FROM SITE TO NETWORK ENGAGEMENT

NEW ASPECTS OF USER ENGAGEMENT

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UNIVERSITAT POMPEU FABRA

YAHOO! RESEARCH

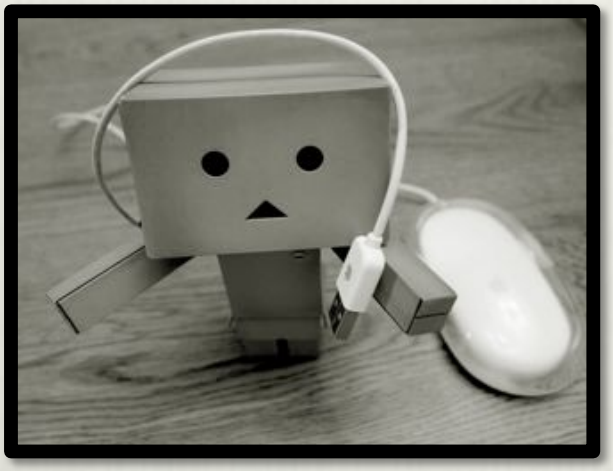
OUTLINE

1. **What is user engagement?**
   1. Overview
   2. Influencing factors
   3. Measurements

2. **Engagement under the microscope**
   1. Differences between sites
   2. Models of engagement

3. **From site to network engagement**
   1. Motivation
   2. Downstream engagement

Lights on by JC*+Al



182-365+1 by meaganmakes

User Engagement

Buzzword, or a rule to live by?

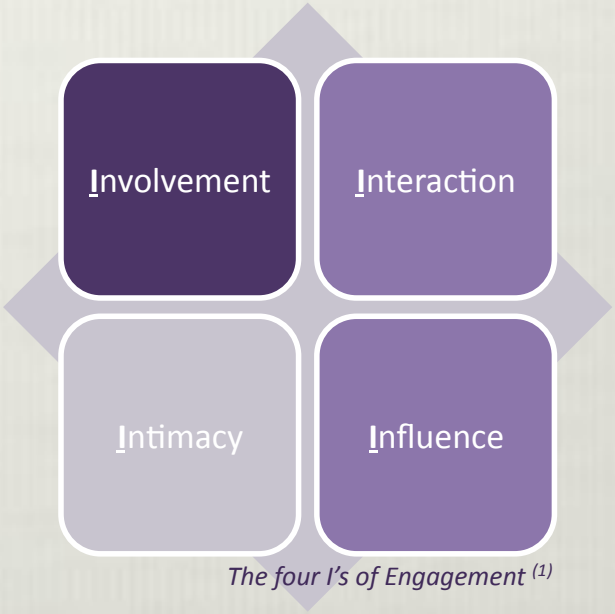
OVERVIEW

What is user engagement?

- User engagement is a **quality of user experience** that emphasizes the positive aspects of interaction – in particular the fact of being captivated by the technology.

- **In-the-moment engagement**:
  Users stay on a web site over a long time

- **Long-term-engagement**:
  Users come back frequently and over a long-term



The four I's of Engagement [1]

(1) Brian Haven, Forrester Research: Marketing's New Key Metric: Engagement, Marketing Leadership Professionals, August 2007

USER ENGAGEMENT – CONNECTING 3 ANGLES

Successful technologies are not just used, they are engaged with.

user **feelings**: happy, sad, excited, bored, …

user **mental states**: concentrated, challenged, lost, interested …

user **interactions**: click, read, comment, recommend, buy, …

The emotional, cognitive and/or behavioural connection that exists, at any point in time and over time, between a user and a technological resource.

S. Attfield, G. Kazai, M. Lalmas and B. Piwowarski. Towards a science of user engagement (Position Paper), WSDM Workshop on User Modelling for Web Applications, 2011.

Beautiful Day by JC*+A!

User Engagement

What are the influencing factors?

Would a user engage with this web site?

www.chestertourist.com

Site type: tourist information

- Interesting for tourists in Chester
- No aesthetic appeal

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User

Presentation

Would a user engage with this web site?

www.arngren.net

Site type: online shop

- Menus are incomprehensible
- Navigation is difficult

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Functionality

Would a user engage with this web site?

www.weeklyworldnews.com

Site type: news provider

- Stories are not serious, more entertaining
- Personal interests and trends

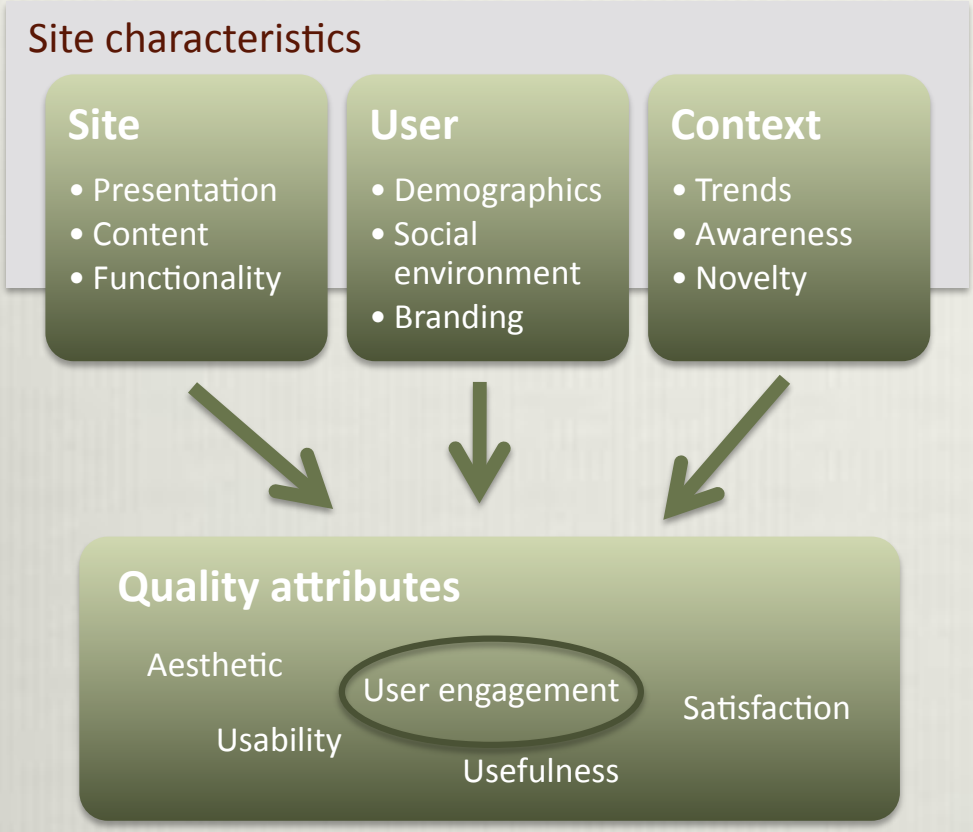
Would a user engage with this web site?

www.weeklyworldnews.com

Site type: news provider

- Stories are not serious, more entertaining ← ***Content***
- Personal interests and trends ← ***User + Context***

WHAT INFLUENCES USER ENGAGEMENT?



- Site characteristics offer the basis to increase engagement

Past discoveries:

- Importance of site features depends on the type of service [2]
- Influence on quality attributes can be contrary [2]
- There are relationships between quality attributes (Halo Effect) [1,2]

[1] N. Tractinsky. What is beautiful is usable. Interacting with Computers, 2000.
[2] J. Hartmann et al. Towards a theory of user judgment of aesthetics and user interface quality. TOCHI, 2008.

left by [embr]

User Engagement

How to
measure it?

MEASURING USER ENGAGEMENT

Self-reported engagement

subjective

Questionnaire, interview, report, product reaction cards

User study (lab/online)

mostly qualitative

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Cognitive engagement

objective

Task-based methods (e.g. time spent, follow on task)

Neurological (e.g. EEG)

Physiological (e.g. eye tracking, facial expression)

User study (lab/online)

mostly quantitative, scalability an issue?

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User study (lab/online)

mostly quantitative, scalability an issue?

Interaction engagement

objective

Web analytics + "data science" (e.g. CTR, bounce rate, dwell time)

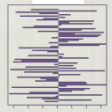
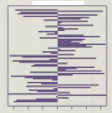
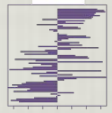
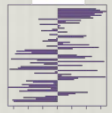
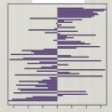
Data study

quantitative, large scale

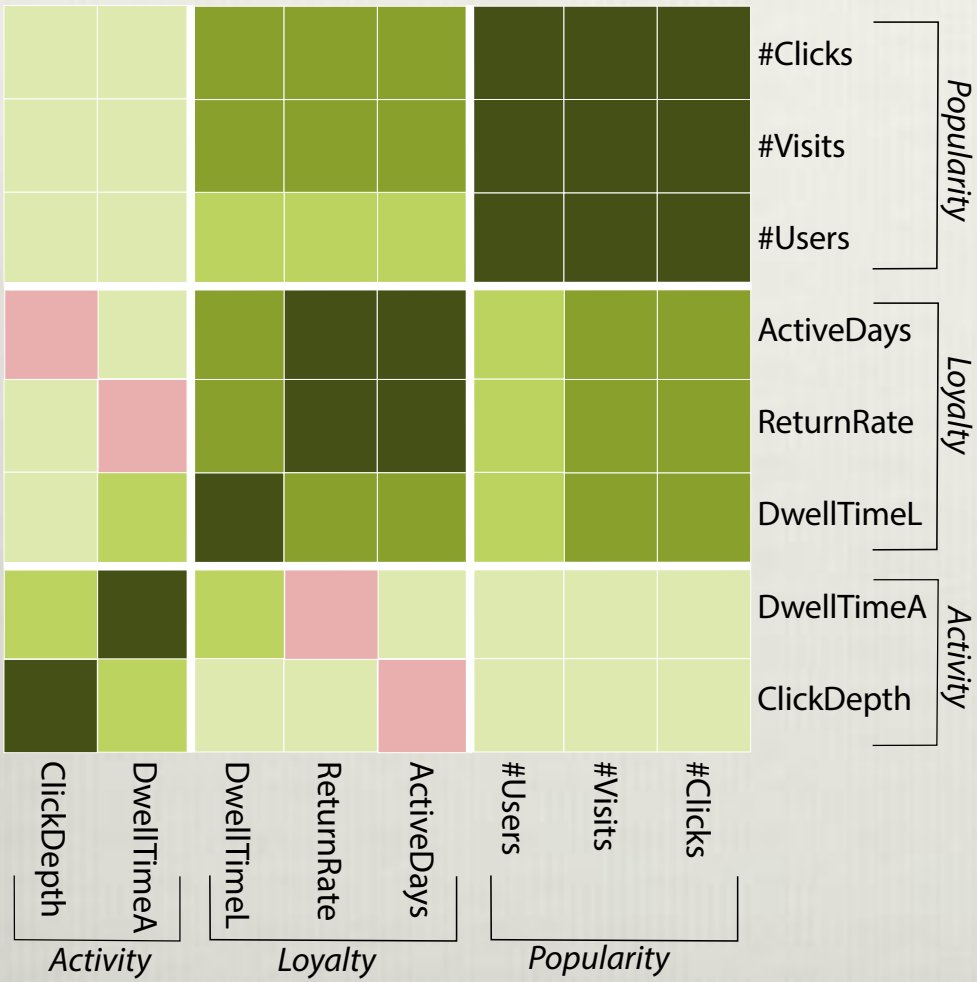
THERE ARE MANY METRICS

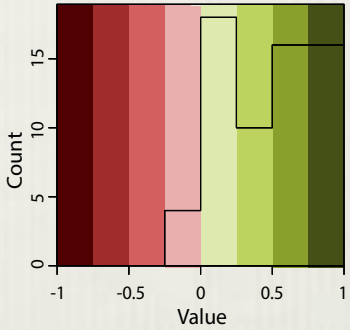
Examples:
Peterson et al - Engagement indices
Haven et al - Marketing's New Key Metric: Engagement

GROUPS OF METRICS

Popularity	#Users	Number of distinct users	
	#Visits	Number of visits	
	#Clicks	Number of clicks	
Activity	ClickDepth	Average number of page views per visit.	
	DwellTimeA	Average time per visit	
Loyalty	ActiveDays	Number of days a user visited the site	
	ReturnRate	Number of times a user visited the site	
	DwellTimeL	Average time a user spend on the site.	

METRIC CORRELATIONS





1. *Interaction data, 2M users, July 2011, 73 US sites*
2. *Pair-wise metrics correlations using Kendall tau rank correlation (τ)*
3. $\tau_{intra} = 0.61$, $\tau_{inter} = 0.23$

High correlations within metric groups, less correlations between.

Everything is skateable.. by AK_74

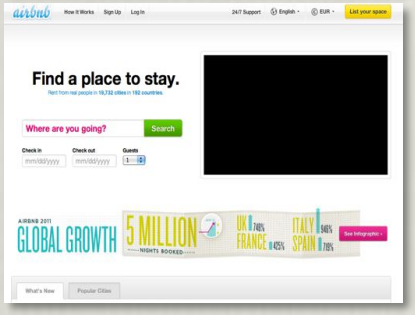
Sites differ

Engagement under the microscope.

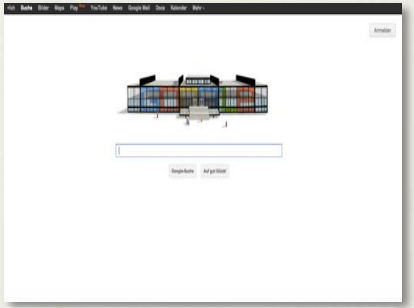
SITES DIFFER CONCERNING THEIR ENGAGEMENT

Games
Users spend much time per visit

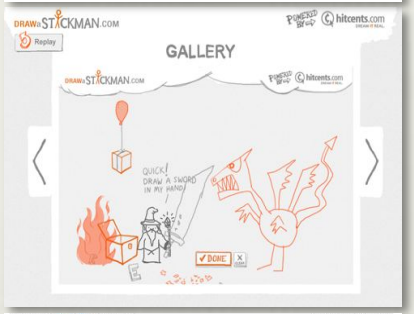
Social media
Users come <u>frequently</u> and <u>stay long</u>



Service
Users visit site, if required



Search
Users come <u>frequently</u> and do <u>not stay long</u>



Special
Users come in average only one time

News
Users come periodically

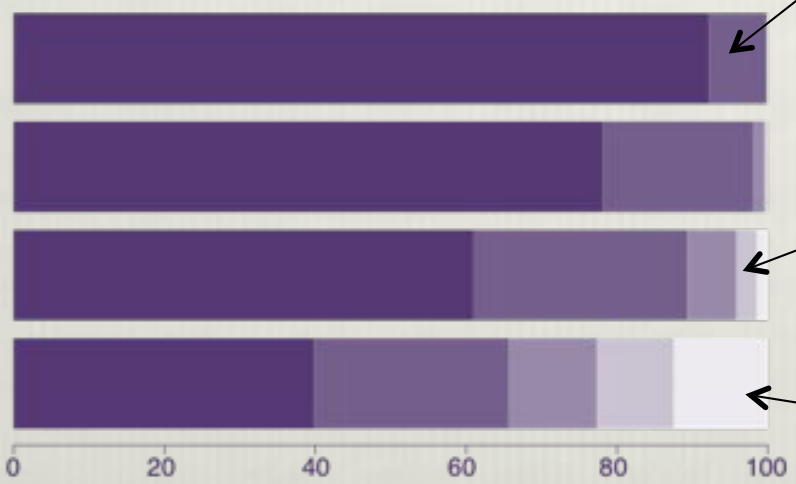
Is it possible to <u>model</u> these characteristics?

ENGAGEMENT OF A SITE DEPENDS ON USERS AND TIME

Users and Loyalty

- Sites have <u>different user groups</u>
- Proportion of user groups is site-dependent

Groups	#Days with a visit
Tourists	1 day
Interested	2-4 days
Average	5-8 days
Active	9-15 days
VIP	>15 days



media (special events)

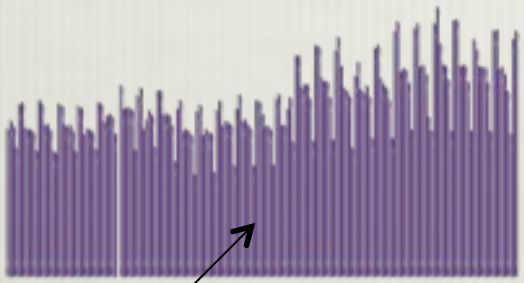
media, entertainment

daily activity, navigation

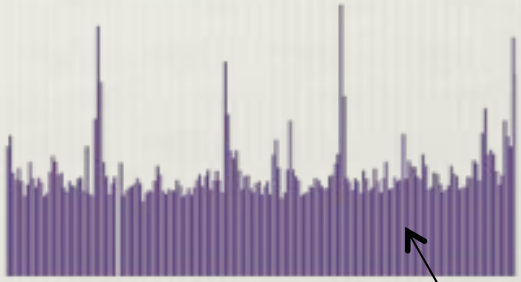
ENGAGEMENT OF A SITE DEPENDS ON USERS AND TIME

Time and Popularity

- Site engagement can be <u>periodic</u> or contains <u>peaks</u>
- Popularity is influenced by internal and external factors



mail, social media



shopping, entertainment

MOTIVATION

The challenge

- Measuring user engagement of sites with engagement metrics

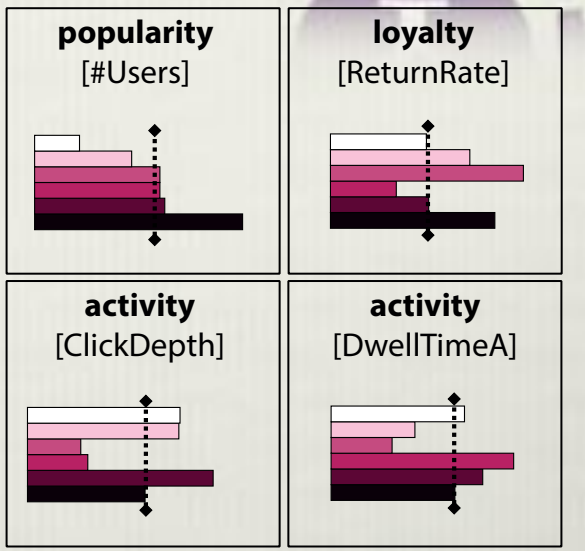
If you provide an online service…

- How do you know which engagement values indicate success/fail?
- There are services that are similar to yours?
- Which engagement metrics are important for you?
- There are changes in engagement over time and within user groups?

MODELS OF ENGAGEMENT

General [6 models]

- Popularity and loyalty are influenced by external and internal factors
  - e.g. frequency of publishing new information, events, personal interests
- Activity depends on the structure of the site



interest-specific

periodic media

e-commerce, configuration

	popularity	activity [ClickDepth]	activity [DwellTimeA]	loyalty
model m_{g6}	--			
model m_{g5}				
model m_{g4}		--	--	++
model m_{g3}		--	++	--
model m_{g2}		++		
model m_{g1}	++			

average *++ high* *- - low*

MODELS OF ENGAGEMENT

User-based [7 models]

- Models based on engagement per <u>user group</u>

navigation *game, sport*

	popularity	activity	loyalty	user groups
model m_{u7}	--			T
model m_{u6}	--			T,I
model m_{u5}	↘	↗	↗	T,I,N,A
model m_{u4}	↗	++	↗	T,I,N,A,V
model m_{u3}	↗	↗	++	T,I,N,A,V
model m_{u2}	++	++	↗	T,I,N,A,V
model m_{u1}	++	↗	↗	T,I,N,A,V

average *++ high* *- - low* *from T to V:* ↗ *increasing* ↘ *decreasing*

Time-based [5 models]

- Models based on engagement over <u>weekdays</u> and <u>weekend</u>

hobbies, interest-specific *daily news*

	popularity	activity	loyalty
model m_{t5}	{wd}++		
model m_{t4}	{wd}++	{wd}++	
model m_{t3}		{we}++	{we}++
model m_{t2}	{we}++		{wd}++
model m_{t1}	{we}++		{we}++

average *++ high* **{wd}** *weekdays* **{we}** *weekends*

- ➢ Sites of the same type (e.g. mainstream media) do not necessarily belong to the same model
- ➢ The groups of models describe different aspects of engagement, i.e. they are independent from each other

RECAP + NEXT

- User engagement is complex and standard metrics capture only a part of it
- Sites have different engagement characteristics
- Engagement depend also on users and time

Next

- Large scale data analysis to build a taxonomy of models of user engagement
- Studying engagement characteristics of specific type of sites
- User demographics, time of the day, geo-location, etc
- Interactions between models and sites

Danboard by s(Jndy*

From site to network engagement

Looking beyond the own nose!

ENGAGEMENT ACROSS A NETWORK OF SITES

- Large online providers (AOL, Google, Yahoo!, etc.) offer <u>not one service</u>, but a <u>network of services</u>

- Each service is usually <u>optimized individually</u>, with some effort to direct users between them

➢ Success of a service depends on itself, but also on how it is reached from other services

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Measuring user engagement
should account for user traffic between sites.

ONLINE MULTI-TASKING

- Users switch between sites within one online session (e.g. emailing, reading news, search, social networking)

➢ A short visit does not mean less engagement

Navigation			
	Back button	Link	Other[1]
1995	35.7%	45.7%	18.6%
1997	31.7%	43.4%	24.9%
2006	**14.3%**	43.5%	**42.2%**

Oberdorf et. al [23]

Browser usage changed
Less usage of the back button

1) *Usage of tabs, bookmarks, typing the URL directly,…*
2) *http://uxmovement.com/navigation/why-external-links-should-open-in-new-tabs/*

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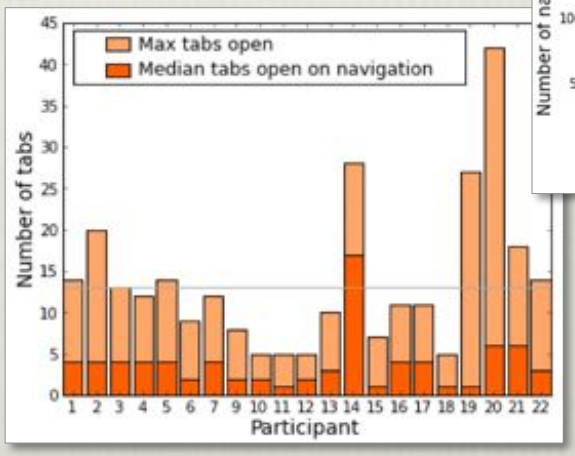
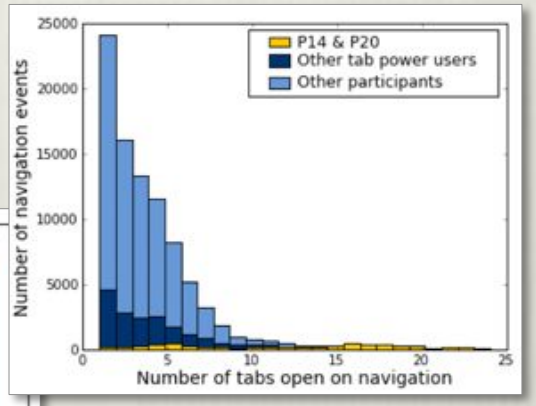
Oberdorf et. al [23]

Browser usage changed
More and more usage of tabs





Dubroy et. al [24]

UX Movement[2]:
External links affect your site and users
Links that take users to different websites should open in new tabs.

1) *Usage of tabs, bookmarks, typing the URL directly,…*
2) *http://uxmovement.com/navigation/why-external-links-should-open-in-new-tabs/*

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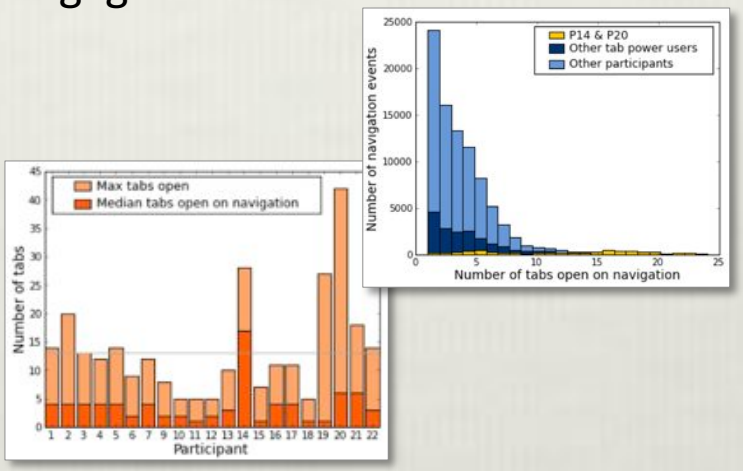


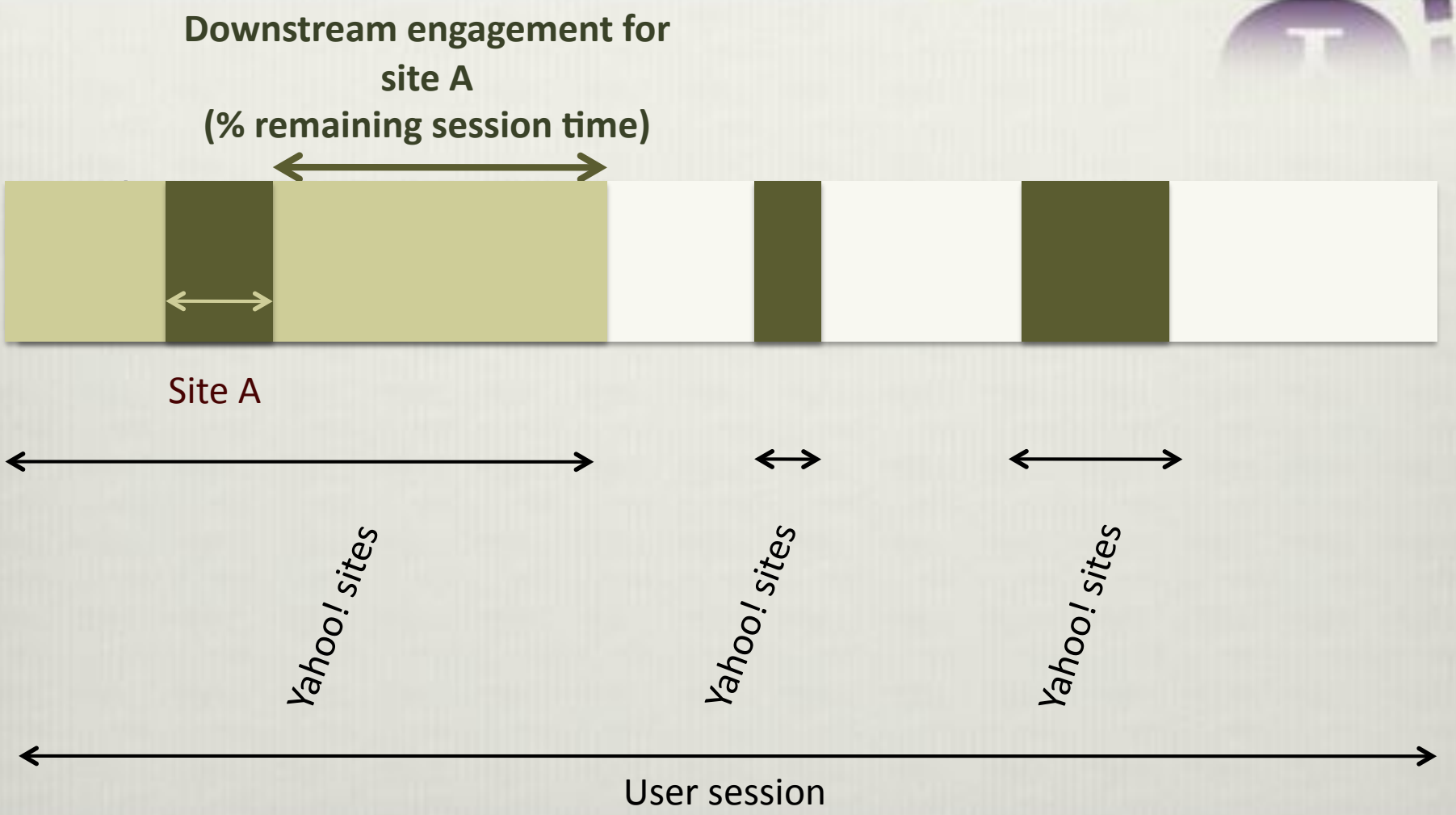
Measuring user engagement should account for online multi-tasking.

Danboard's Messy Home by Mullenkedheim

From site to network engagement

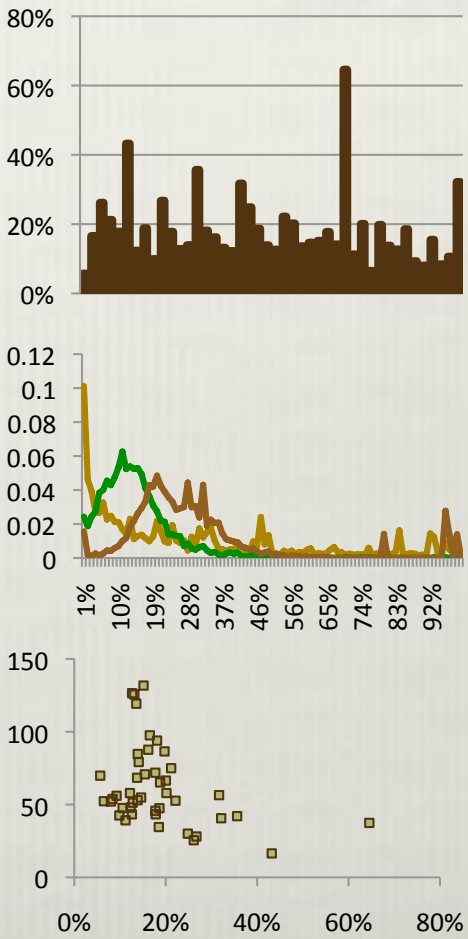
Downstream engagement

DOWNSTREAM ENGAGEMENT



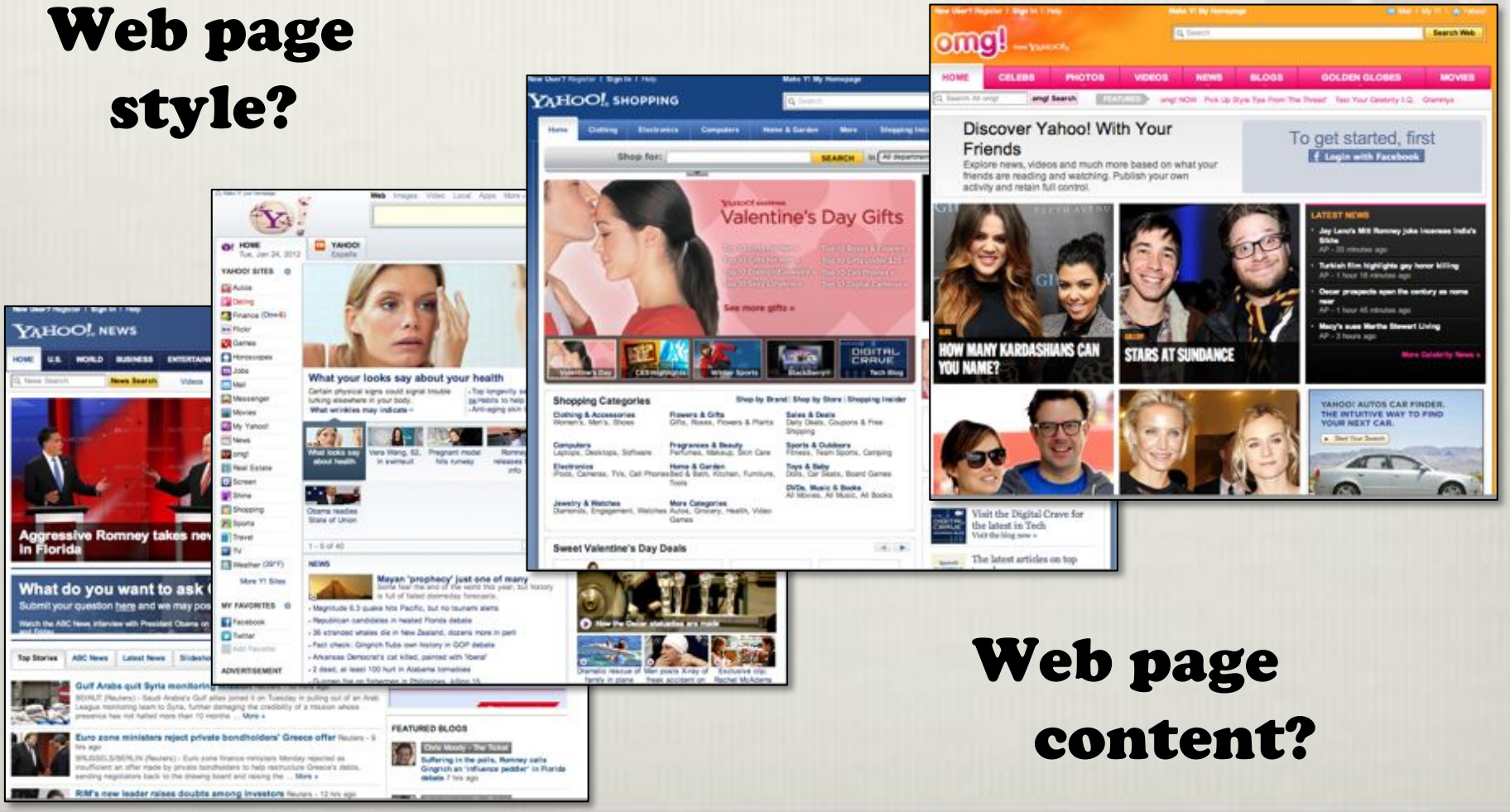
DOWNSTREAM ENGAGEMENT

- Varies significantly across sites
- Exhibits different distributions according to site type
- Is not highly correlated with other engagement measures such as dwell time
- Optimizing downstream engagement will have little effect on user engagement within that site



WHAT CAUSES ENGAGEMENT TO CHANGE?

Web page style?



Web page content?

DATA

Site data

- Sampled the front page every hour
- Two types of attributes for each site:
  - Stylistics (layout and structure)
  - General such as time of day, date, weekday or not

User data

- Yahoo! toolbar
- 19.4M sessions, ≈265,000 users
- Measuring average downstream engagement, dwell time

- User and site datasets joined, such that for each site and each date and time combination we have:
  - average downstream engagement
  - average dwell time
  - vector of corresponding style attributes

- 50 popular (by page views) Yahoo! sites
- Month of May 2011

RESULTS

Page stylistics are a good predictor for downstream engagement

- Downstream engagement of a number of sites of not particular types (models) could not be predicted from their stylistics.

Links are important

- Link placements and number of Yahoo! links can influence downstream engagement
  - Not new, but here shown to hold also across sites
- Links to non-Yahoo! sites have a positive effect on downstream engagement
  - Possibly because when users are faced with abundance of outside links they decide to focus their attention on a central content provider, rather than visiting multitude of external sites

INFLUENCING ENGAGEMENT THROUGH LINKS

Influence of links depends on the type of site

- **e-commerce**:
  - Links have little effect on downstream engagement, but have on dwell time
- **news:**
  - More news stories lead to more time spent on news
  - Links to other Yahoo! sites increase engagement and dwell time
- **women-interests:**
  - Links to other Yahoo! sites can help increase engagement, but they may decrease dwell time

	e-commerce	news	women-interests
		Downstream engagement	
Same site	0.03	-0.31	-0.27
Other Y! site	-0.09	0.20	0.22
Non Y! site	-0.10	0.04	-0.25
		Dwell time	
Same site	0.51	0.78	0.82
Other Y! site	-0.61	0.38	-0.68
Non Y! site	-0.51	0.04	0.80

DEPENDENCE TO SESSIONS

Difference between goal-specific vs. browsing sessions

- **Goal-specific sessions** are those sessions where users have a specific goal in mind: do email, read news, check FB
- Average downstream engagement in goal-specific sessions was 0.16 vs. 0.2 for other sessions.

1. *Sessions when at least 50% of visited sites belonged to the five most common sites (for that user) were classified as goal-specific*
2. *Goal-specific sessions accounted for 38% of sessions.*
3. *Approximately 92% of users had sessions of both kinds.*
4. *Accuracy of predicting downstream engagement was **0.76** for goal-specific sessions vs. **0.81** for other sessions.*

When users do not have specific goals in mind, they may be more ready to accept suggestions (e.g. more links) for additional browsing.

RECAP + NEXT

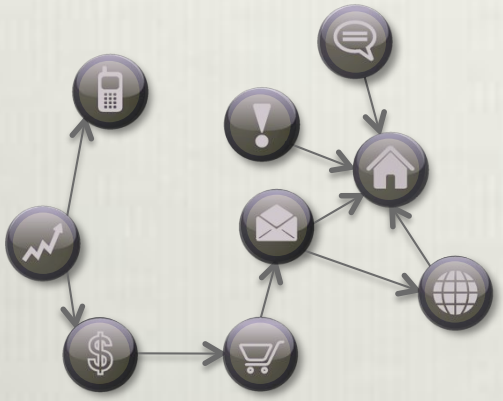
- Using one metric (downstream engagement), we showed that there is a network effect, and that the network effect can be influenced.

- We go one step further and propose a methodology to account for the traffic between sites when measuring user engagement on a network of sites.

Next step: engagement networks

- Metrics from complex networks area (network-level and node-level)
- Application on 728 Yahoo! sites

THANK YOU



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George Dupret	*gdupret@yahoo-inc.com*

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