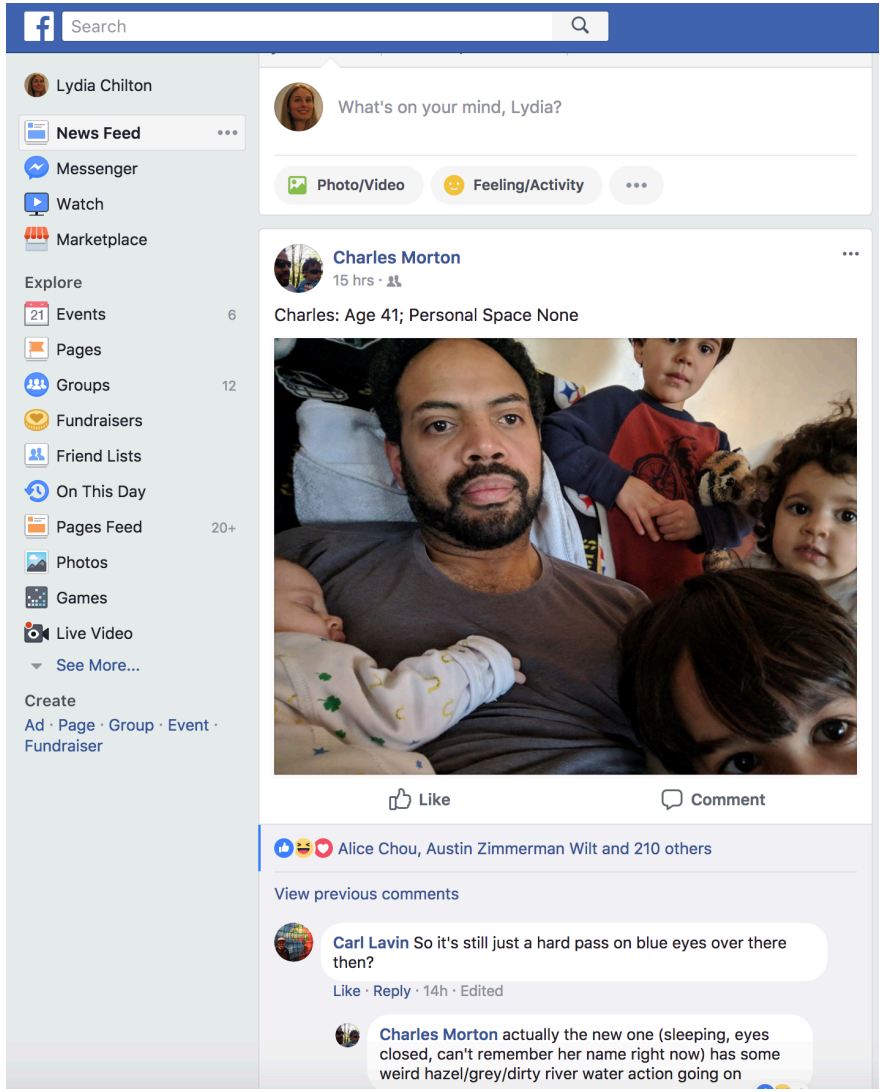
How do they see different portions of the database?



my_friends =
Select * FROM Friends WHERE friend1="Lydia Chilton"

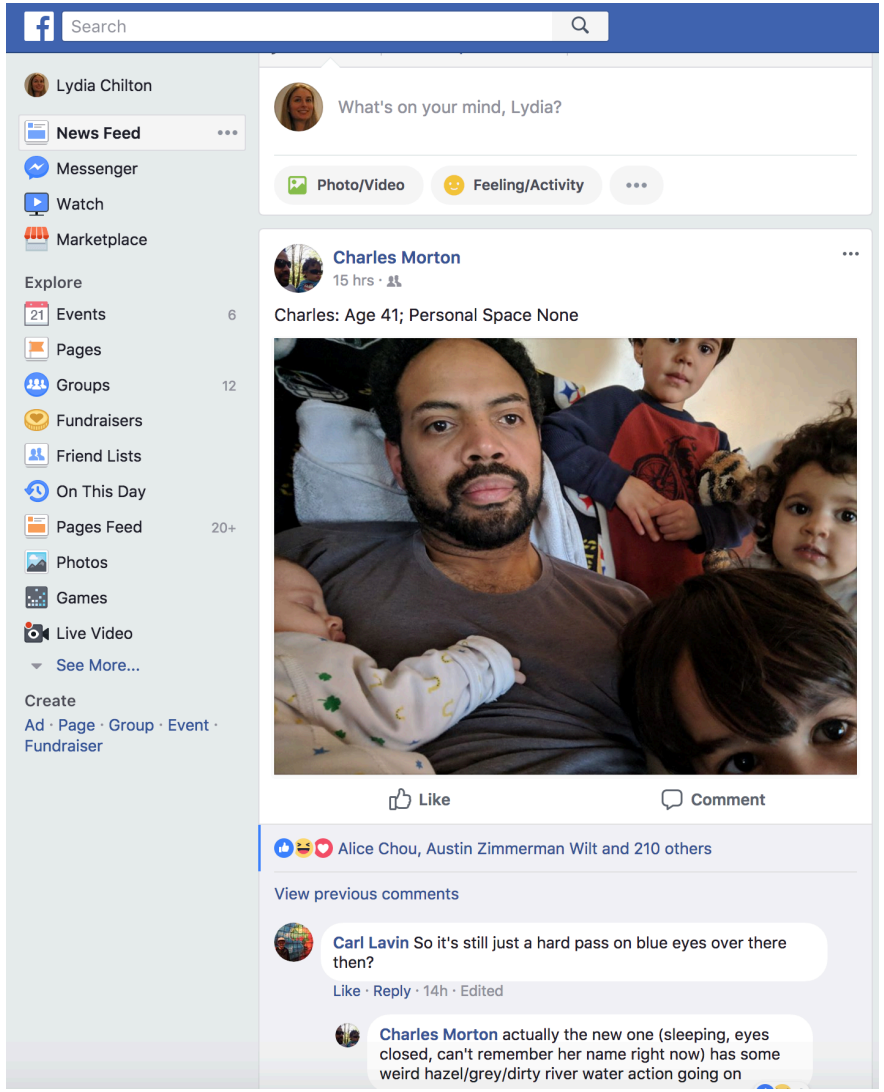
Select * FROM posts WHERE (creator in my_friends)

UPDATE: How do users update data in Facebook?



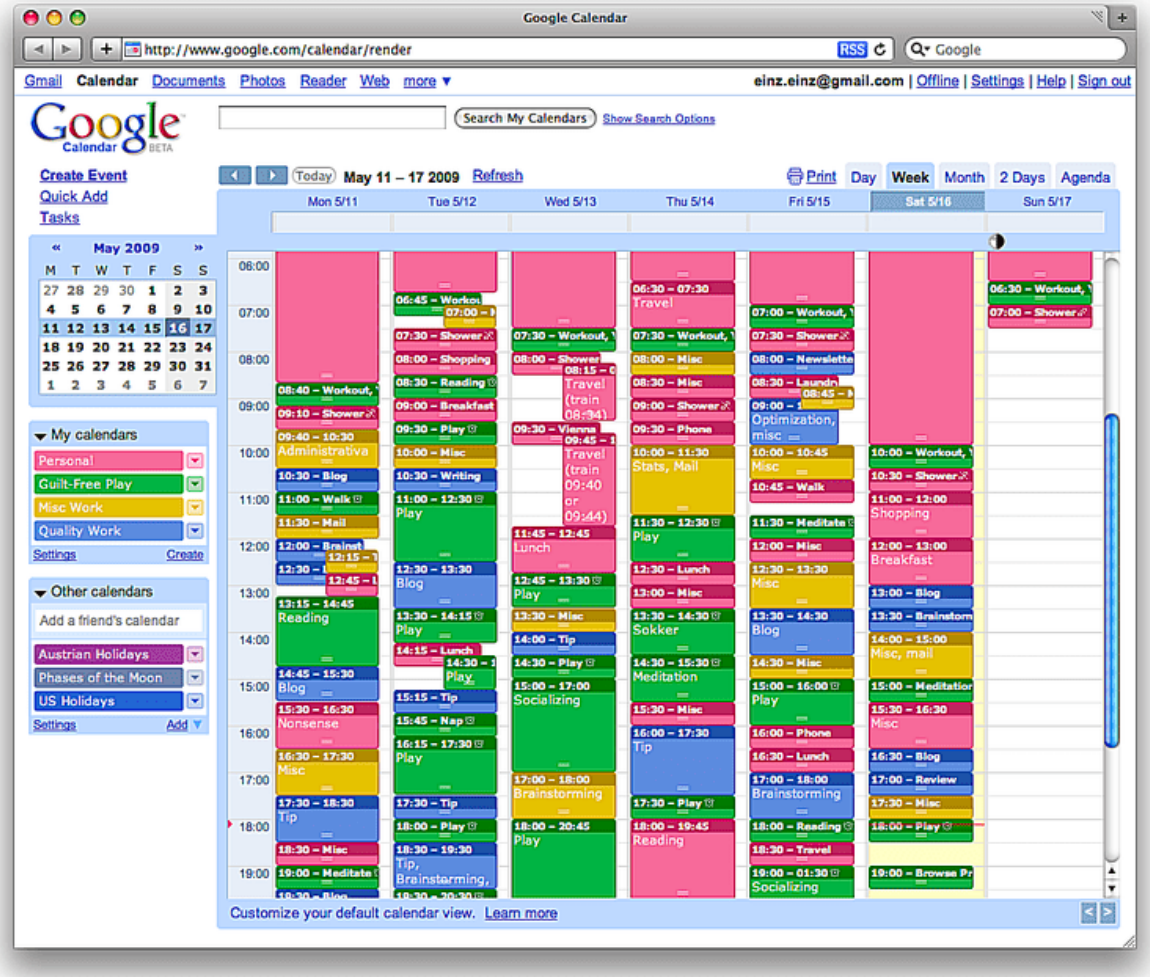
UPDATE posts
INCREMENT likes
WHERE post_id = “123345”

DELETE: How do users delete data in Facebook?

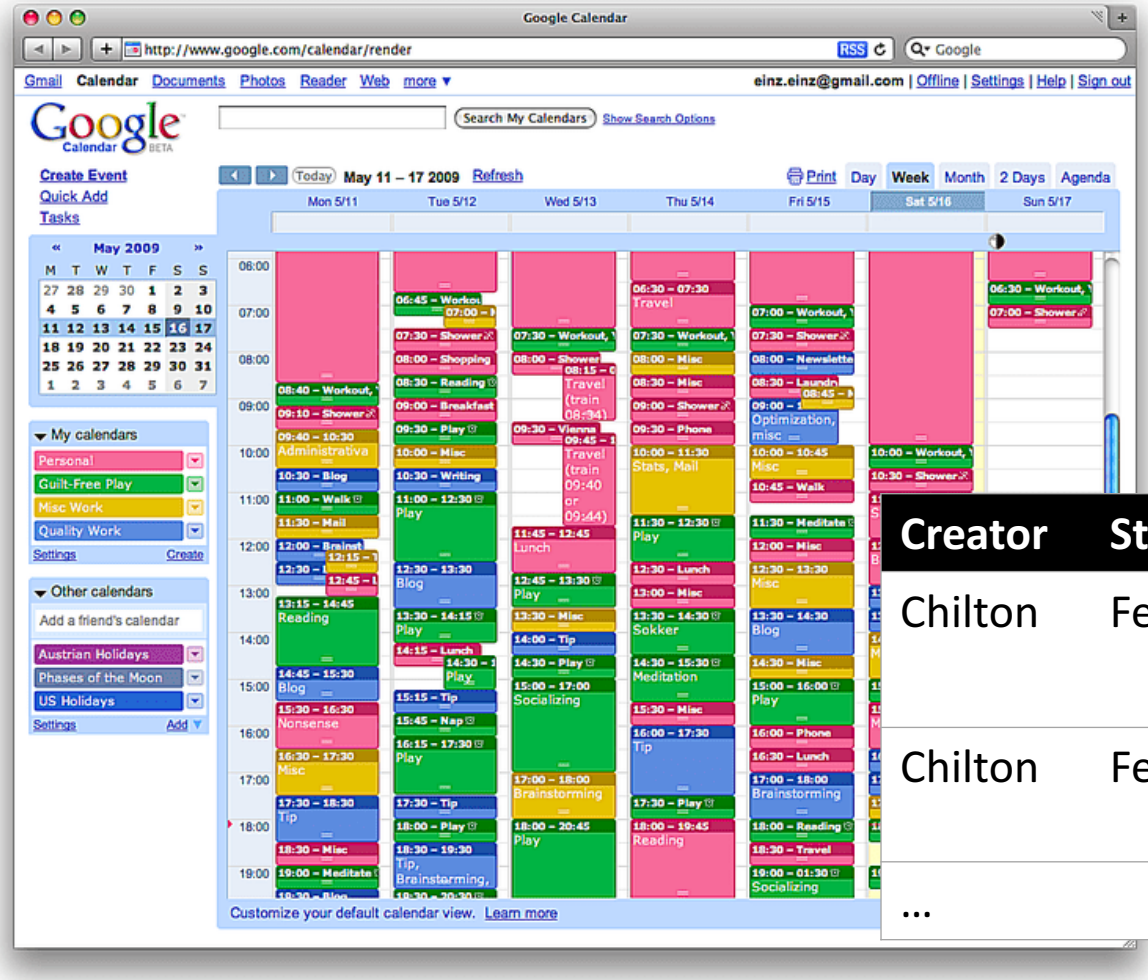


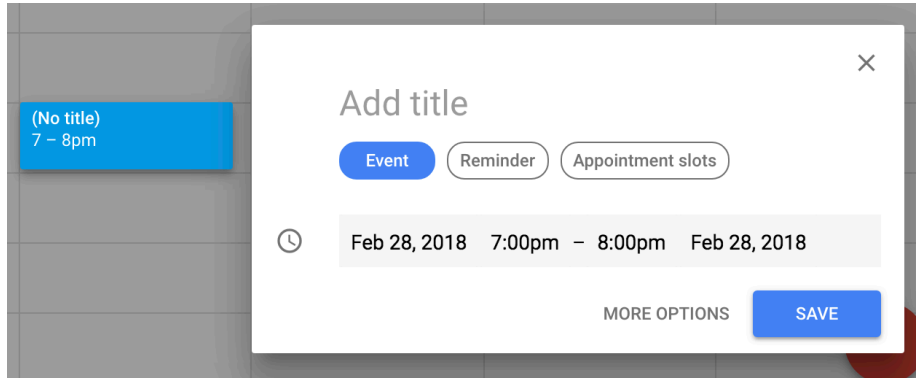
DELETE FROM posts
WHERE post_id = “123456”

What fields are in the Calendar events database?



CREATE: How do users create data in Calendar?

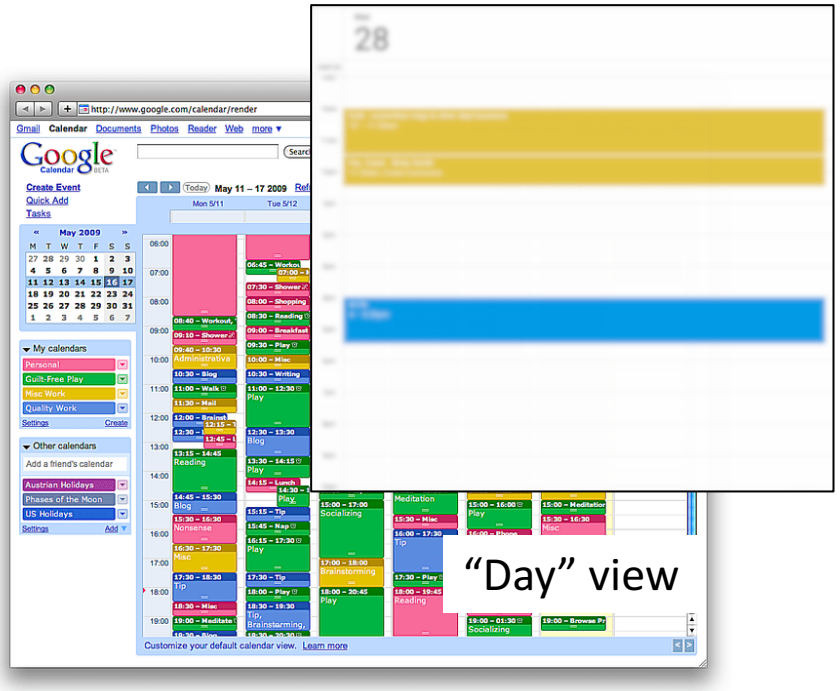




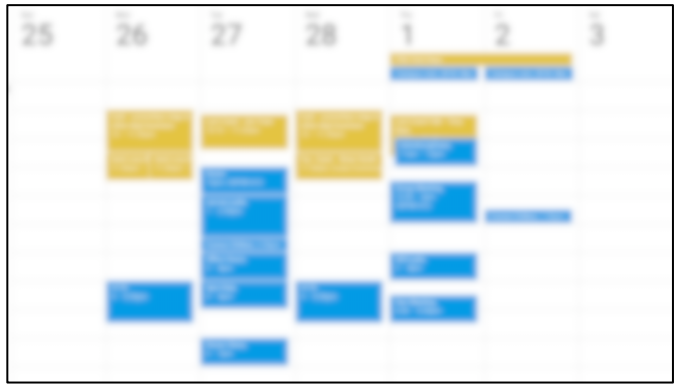
Creator	Start date	End Date	Title
Chilton	Feb 28, 7pm	Feb 28, 8pm	Dinner with Lee
Chilton	Feb 14, 4pm	Feb 17, 12pm	National Academy of Sciences event
…			

READ: How do users read data in Calendar?

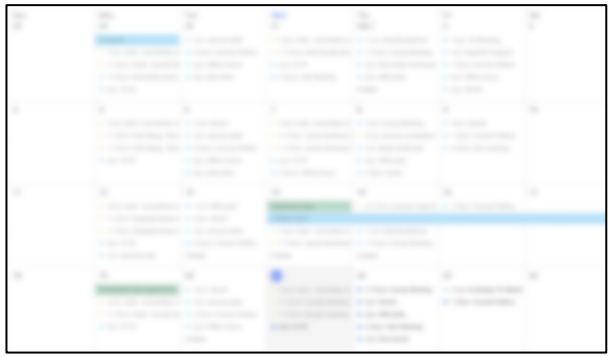
How do they see different portions of the database?



“Day” view



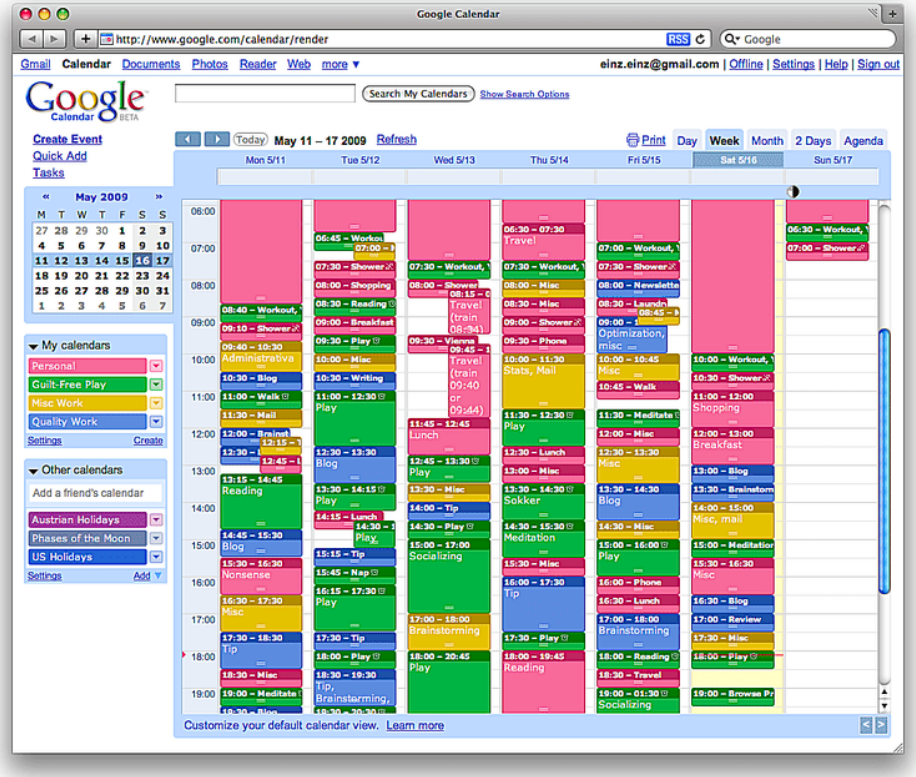
“Week” view



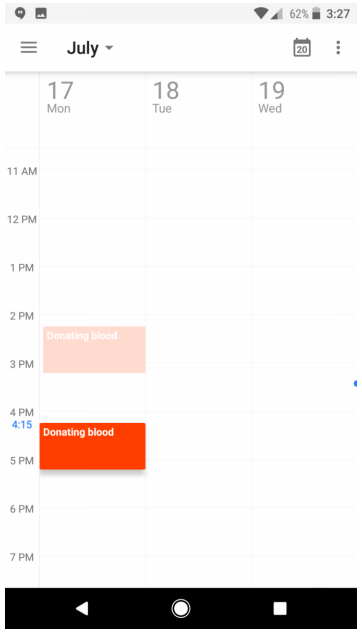
“Month” view

Creator	Start date	End Date	Title
Chilton	Feb 28, 7pm	Feb 28, 8pm	Dinner with Lee
Chilton	Feb 14, 4pm	Feb 17, 12pm	National Academy of Sciences event

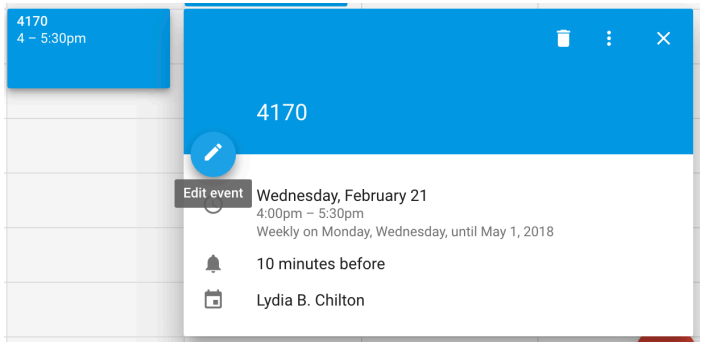
UPDATE: How do users update data in Calendar?

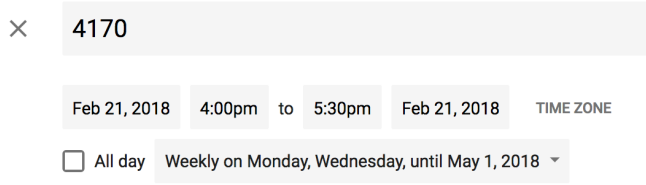


Drag and drop

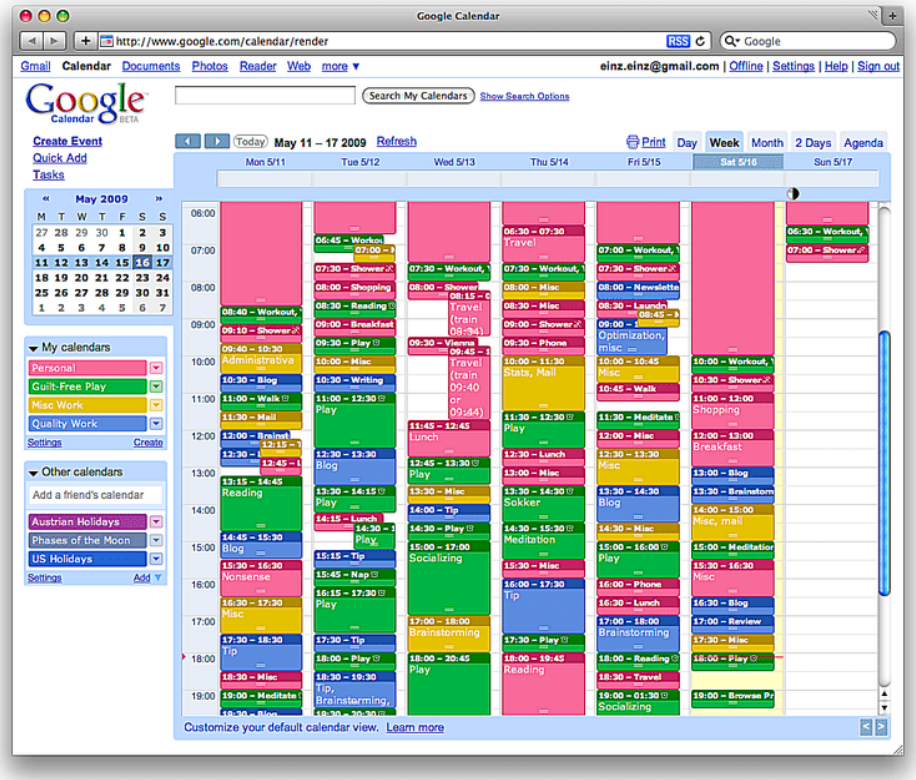


Select an event and edit a form





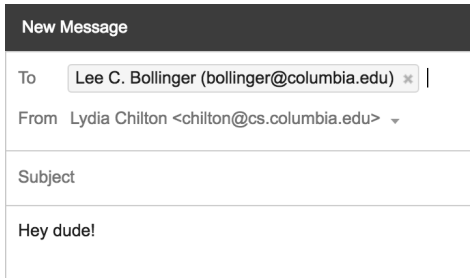
DELETE: How do users delete data in Calendar?

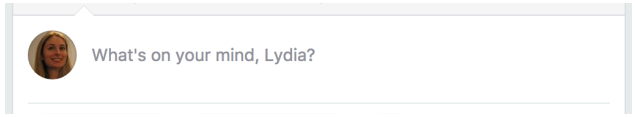


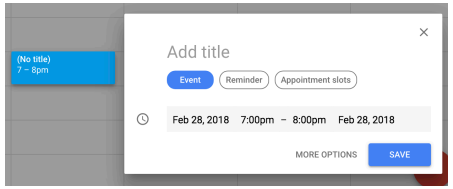
Selecting an event and clicking delete

CRUD: Operations for interacting with a database

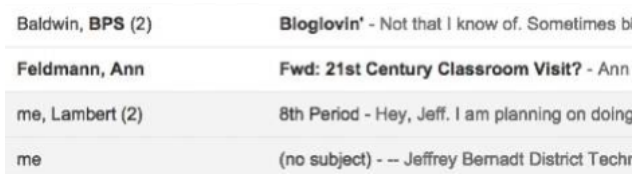
Create



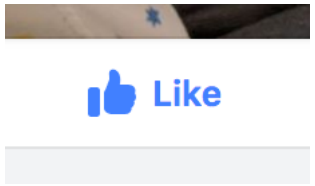


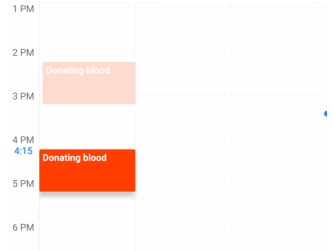


Read

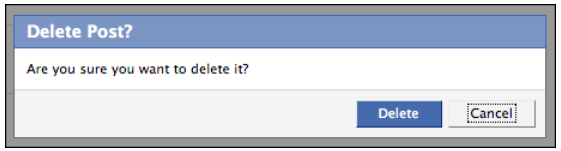


Update





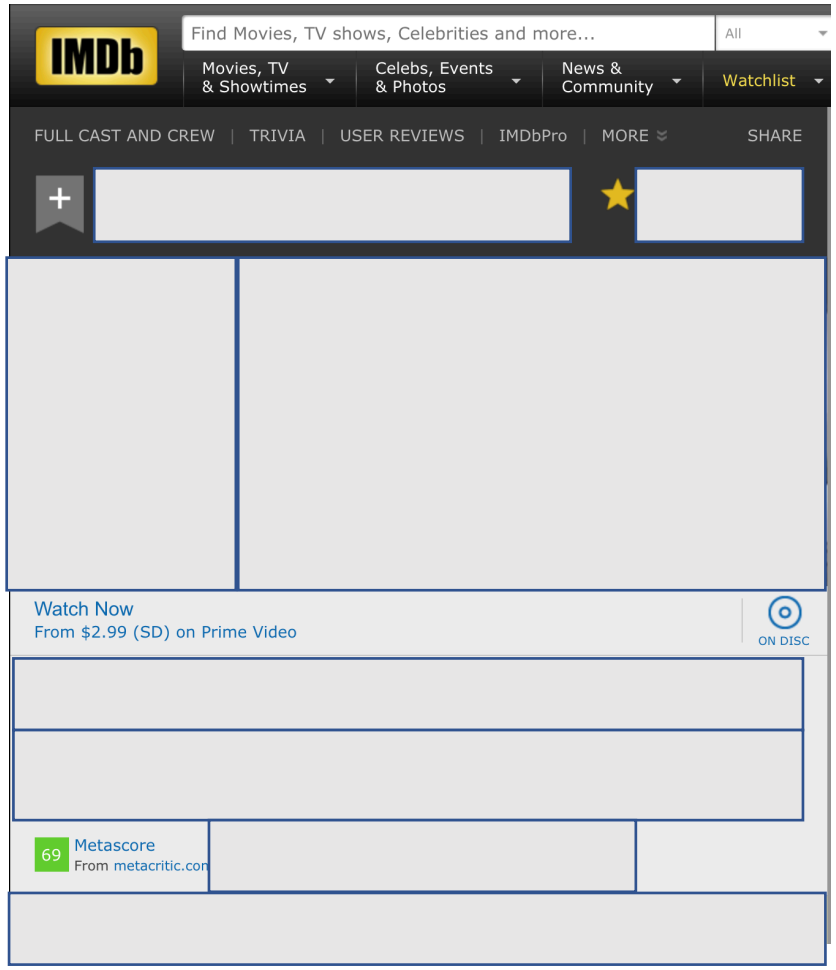
Delete



Dynamically Generated Webpages

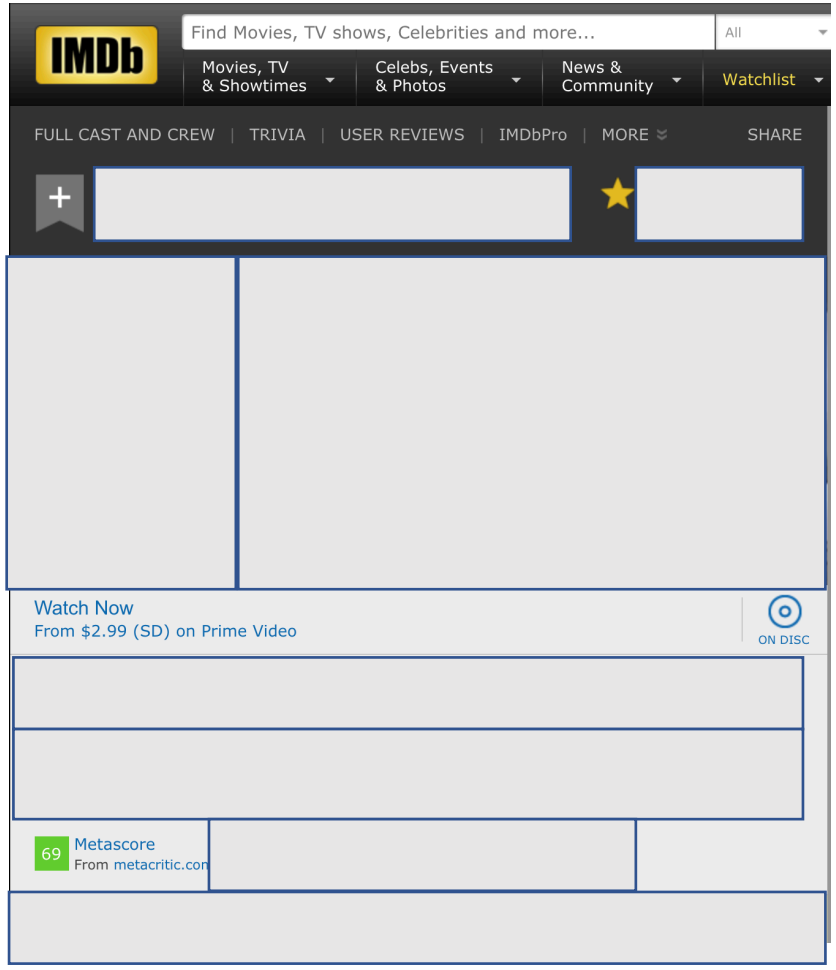
On IMDB, are there 100,000 static HTML pages sitting around?

IMDB uses a template and a database



Title	Plot summary	poster	year
The Big Lebowski	“The dude” Lebowski, mistaken…	Lebowski.jpg	1998
The Big Short	In 2006-7 a group of investors…	Big_short.jpg	2015
The Big Chill	A group of 7 former roommates	Big_chill.jpg	1983

IMDB uses a template and a database
And fills in the data dynamically on pageload



Title	Plot summary	poster	year
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The Big Short	In 2006-7 a group of investors…	Big_short.jpg	2015
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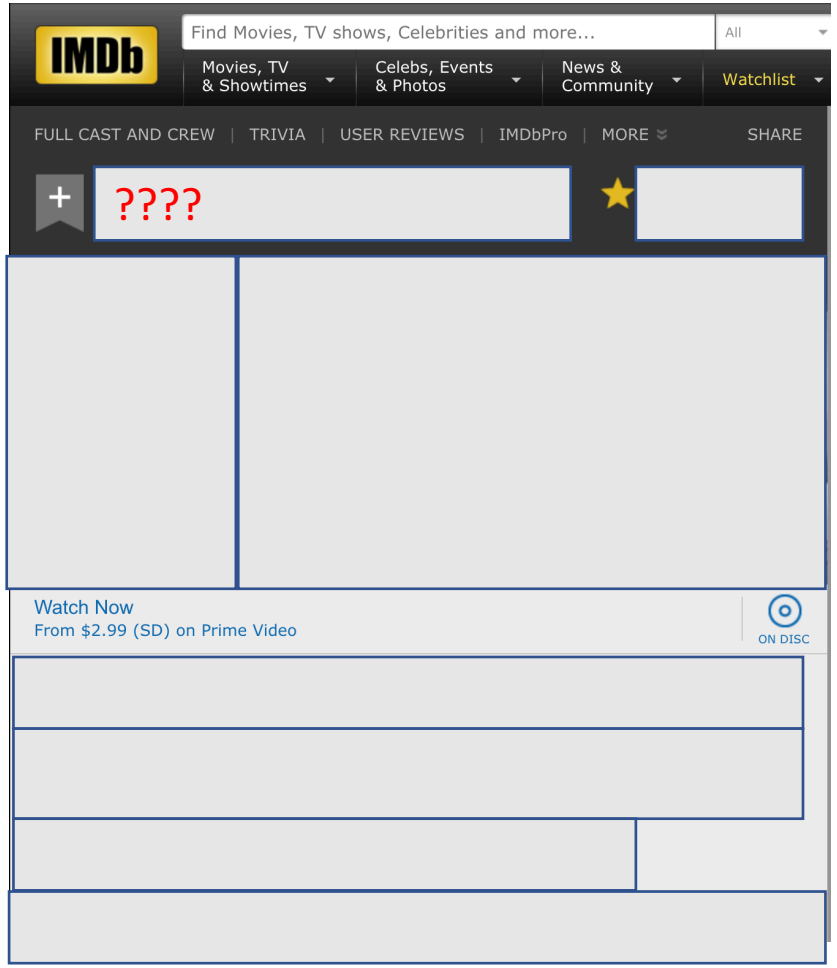
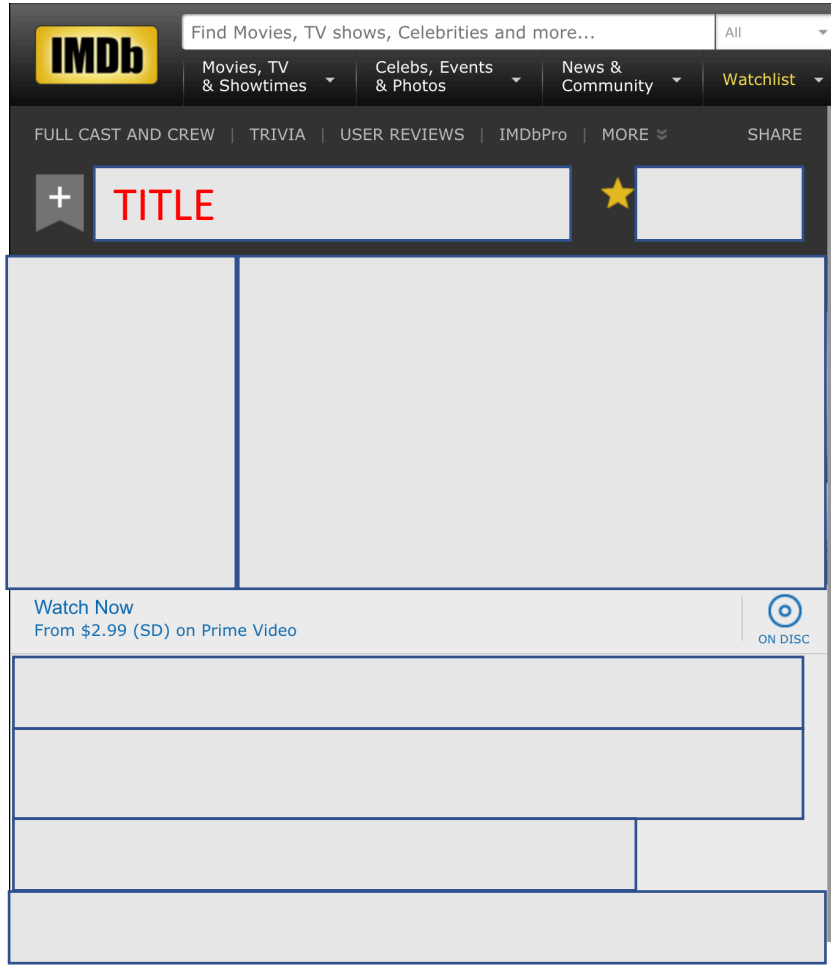
What goes in the template?



What goes in the template?



What goes in the template?

What goes in the template?

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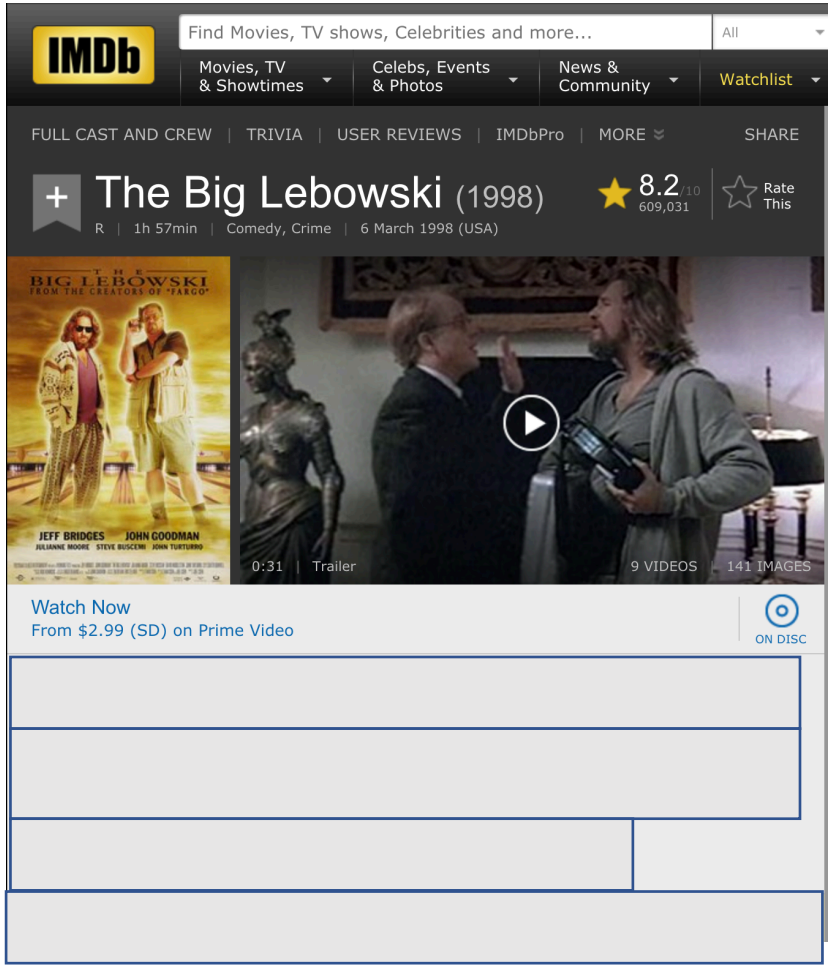
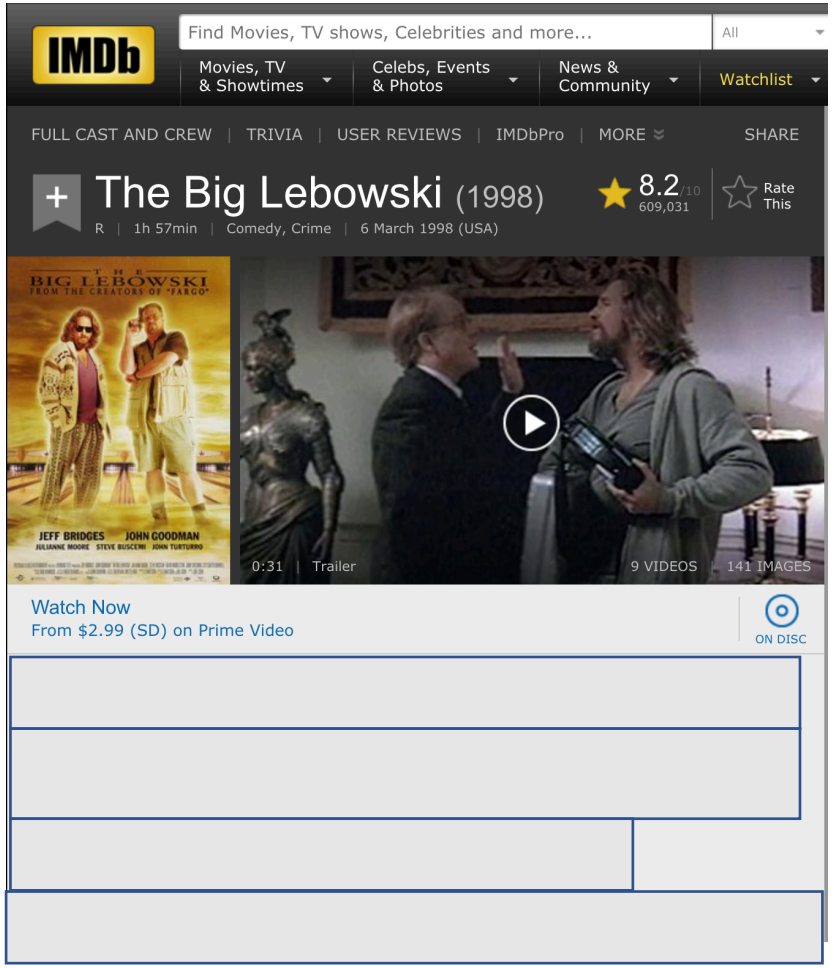
IMDB uses a template and dynamically fills the template from a database query



Anyone remember the other categories?



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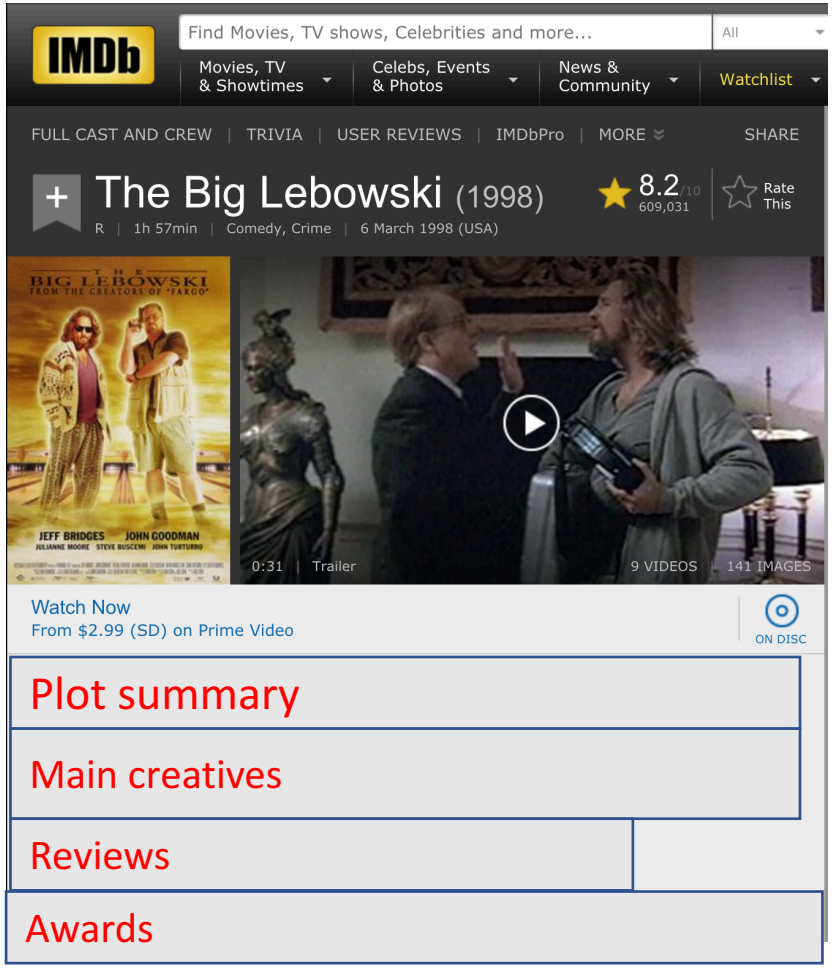
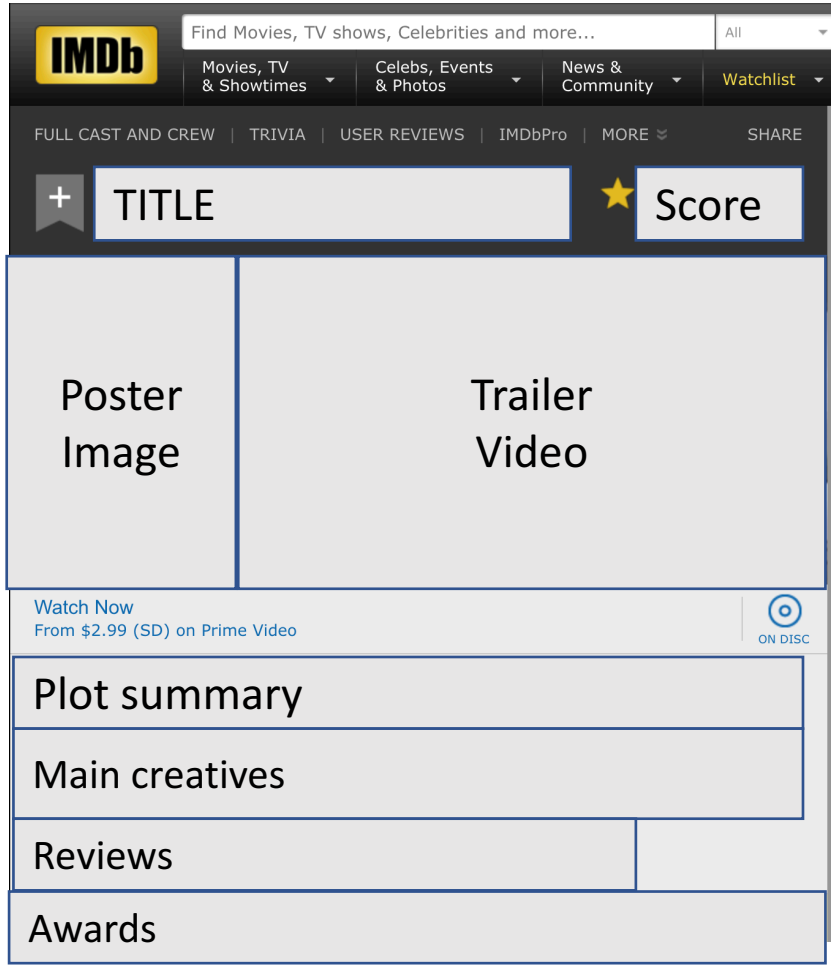
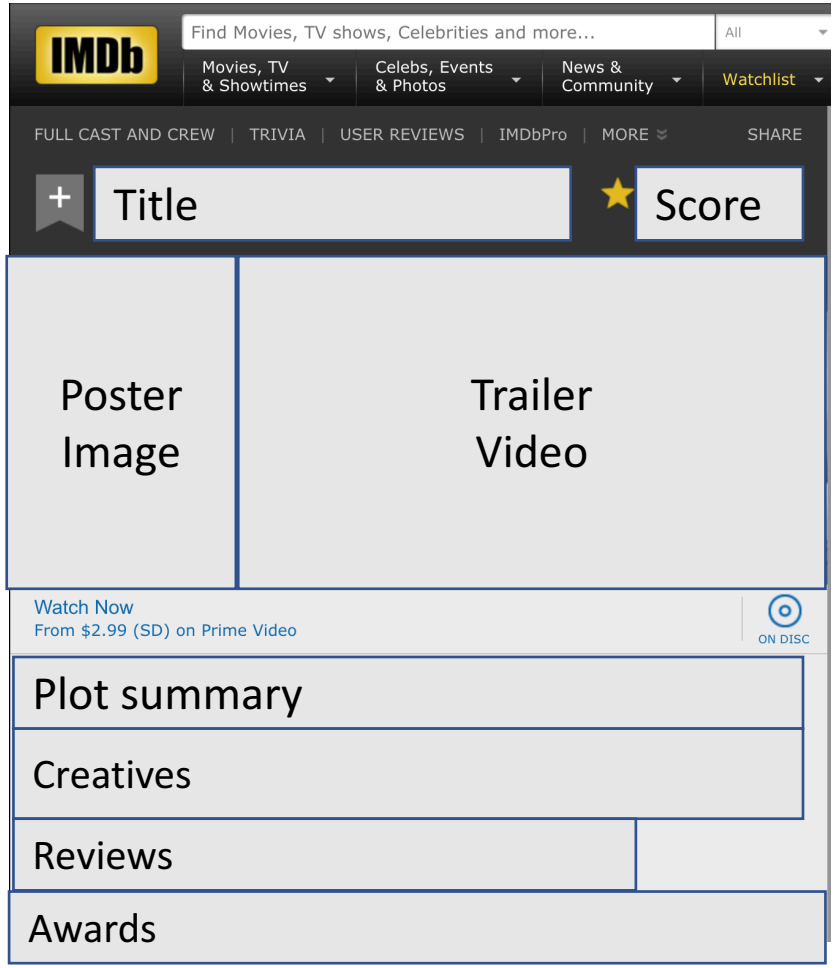


Anyone remember the other categories?

IMDB Template



Templates are standardizations. What can go wrong?



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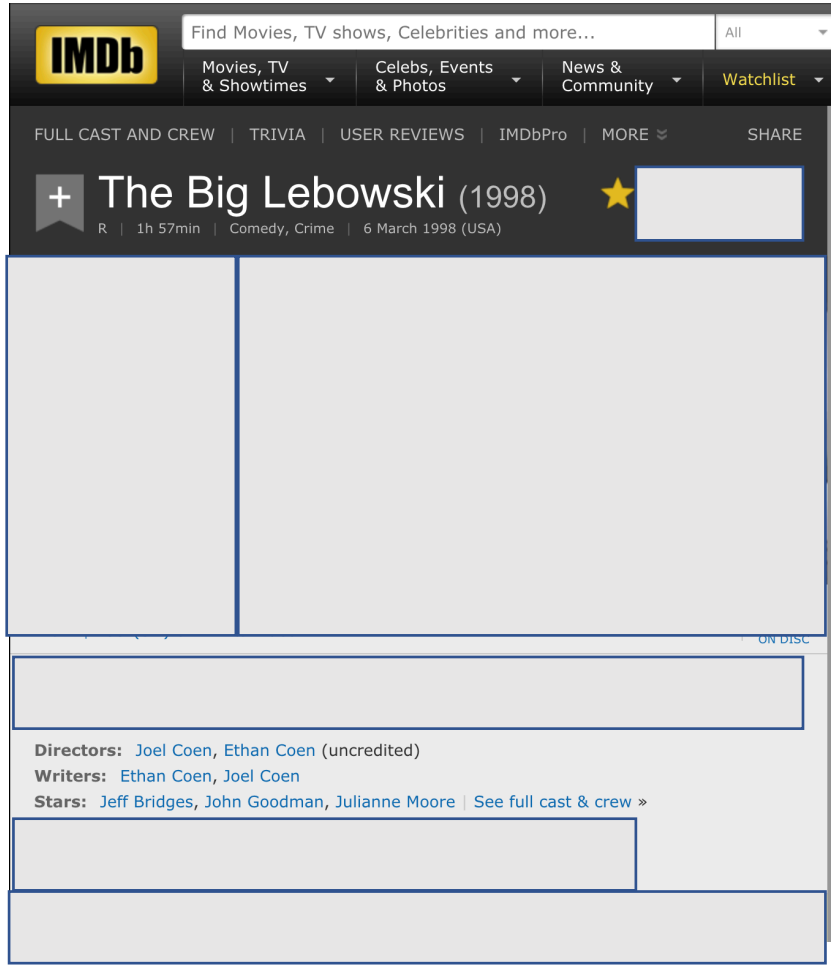
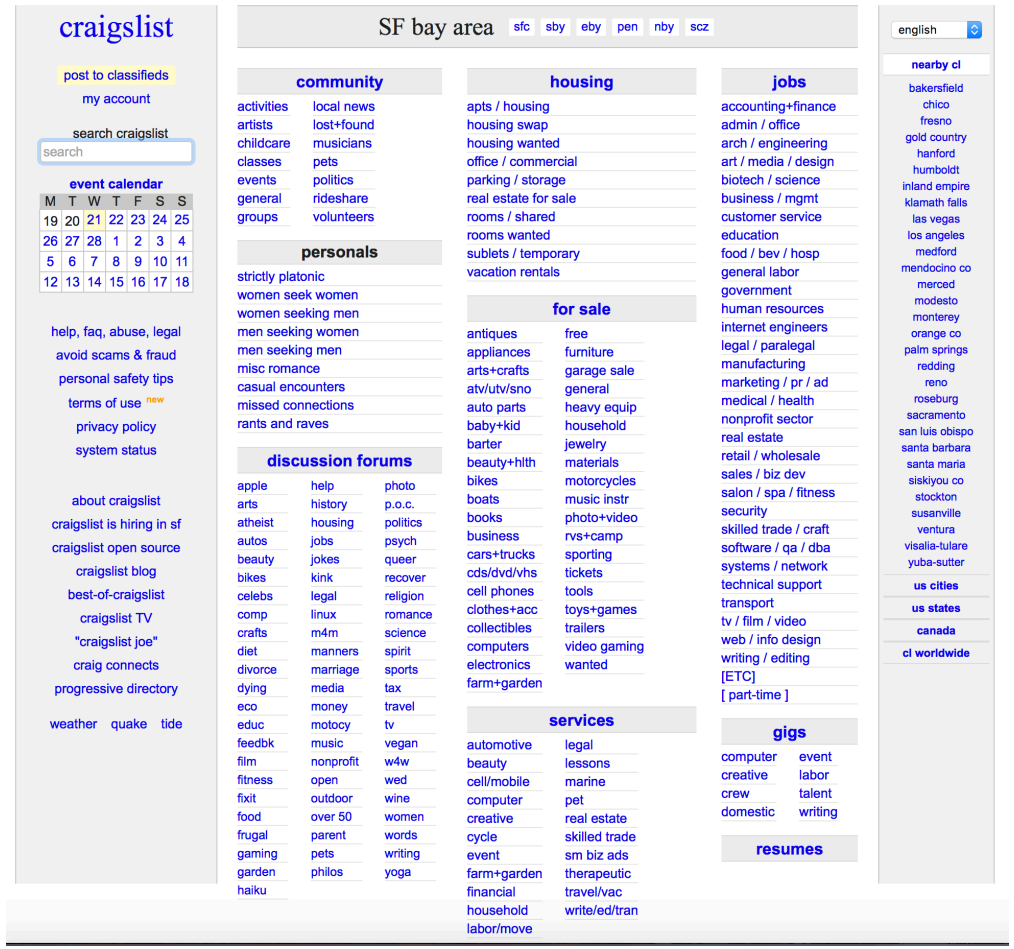
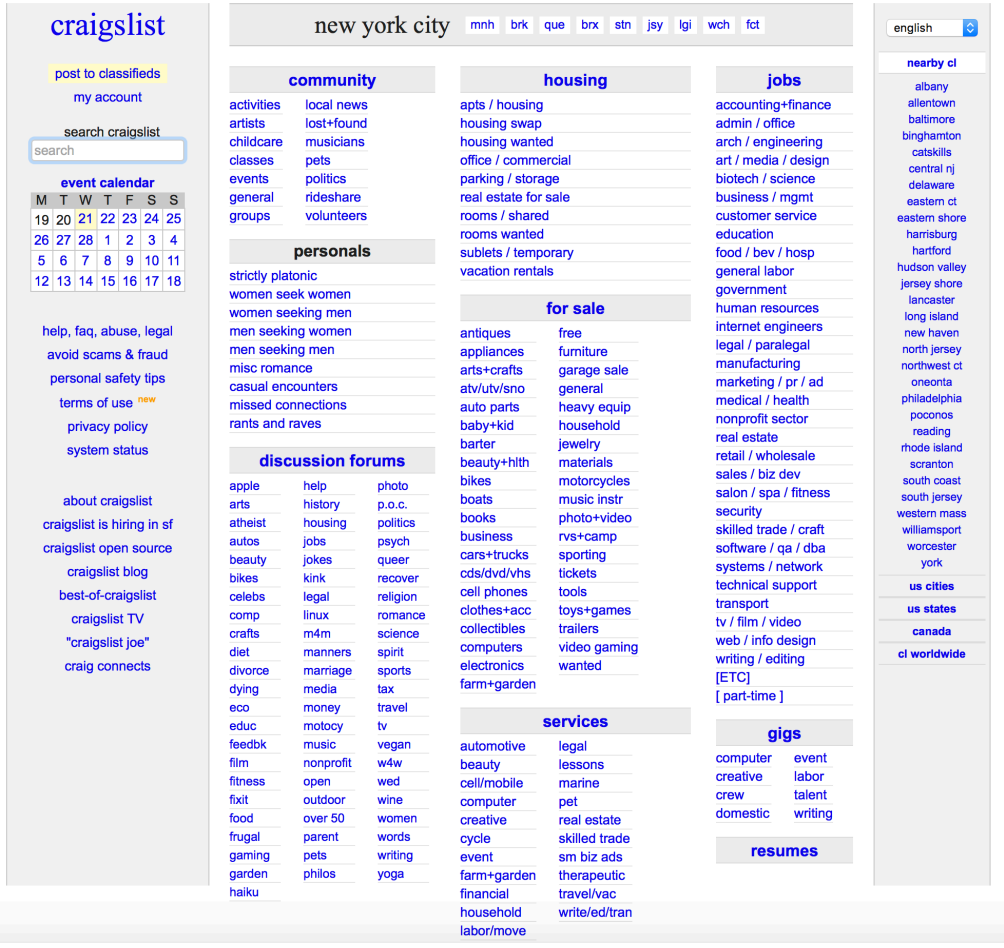


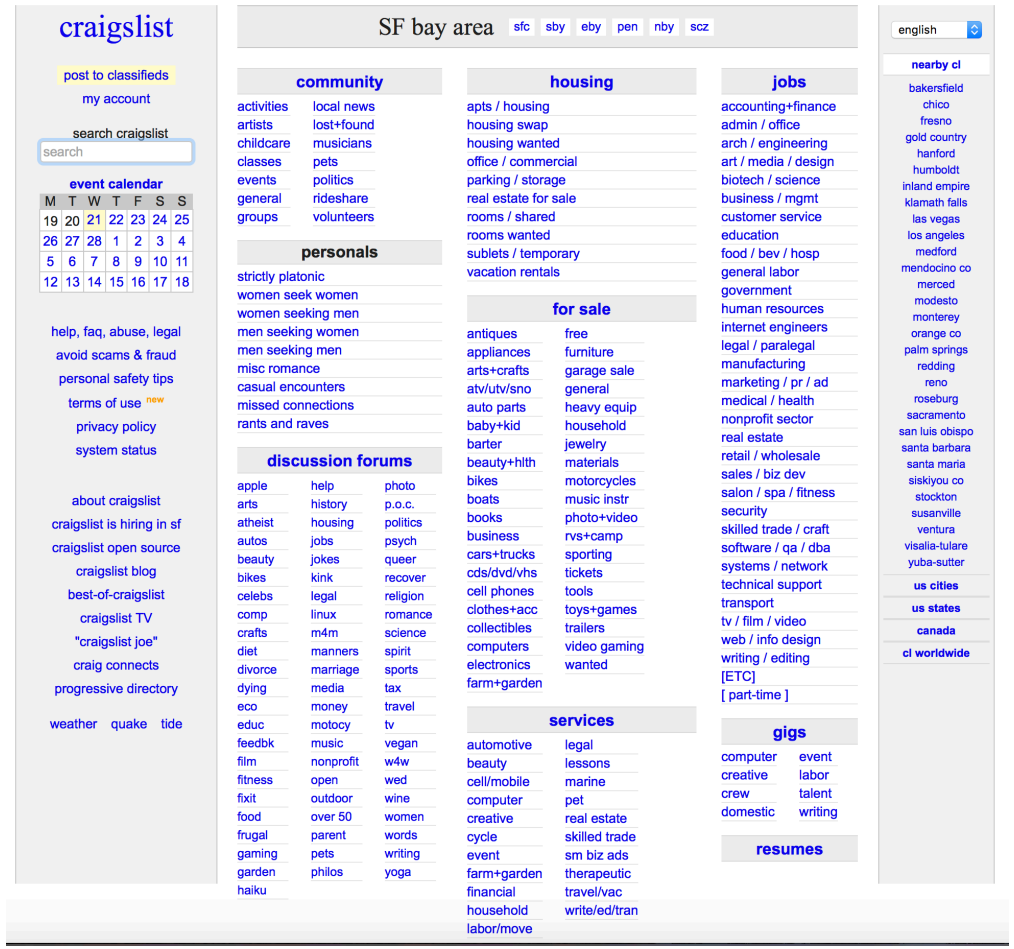
Expect to **iterate** on your templates

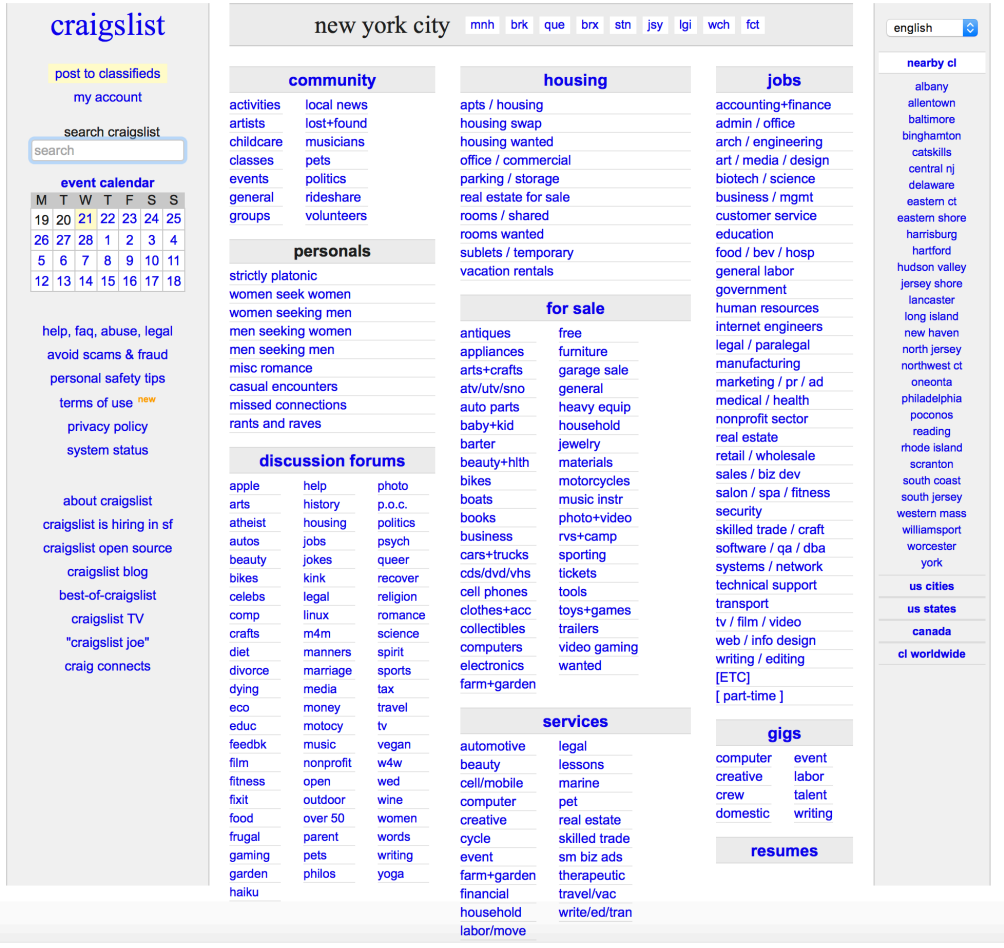
What is **statically** generated on the Craigslist homepage?





What is **dynamically** generated on the Craigslist homepage?





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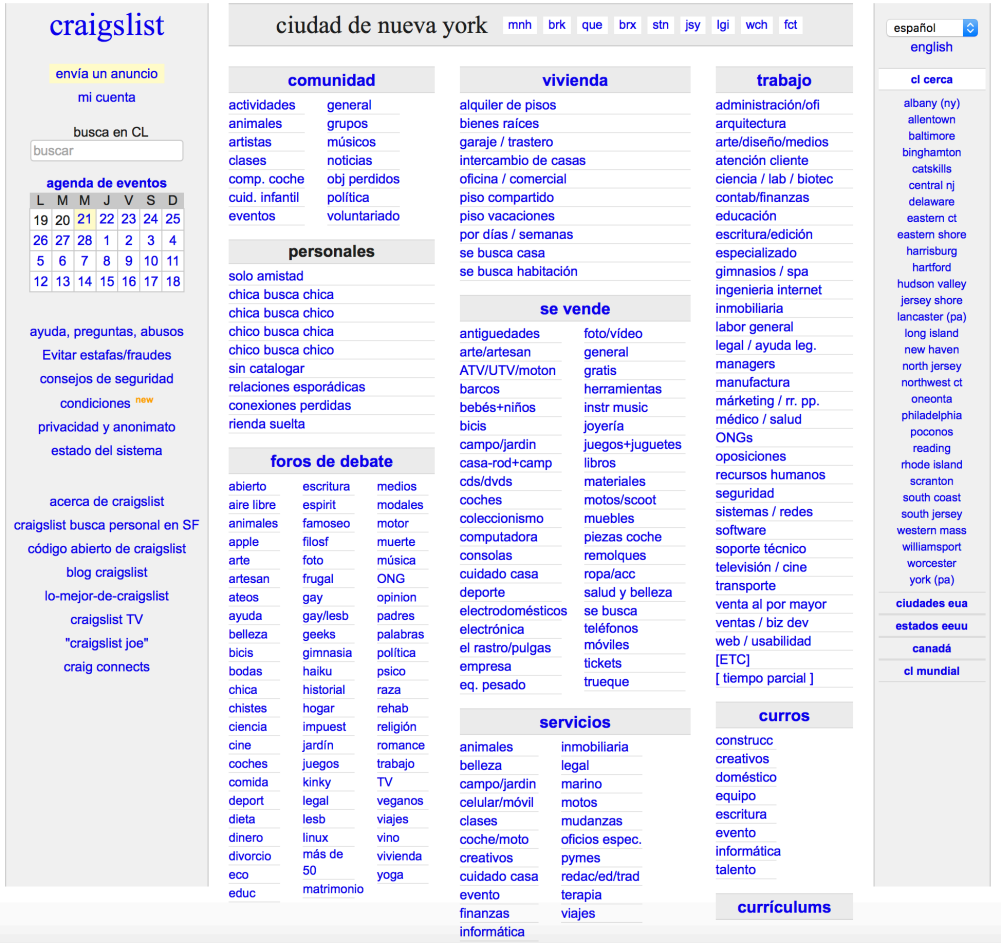
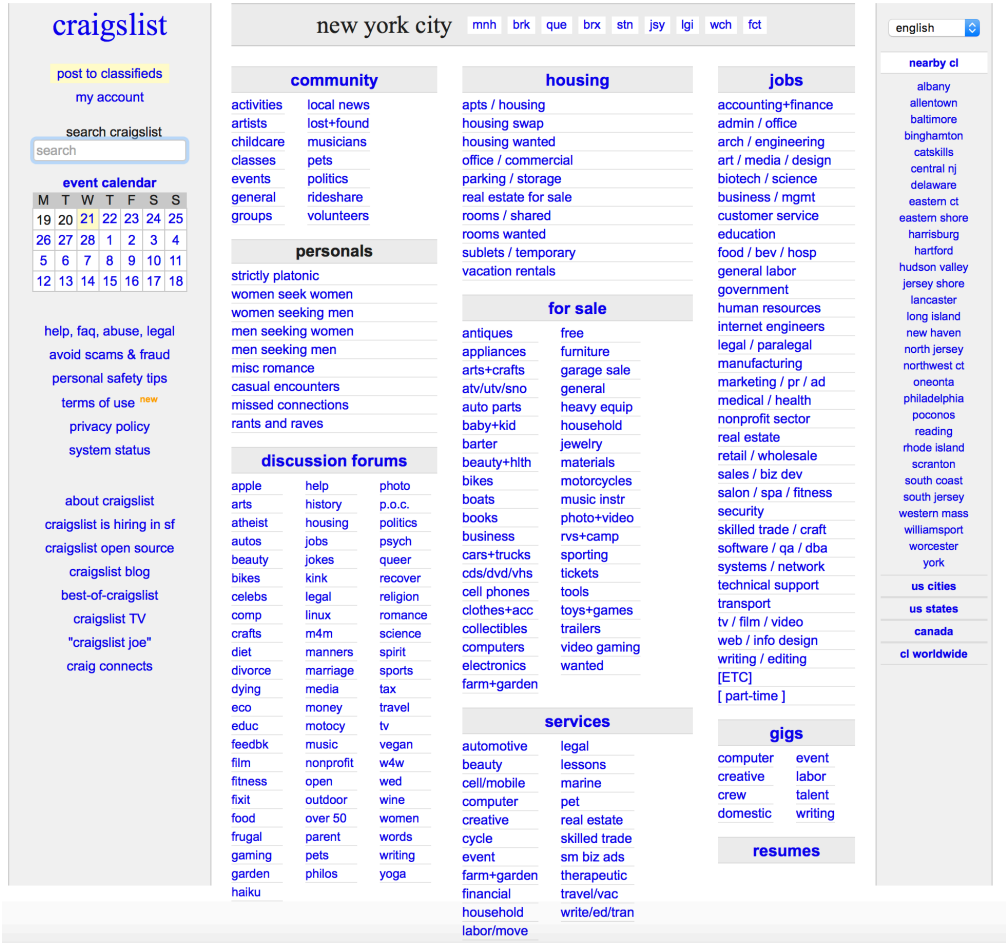
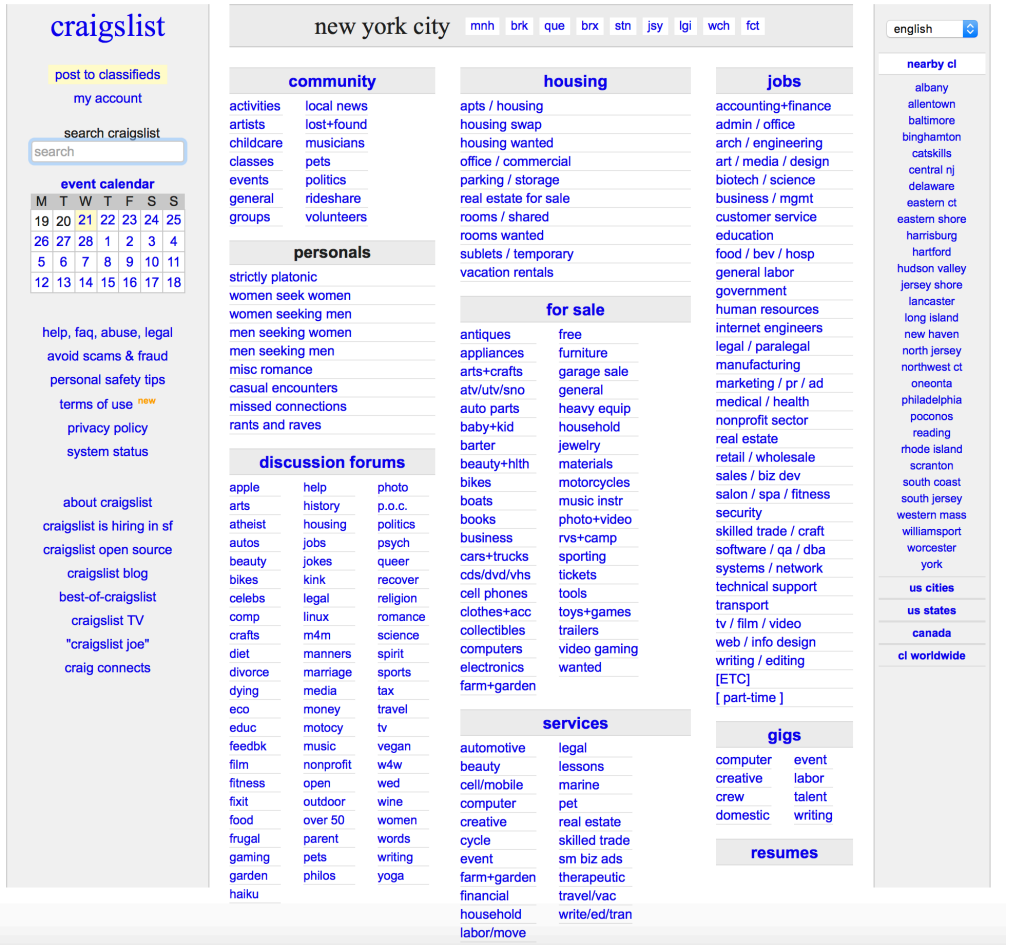




AJAX: Updating portions of the page from the database

These pages do not update once loaded



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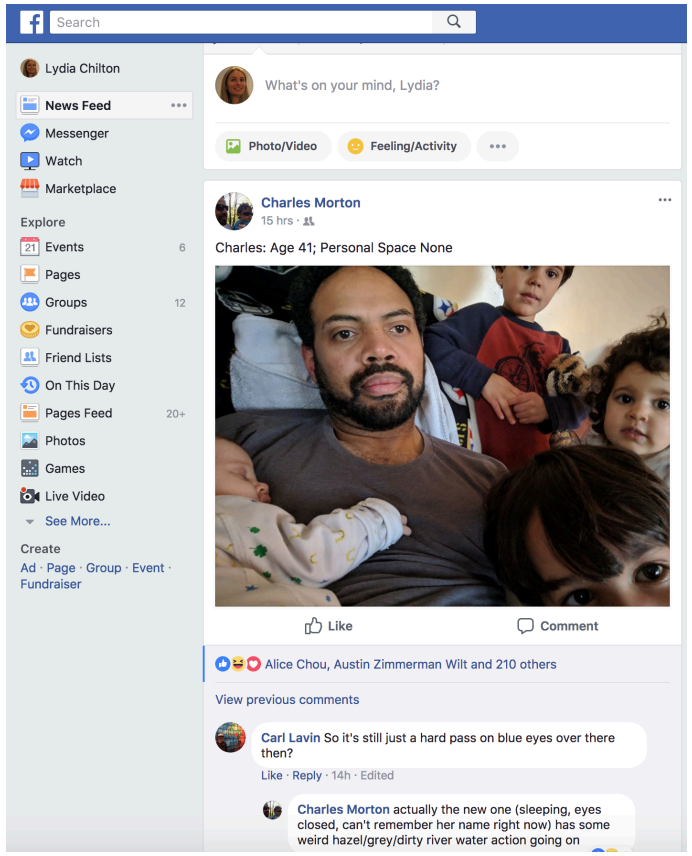
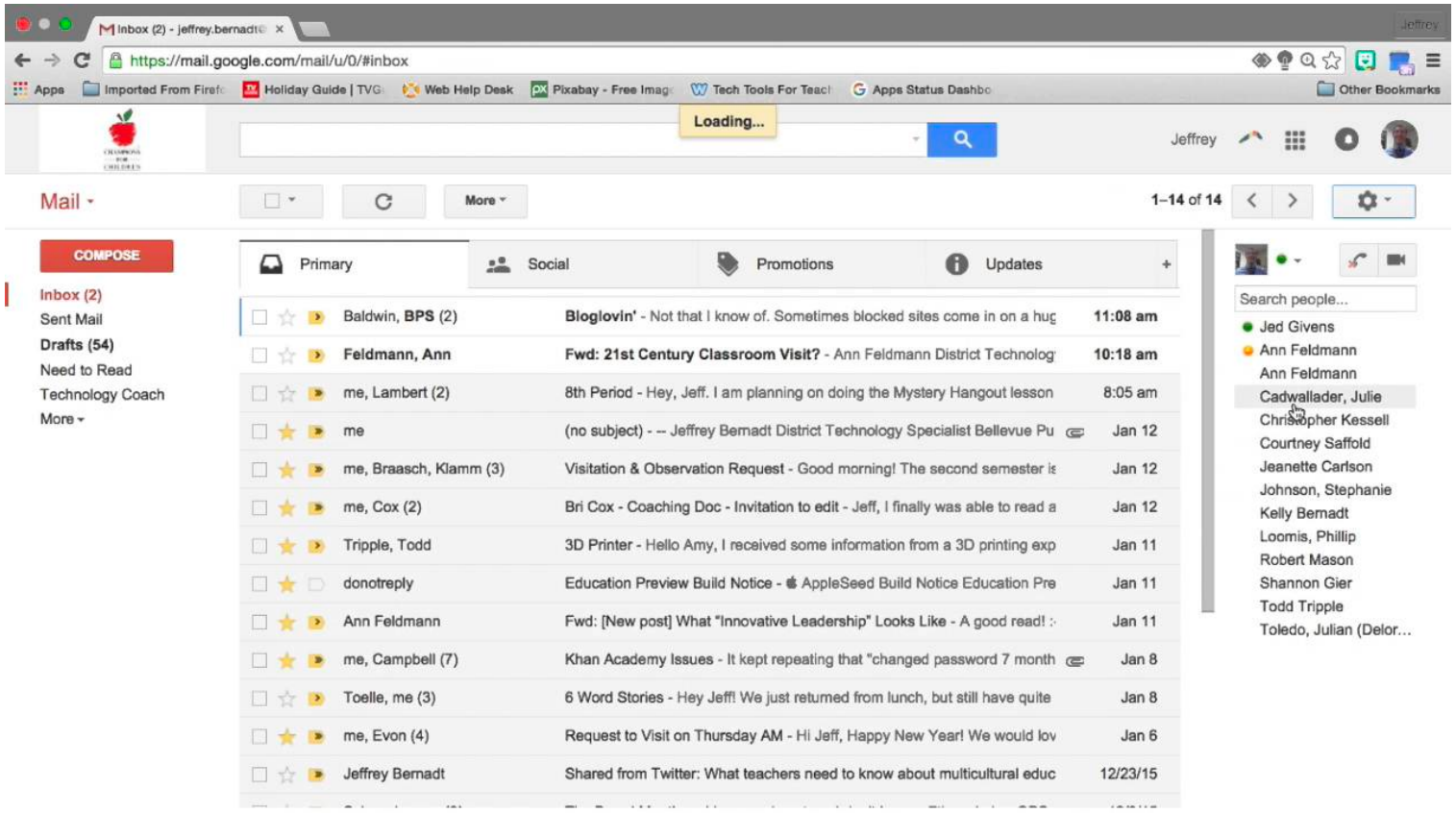
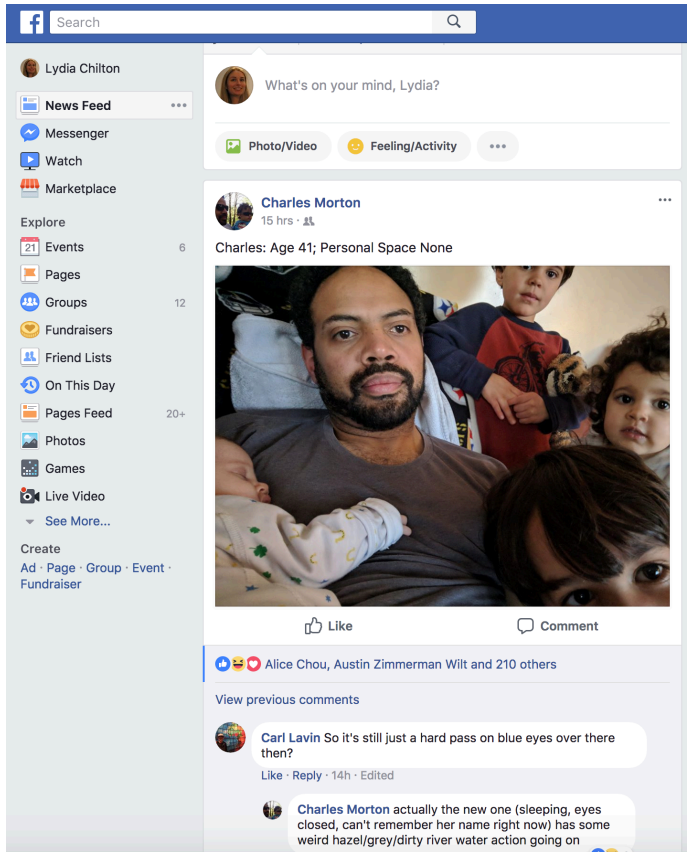




What portions of this page update?



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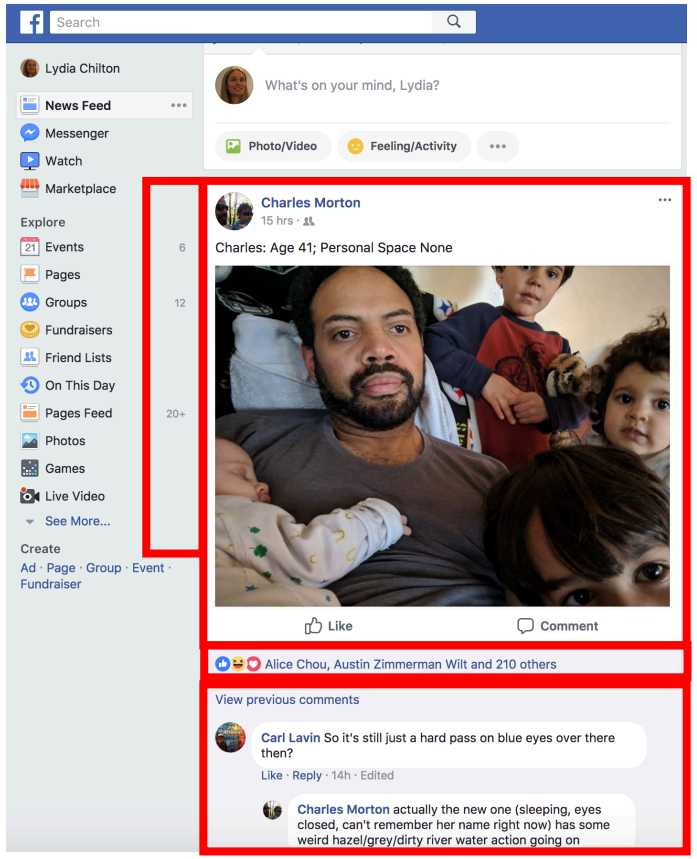
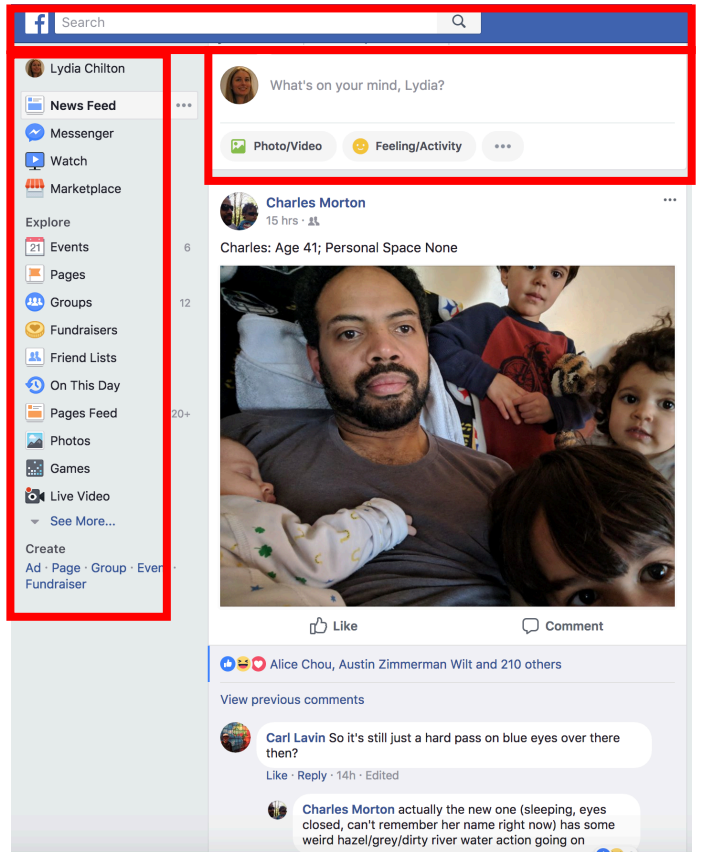
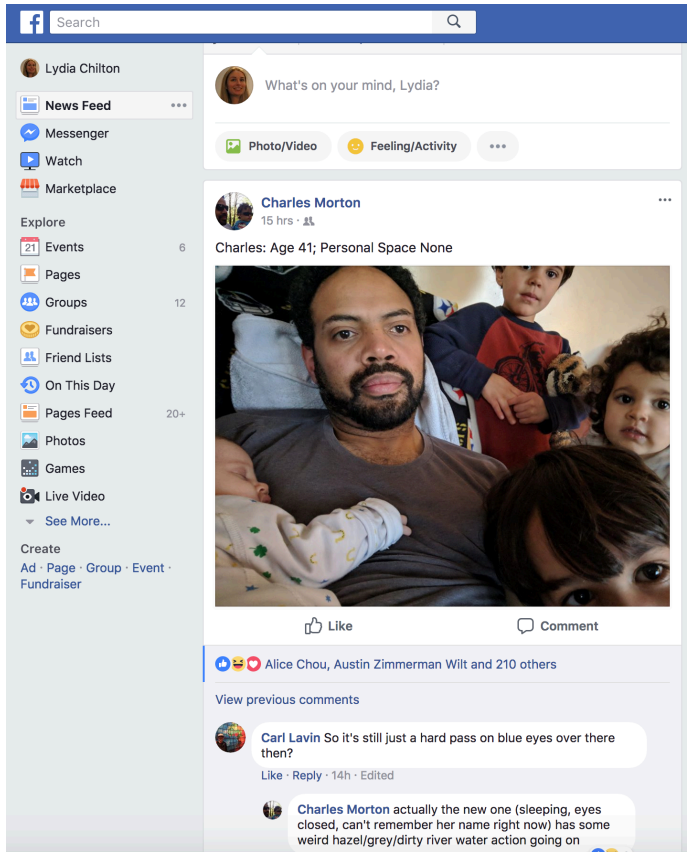


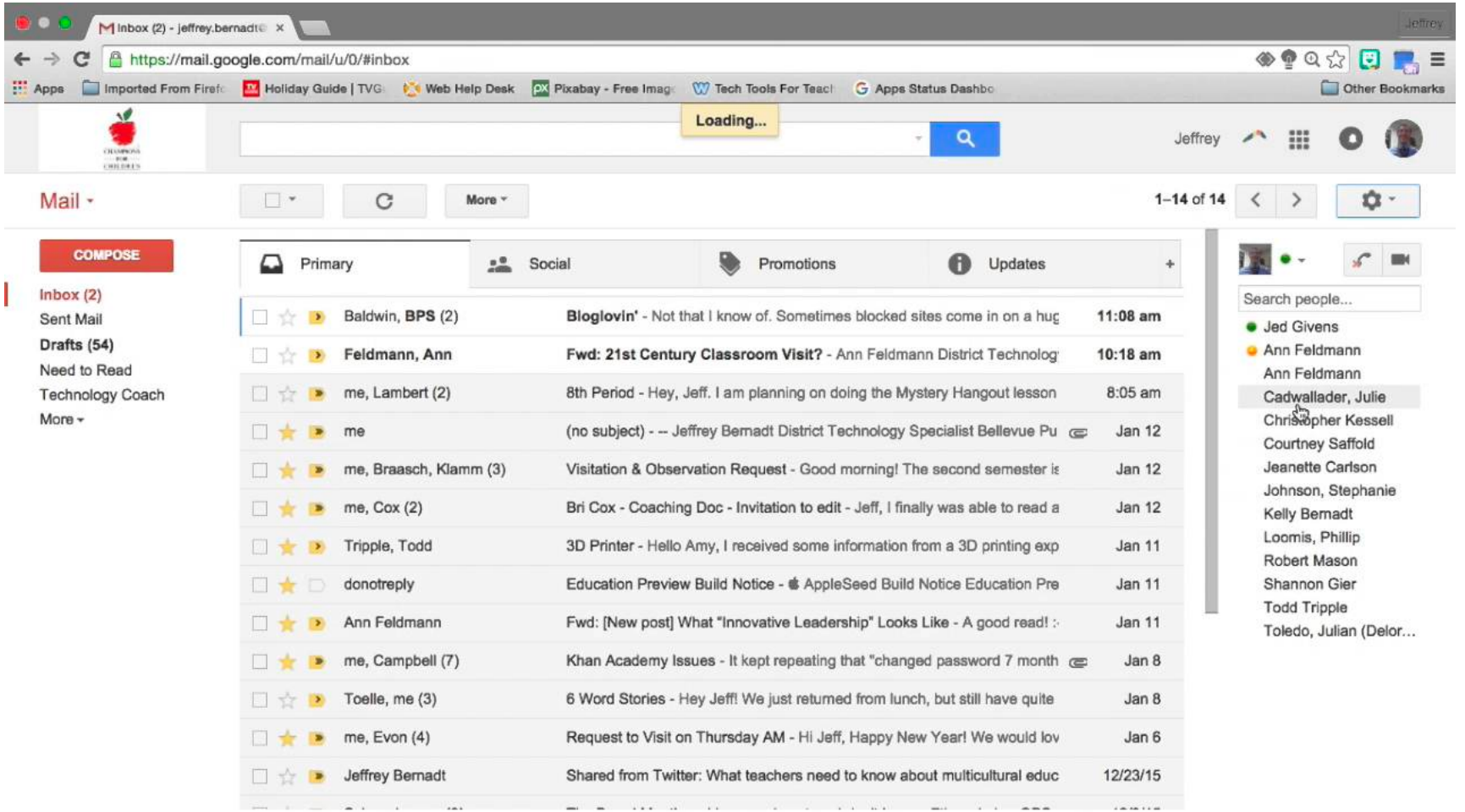
What portions of this page DO NOT update?



What portions of this page DO NOT update?



What portions of this page update?



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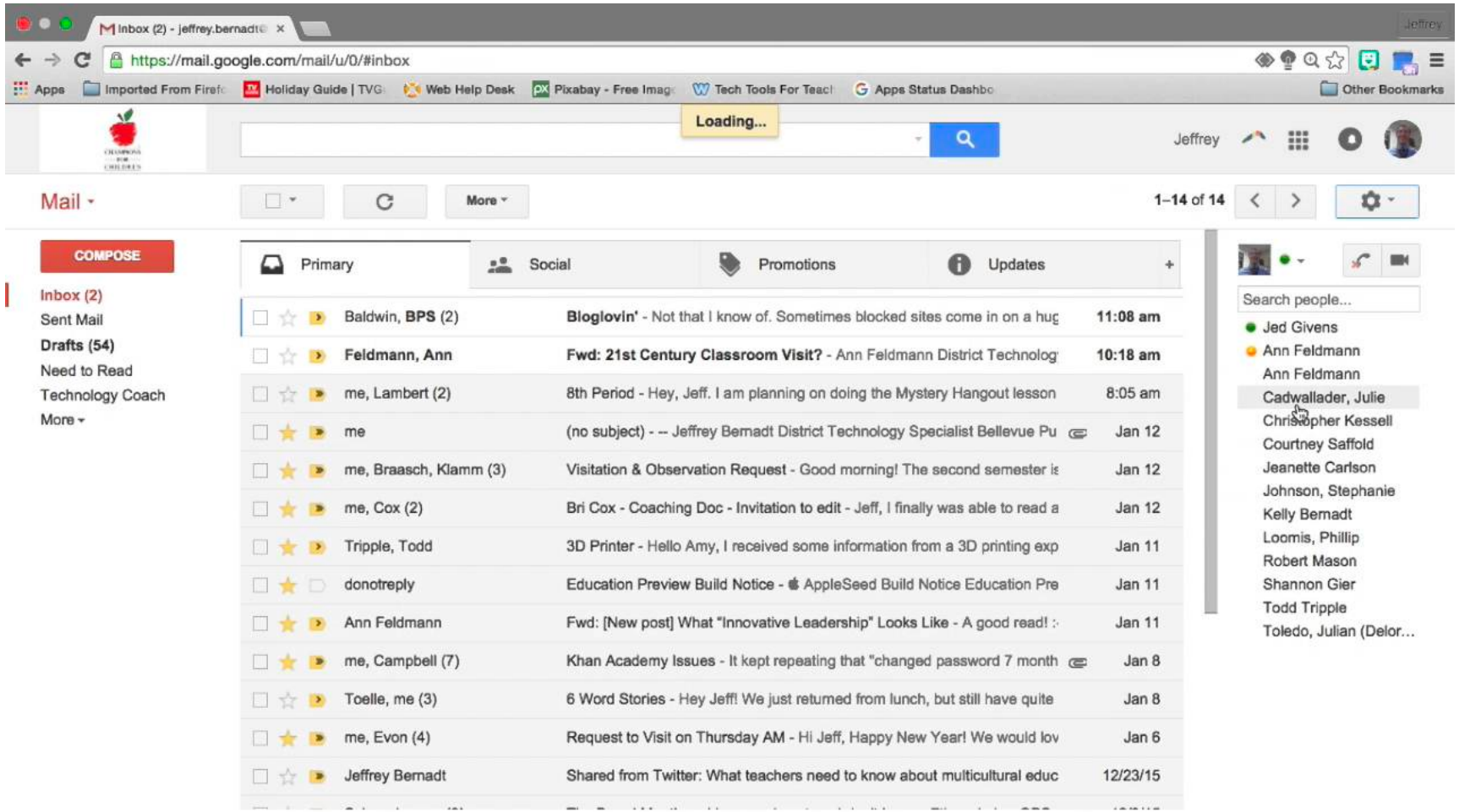
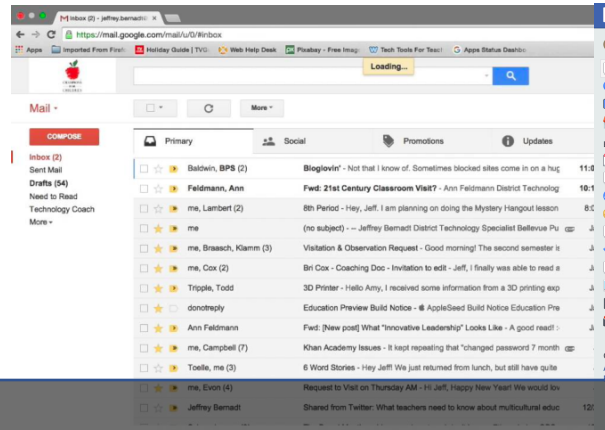
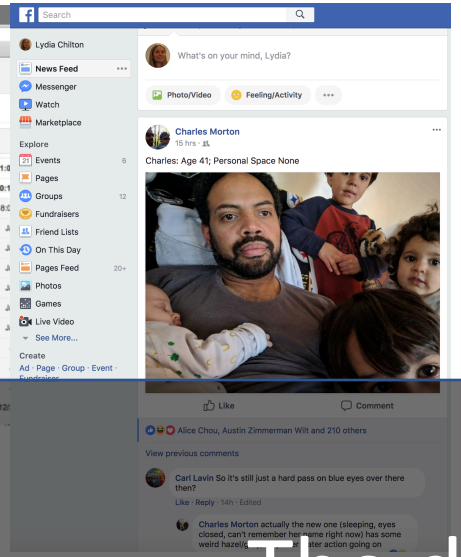


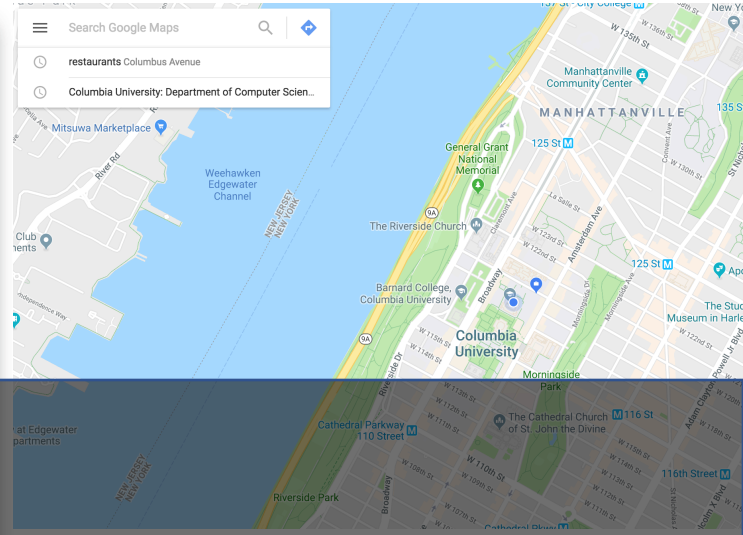
From a back-end perspective

Facebook, Gmail are very similar.

What's different?







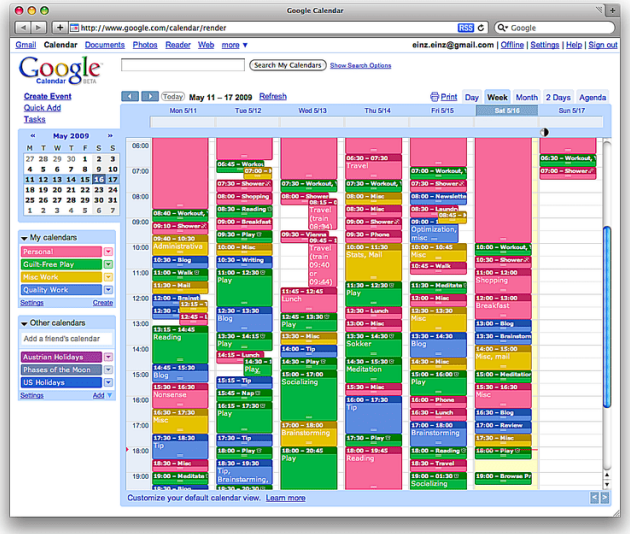
The data is different,

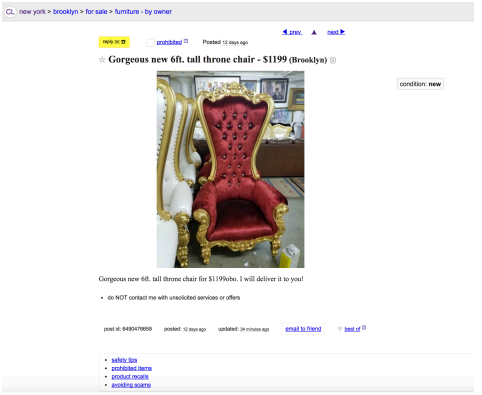
And the information needs they serve are different.

You can drive a lot of human behavior with one database update.

Summary

Sites with lots of data have a database in the backend





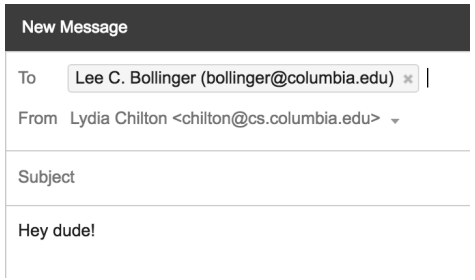
Front-ends and back-ends are tightly coupled.

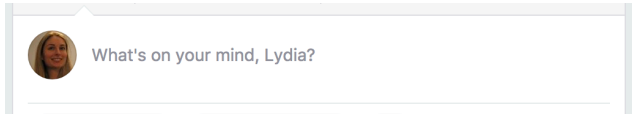
So you need to know something about back-end databases

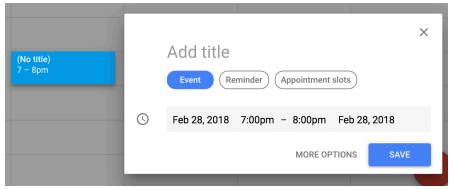
To create awesome websites

CRUD: Operations for interacting with a database

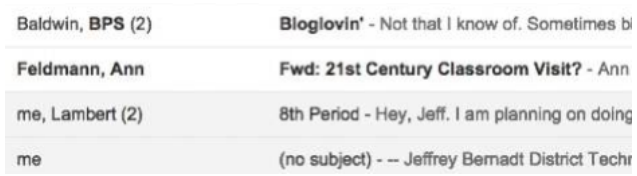
Create



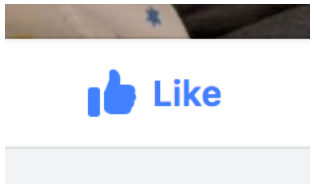


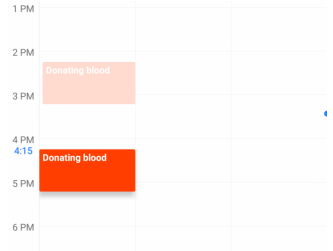


Read

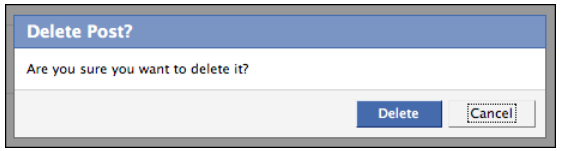


Update

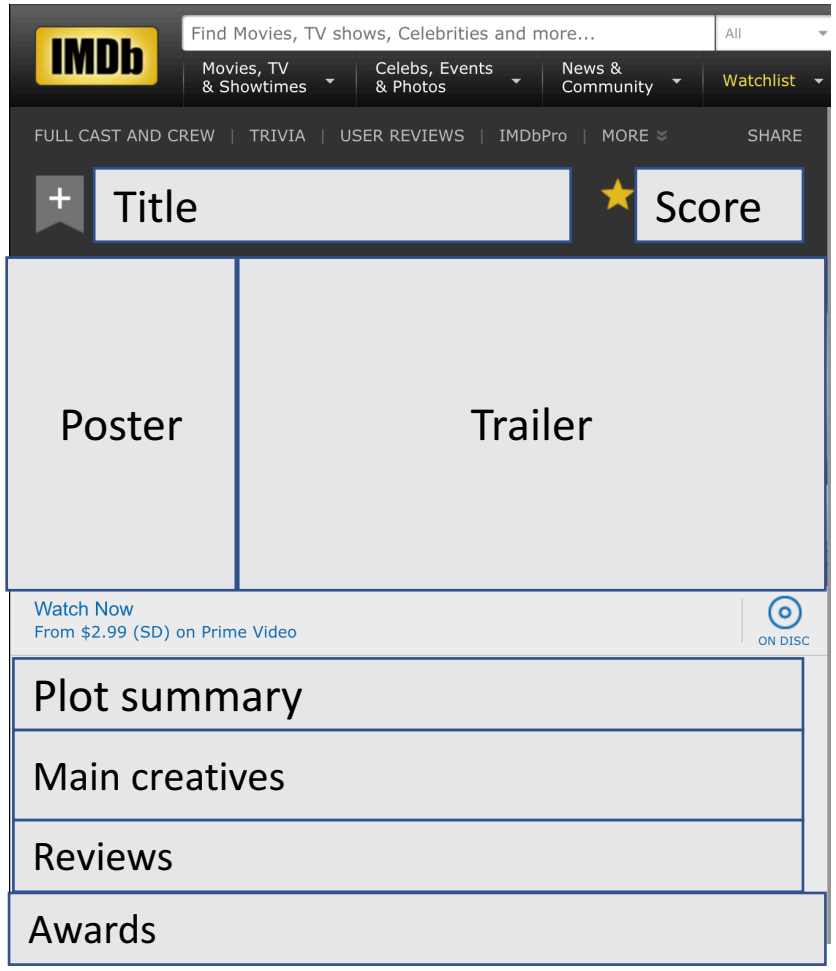




Delete



Use templates to for dynamically generate pages from data in the database



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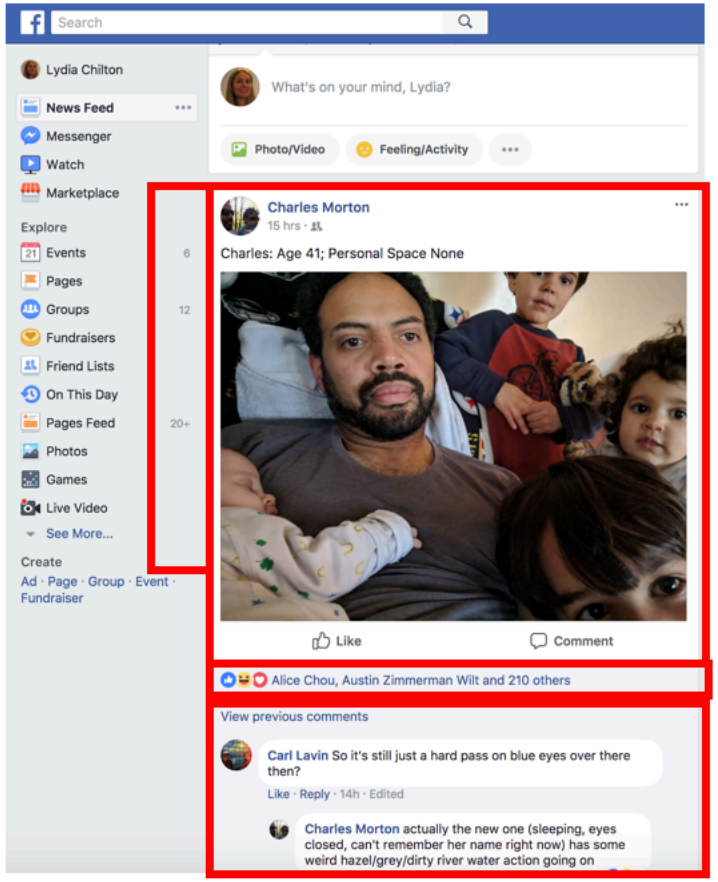
The Big Short	In 2006-7 a group of investors…	Big_short.jpg	2015
The Big Chill	A group of 7 former roommates	Big_chill.jpg	1983

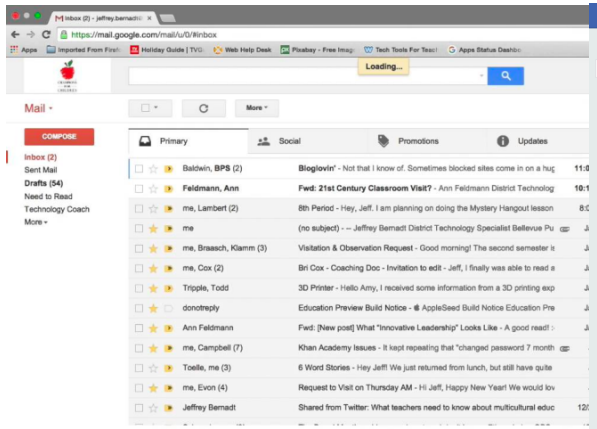
Some sites reload portions of the page

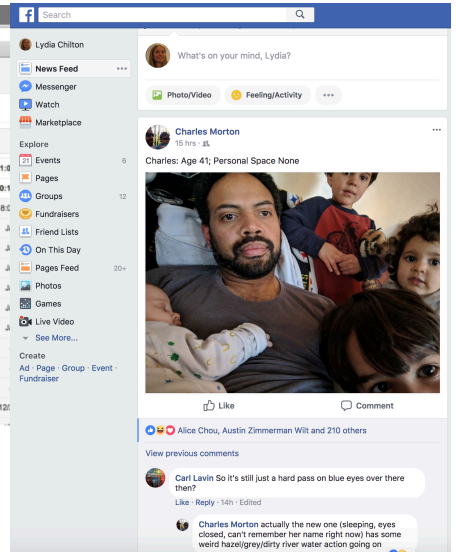
Does not reload

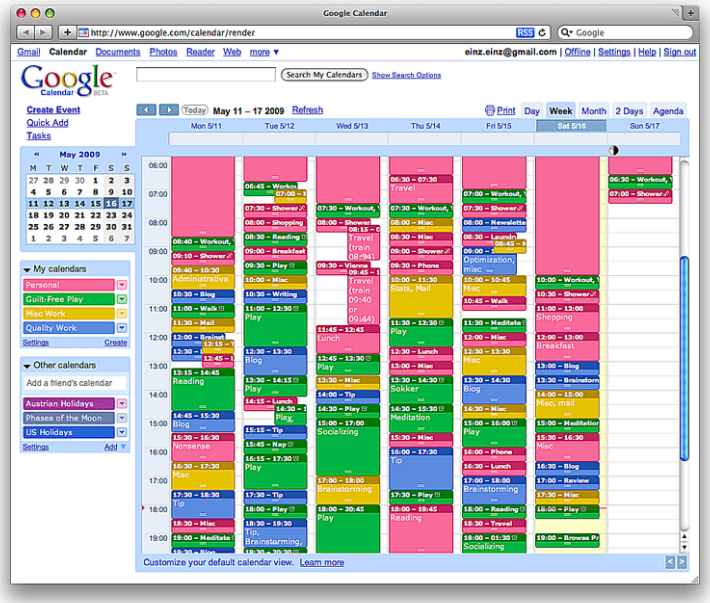
Reloads

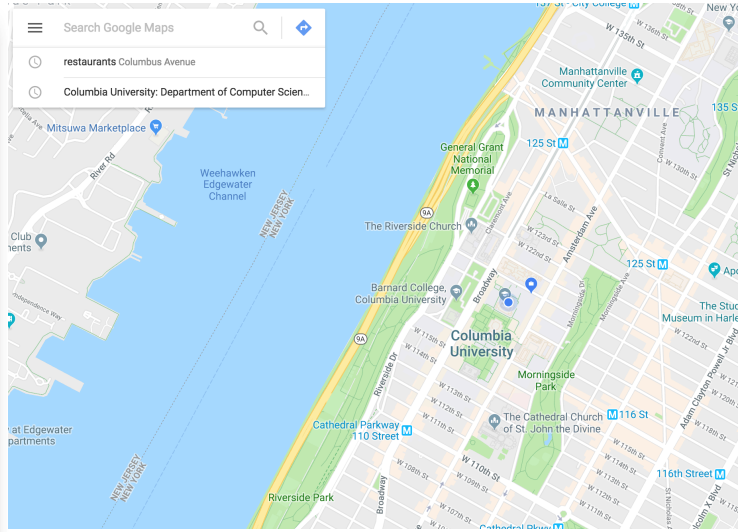


From a back-end perspective
Database-backed websites are very similar.









But they serve different data and different information needs