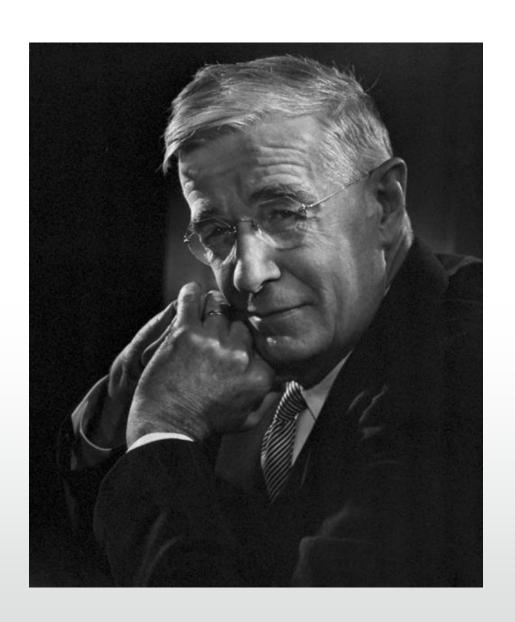
Web Science and the Future of Open Data in Mobile Learning, Applications and Services





"As we may think" Vannevar Bush Atlantic Monthly July 1945

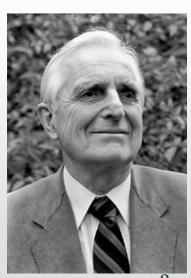


# Southampton Southampton

Everything is deeply intertwingled

### Ted Nelson and Doug Engelbart

Augmenting human intellect



# Southampton Southampton



What do India, the Earl Mountbatten of Burma, the University of Southampton and my research career have in common?



The Mountbatten archive moved to Southampton In 1987



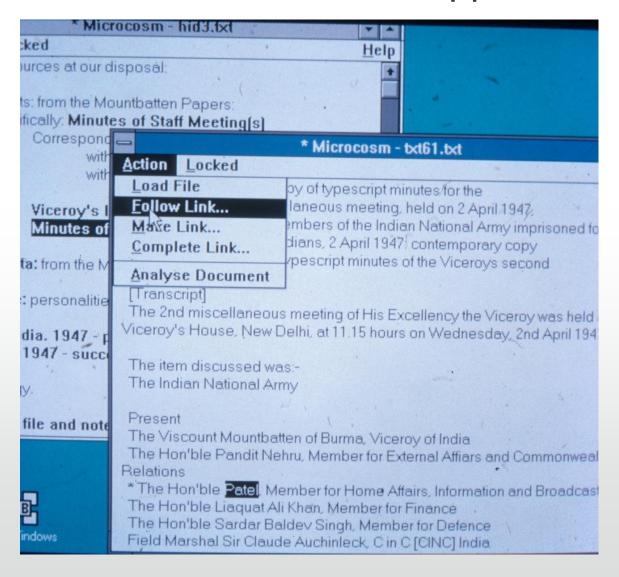
### **Associative Linking**

"An associative link is the instantiation of a semantic relationship between information elements. The semantic relationship can be something as simple as 'definition of' or something far more complex."

Lowe & Hall, Hypermedia and the Web: An Engineering Approach, Wiley, 1999

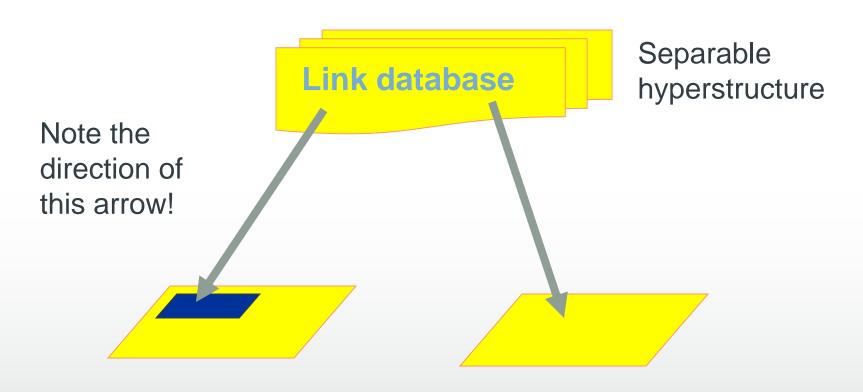


#### Microcosm: Mountbatten archive application

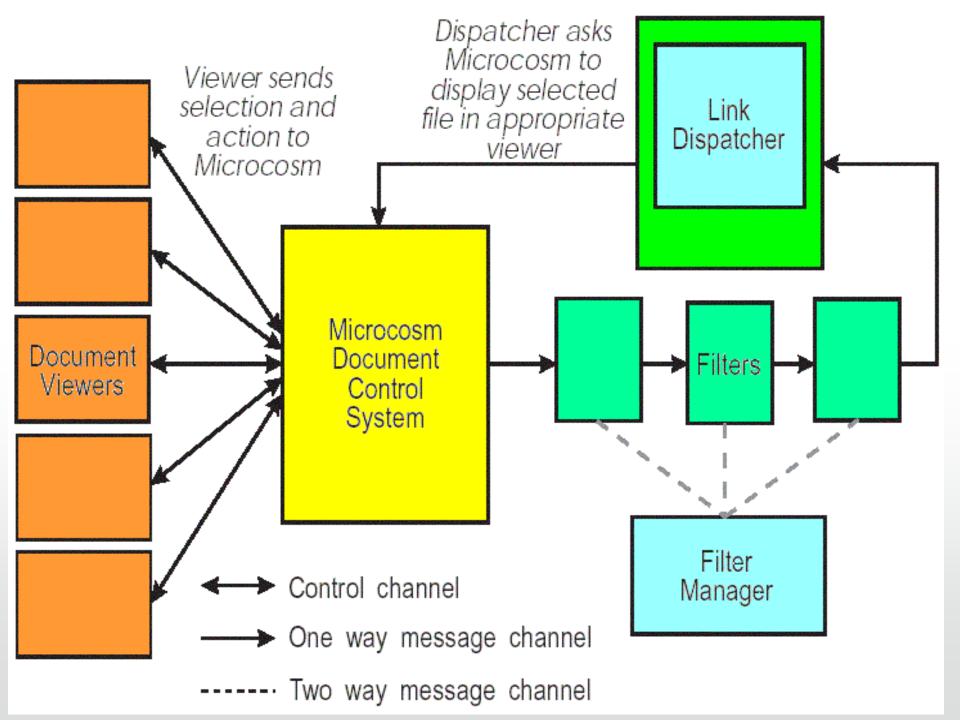




#### Linkbases in Microcosm



**Documents** 

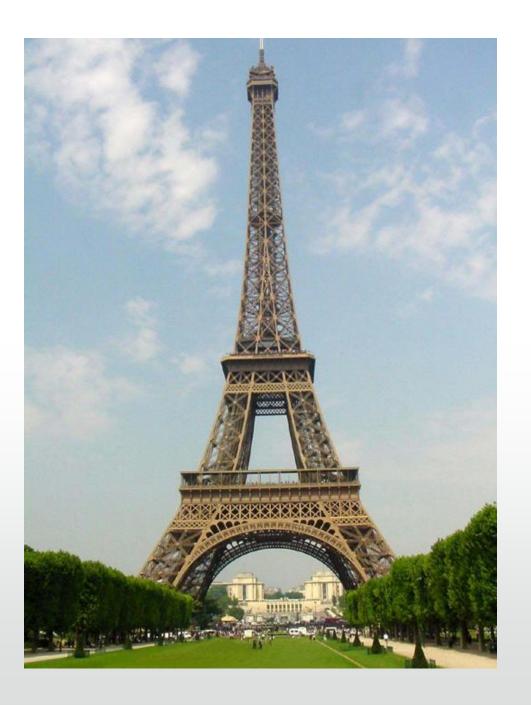




#### Links in Microcosm

- source, destination, description i.e. triples stored in linkbases
- source: object | concept | context
- We generated links based on metadata description of documents in docuverse and "it all falls out"
- We also generated links on the "data" in the documents e.g text strings, multimedia info, cells in spreadsheets and data in databases





ECHT'90

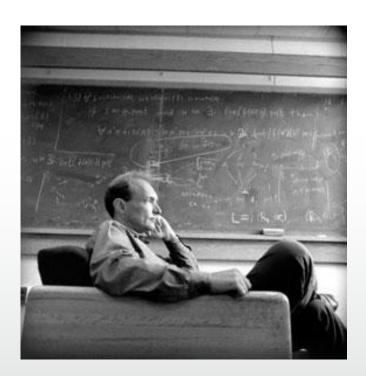


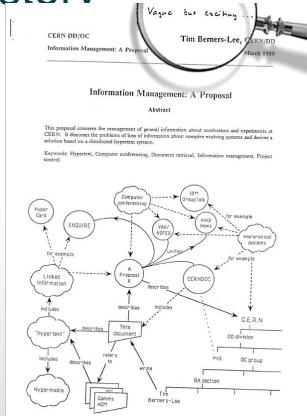


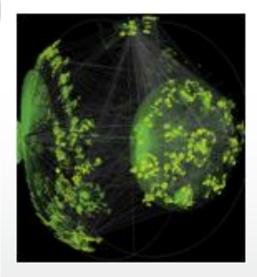


ACM Hypertext' 91

The Web – most successful information architecture in history









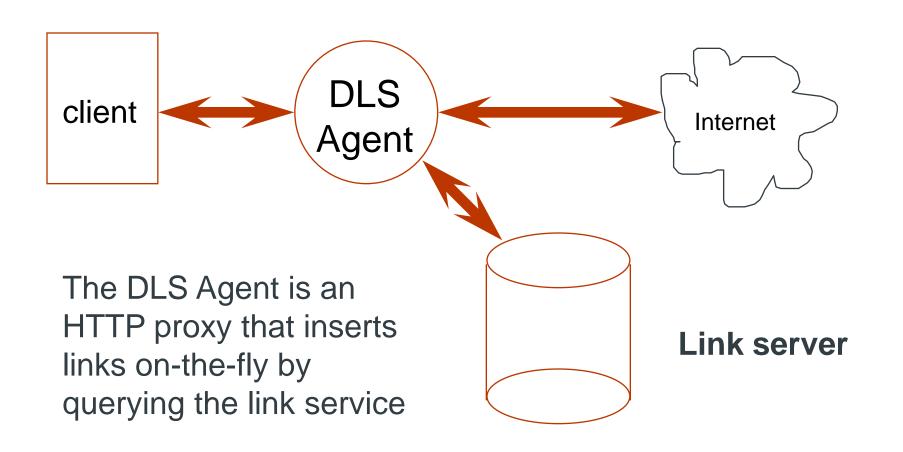
#### Lessons learnt

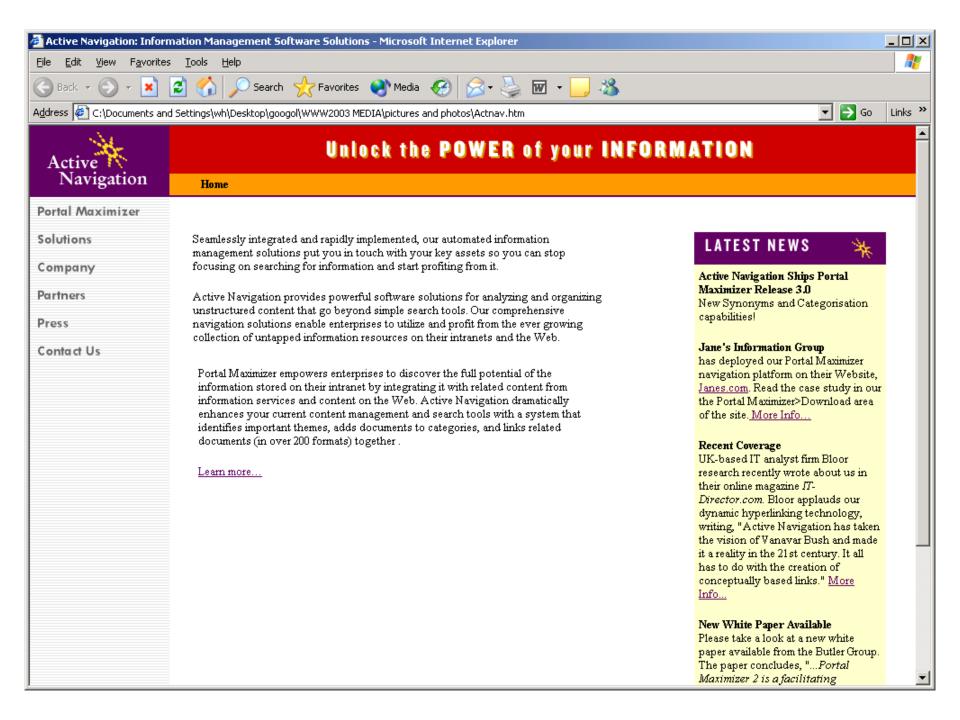
- Big is beautiful: the network is everything
- Scruffy works: let the links fail to make it scale
- Democracy rules: open, free and universal

- But we lost (for a time) conceptual and contextual linking, and link descriptions – the Web is a strangely linkless world
- Missing links search engines fill the gap

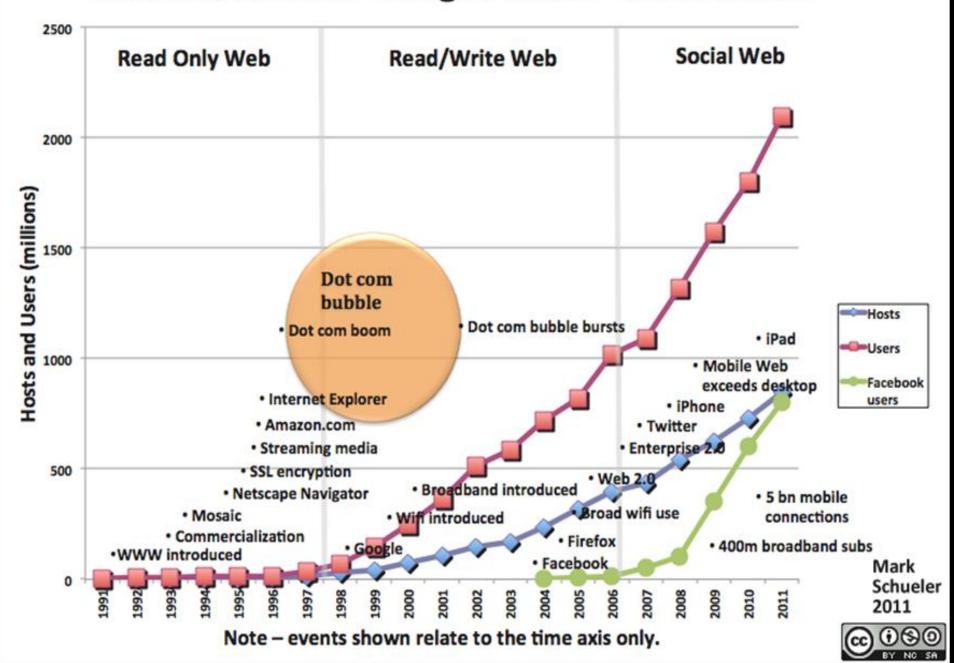


### The Proxy DLS





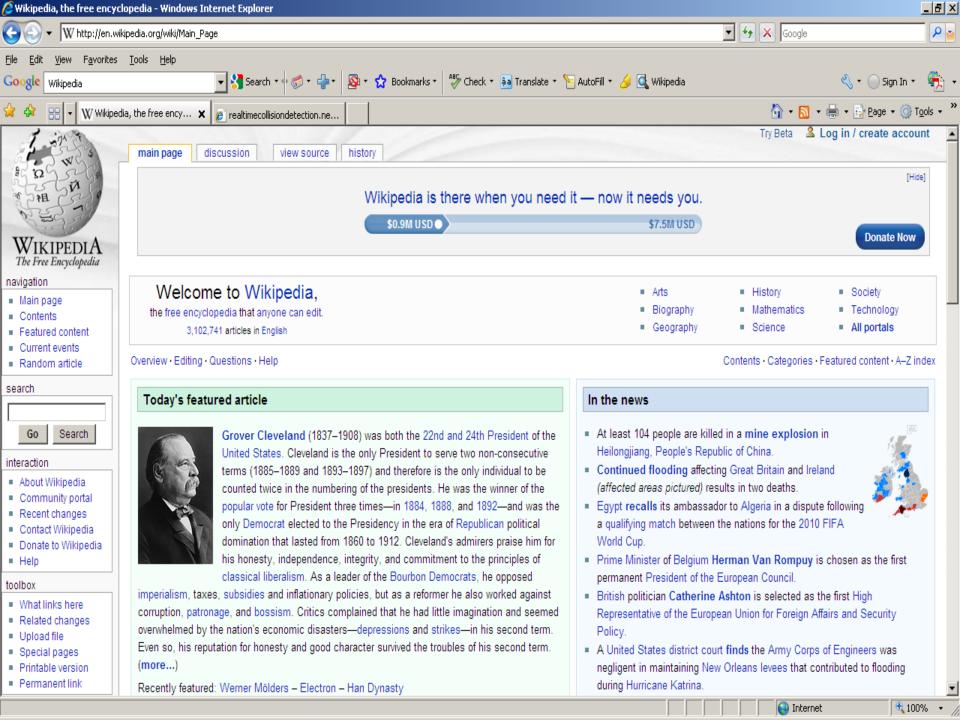
#### **Internet Growth - Usage Phases - Tech Events**

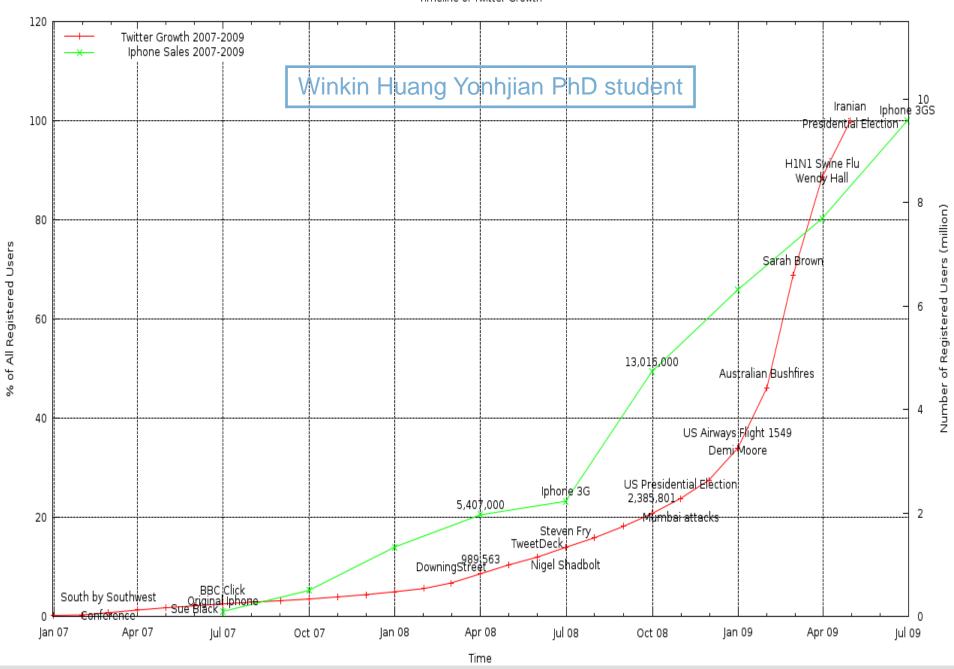


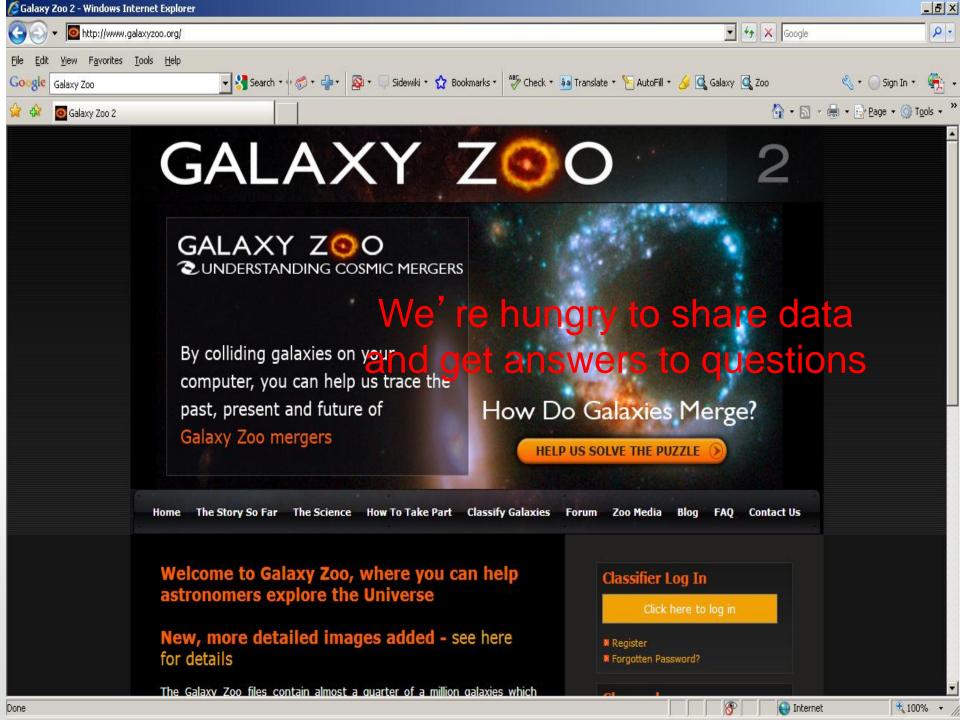
#### Web 2.0

- Wikis
- Blogs
- Flickr
- YouTube
- MySpace
- Facebook
- Second Life
- Twitter









# Web 3.0? The Semantic Web A Web of Data



# Content, Emergence and Unanticipated Reuse

The four micro principles of the Semantic Web

- 1. All entities of interest, such as information resources, real-world objects, and vocabulary terms should be identified by URI references.
- 2. URI references should be dereferenceable, meaning that an application can look up a URI over the HTTP protocol and retrieve RDF data about the identified resource.
- 3. Data should be provided using the RDF/XML syntax.
- 4. Data should be interlinked with other data.



Nigel Shadbolt is a professor of artificial intelligence in the School of Electronics and Computer Science at Southampton University, Contact him at nrs @ecs. soton ac uk



Tim Berners-Lee is the director of the World Wide Web Consortium, a senior researcher at the Massachusetts Institute of Technology's Computer Science and Artificial Intelli-

gence Laboratory, and a professor of computer science in the Department of Electronics and Computer Science at Southampton University, Contact him at timbl@w3.org.



Wendy Hall is a professor of computer science in the School of Electronics and Computer Science at Southampton University, Contact her at wh@ecs.soton.

#### The Semantic Web Revisited

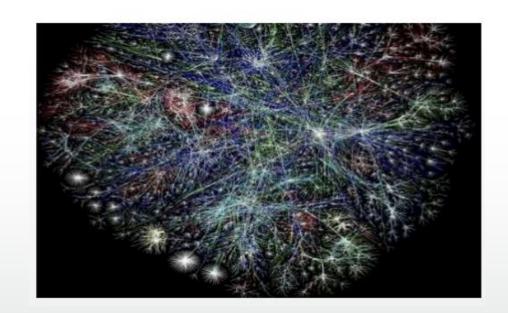
Nigel Shadbolt and Wendy Hall, University of Southampton Tim Berners-Lee, Massachusetts Institute of Technology

# Why Web Science?



### The Web – we need to understand it

- Web architecture is simple set of protocols
- These give rise to complex macro phenomena
- Need systems oriented view of the Web and its ecosystem – Web Science
- One that acknowledges social and technical components



# Web Science Research Initiative November 06

"Web Science represents a pretty big next step in the evolution of information. This kind of research is likely to have a lot of influence on the next generation of researchers, scientists and, most importantly, the next generation of entrepreneurs who will build new companies from this."

Dr Eric Schmidt, CEO, Google Inc.



December 2009



Research Education Thought Leadership

www.webscience.org



### www.webscience.org

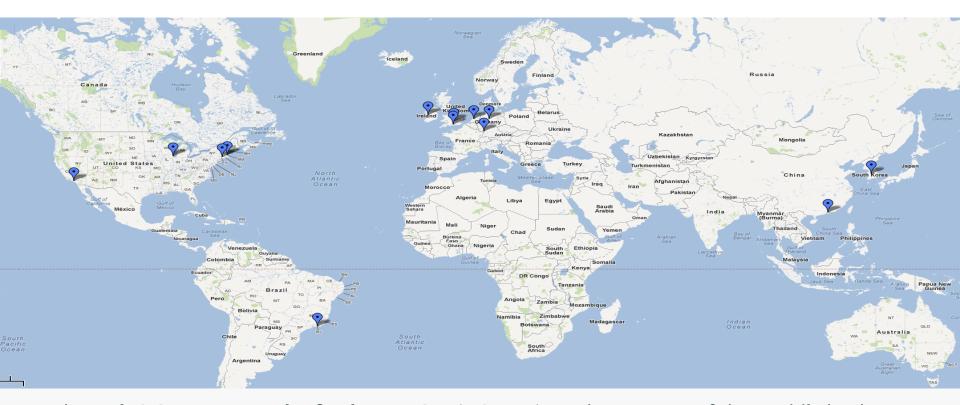
#### Exists to promote and help coordinate

- Research
  - Research Agenda
  - WSTNet Labs
  - ACM WebSci'11 Koblenz, WebSci'12 Chicago, WebSci'13 Paris
- Education
  - Curriculum Development
  - Summer Schools
    - DERI 6-13 July 2011
    - Netherlands July 2012

- Thought Leadership
  - Workshops
  - Dissemination

info@webscience.org

### Web Science Network of Laboratories



The Web Science Network of Laboratories (WSTNet) combines some of the world's leading academic researchers in Web Science, with new academic programmes that will enhance the already growing influence of Web Science. The member Labs will provide valuable support for the ongoing development of Web Science. There are now 13 WSTNet labs.

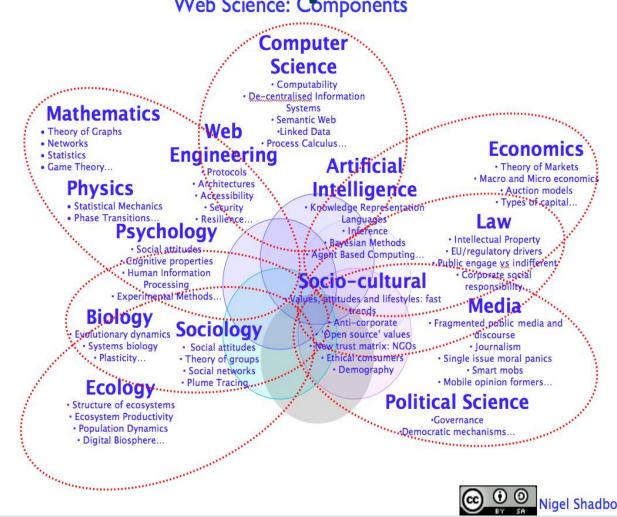
Southampton, UK MIT, USA North-Western, USA Tsinghua Graduate School, Shenzhen, China DERI, Galway, Ireland KAIST, Korea Hannover, Germany Oxford Internet Institute, UK RPI, USA Anaheim School of Communication, USC, USA VU, Amsterdam, The Netherlands Koblenz, Germany Rio, Brazil

## Southampton Southampton

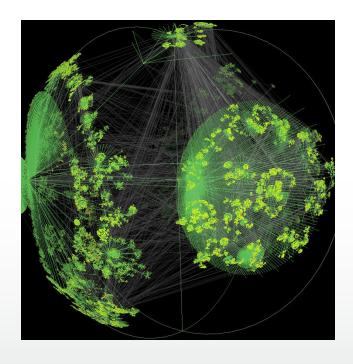
Web Science and additionality
Web Science: Components

Not the union of the disciplines

But more than their intersection



# Web Science shape and structure



#### Scale-free

Some nodes are of high degree most are low degree

#### Power laws

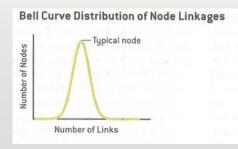
- The degree distribution follows a power law, with an exponent β > 2.

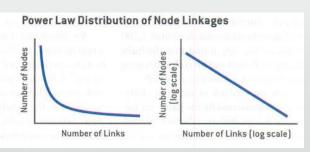
#### Small worlds

 The average distance (or diameter) is much smaller than the order of the graph.

#### Hubs and authorities

 The number of distinct bipartite cliques or cores is large when compared to a random graph with the same number of nodes and edges.





# Web Science collective intelligence

#### WikipediA

#### English

The Free Encyclopedia 3 422 000+ articles

#### 日本語

フリー百科事典 705 000+ 記事

#### Deutsch

Die freie Enzyklopädie 1 125 000+ Artikel

#### Français

L'encyclopédie libre 1 000 000+ articles

#### Italiano

L'enciclopedia libera 728 000+ voci

# はの知り

#### Español

La enciclopedia libre 650 000+ artículos

#### Русский

Свободная энциклопедия 589 000+ статей

#### **Português**

A enciclopédia livre 613 000+ artigos

#### Polski

Wolna encyklopedia 729 000+ haseł

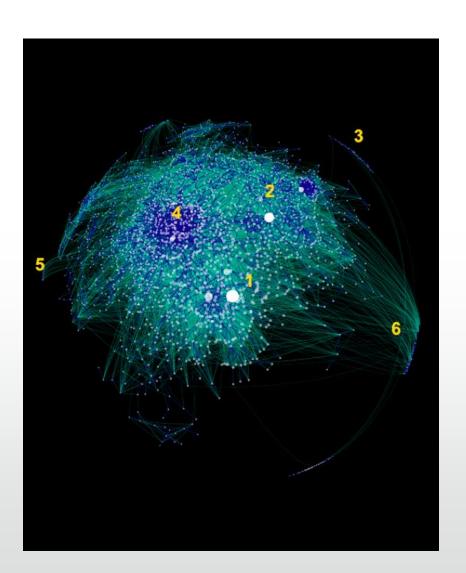
#### Nederlands

De vrije encyclopedie 641 000+ artikelen

search・suchen・rechercher・szukaj・ricerca・検索・buscar・zoeken・busca・поиск・sök・捜索・cerca・søk・haku・пошук・keresés・hledání・căutare・ara・찾기・søg・serĉu・・・cari・tìm kiếm・претрага・suk・hladať・paieška・ロー・Tърсене・・poišči・bilnga

# Web Science emergence

When and why did the blogosphere take off



### Web Science social networks



#### 校内网

欢迎访问校内网

#### 校内阁,是一个在校大学生电子名录。 您可以通过校内网:

- 1. 了解周围的同学:
- 2. 详价上过的课,认识选同一门课的人;
- 3. 和同学们共享喜欢的音乐、电影、书籍。



- 1. 清华大学 电子工程系 [849人]
- 2. 清华大学 微电子学研究所 [41人]

# Web Science crowd sourcing



### Web Science

### the mobile Web





















All drivers for the digital economy and changing the way we work

But most importantly ......

# The Web – a socio- technical system

Tim Berners-Lee didn't create the Web - we did

Web Science is the theory and practice of social machines

### What is a social machine?

"Real life must be full of all kinds of social constraints – the very processes from which society arises. Computers help if we can use them to create abstract social machines on the Web, processes in which people do the creativity and the machine does the administration. The stage is set for an evolutionary growth of new social engines. The ability to create new forms of social process would be given to the world at large and development would be rapid"

Tim Berners-Lee and Mark Fischetti, Weaving the Web, 1999

## Examples of social machines

- The Web, Google, FaceBook, Twitter, Wikipedia ......
- Captcha (Luis von Ahn)
- Trip Advisor
- Galaxy Zoo
- Ushahdi open source project which allows users to crowd source crisis information to be sent via mobile
- The OpenStreet Map of Haiti created after the earthquake
- The list goes on ... design your own

### Social Machines in Context

Big Data Big Compute Machines

Social

Conventional Social Computation Networking More machines

More people

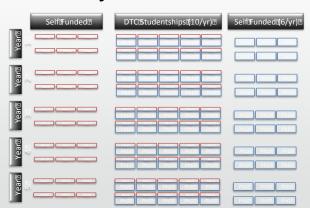


# Proud to be producing the first generation of Web Scientists

# **Doctoral Training Centre**

Digital Economy Pansforming Business and Society

- Create a cohort of web scientists
  - Leaders and advisors in the UK's Digital Economy
  - £6 million over 8 years for 50 students
  - Funded by RCUK's £250 million DE programme\*
    - rcukdigitaleconomy.org.uk
- Promote a deep understanding of the Web in society
- Carry out significant research
  - analytical, practical & constructive
  - forming a hub for research investment



### DTC Students 2012





# Tipping points for the Web of Data

## Southampton Southampton The Web – open government data



"Openness will strengthen our democracy and promote efficiency and effectiveness in Government."

--- President Obama



data.gov online

57 Data Sets



December 8,

2010

"Open Government Directive" released ~2000 Data Sets



data.gov relaunch with semantic web featured

2010

2009



June30,2009

online-



**Putting Govt Data** Data.gov.uk beta



data.gov.uk online

Semantic Web and

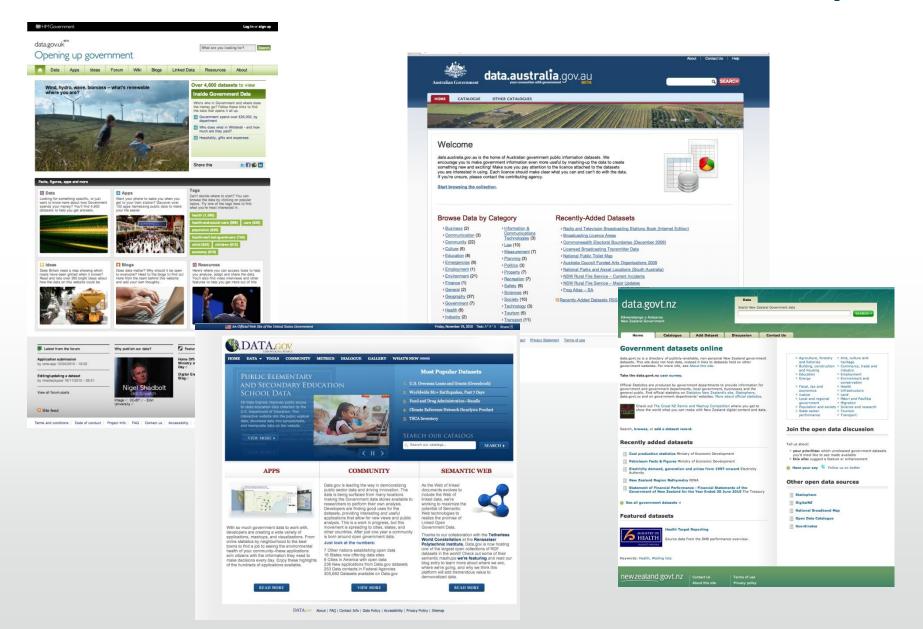
Linked Data enabled

~3000 Data Sets 🖁

~4500 Data Sets

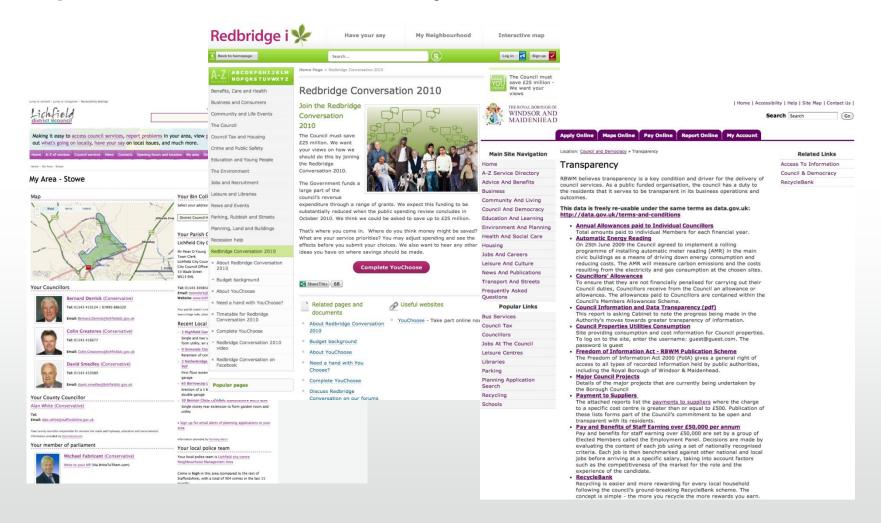
### Open Government Data

# Southampton Southampton



# Southampton Southampton

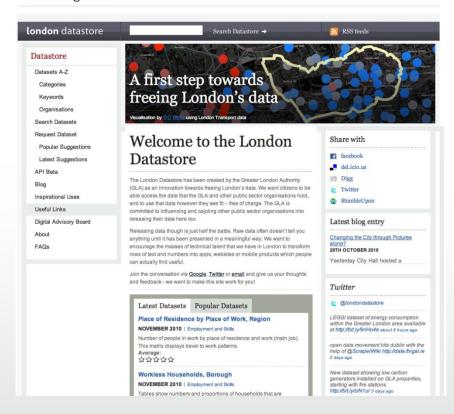
# Open Local Authority Data



## **Open City Data**

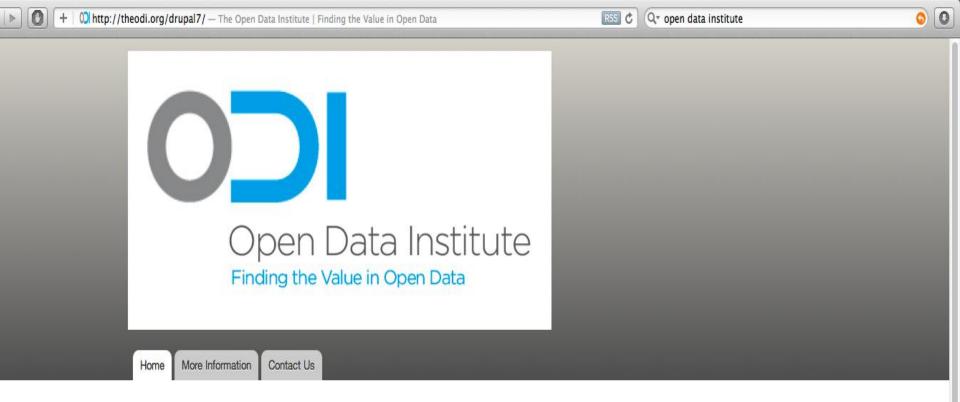
GREATER LONDON AUTHORITY

#### london.gov.uk



# Southampton Southampton





#### The ODI Vision

Submitted by admin on Sat, 19/05/2012 - 21:27

Our vision is to establish the world's first Open Data Institute (ODI) as the leading centre in which the exploitation of Open Data is demonstrated. We will incubate, nurture and mentor new businesses exploiting Open Data for economic growth. We will promote innovation driven by the UK Government's Open Data policy.

Read more Log in to post comments



# Southampton Southampton

# Why?

- Transparency
- Accountability
- Engagement
- Improve Public Services
- Efficiency better for less
- Economic and social value



#### LIVID /EDOLETY OF 13:47 placr.co.uk - Tube...

# ASBOs, Dentists and Tubes



ASBOrometer is a mobile application that measures levels of anti-social behaviour at your current location (within England and Wales) and gives you access to key local ASB statistics.

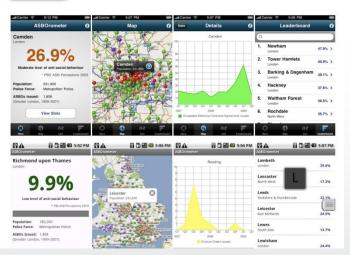
ASBOrometer is available for iPhone and Android phones. Get it FREE from the iTunes App Store or Android Market now!

This app was created by Jeff Gilfelt and made possible by the data.gov.uk initiative, which is opening up UK government data for public reuse.











#### Kilburn Park Platforms

#### Northbound -Platform 1

Bakerloo

Less waiting than normal current time between trains: 2.1 mins. normal:3.1 mins

#### Southbound -Platform 2

Bakerloo

r imaging

Normal performance current time between trains: 2.2 mins. normal:2.2 mins

#### Overall station performance:



Less waiting than normal

### **UK Dentists**

Find GPs

Find Postboxes

Find Pubs

Find Toilets

SF Trees

twitter

App Store

Find

Find your nearest NHS dentist quickly and easily!

The National Health Service has over 7,500 dental surgeries across England but finding one can be a difficult and time consuming task. This app is based on data provided by the UK's Health and Social Care Information Centre (HSCIC)\* and covers 99.4% of all registered NHS dental surgeries in England.

Search for an NHS dentist around your current location, or look for one in another area (where you may be moving to, or for a friend) via a simple place name or postcode search. Distances can be displayed in metric or imperial units (configured in the application

UK Dentists uses the built in GPS on the iPhone to get your current location, but can also locate an iPod Touch in built-up WiFi areas. If your location cannot be determined automatically then you can always enter your post code to get started. Please note that an internet connection is required to get location and map data.

\* Data reproduced under the terms of the Office of Public Sector Information (OPSI) Click-Use Licence.









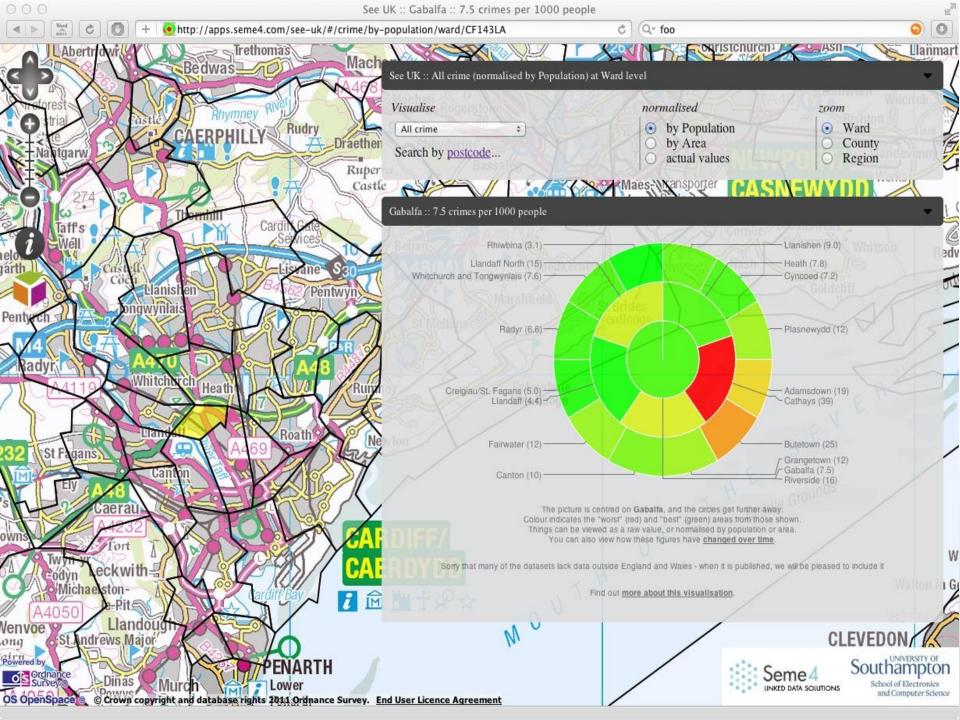


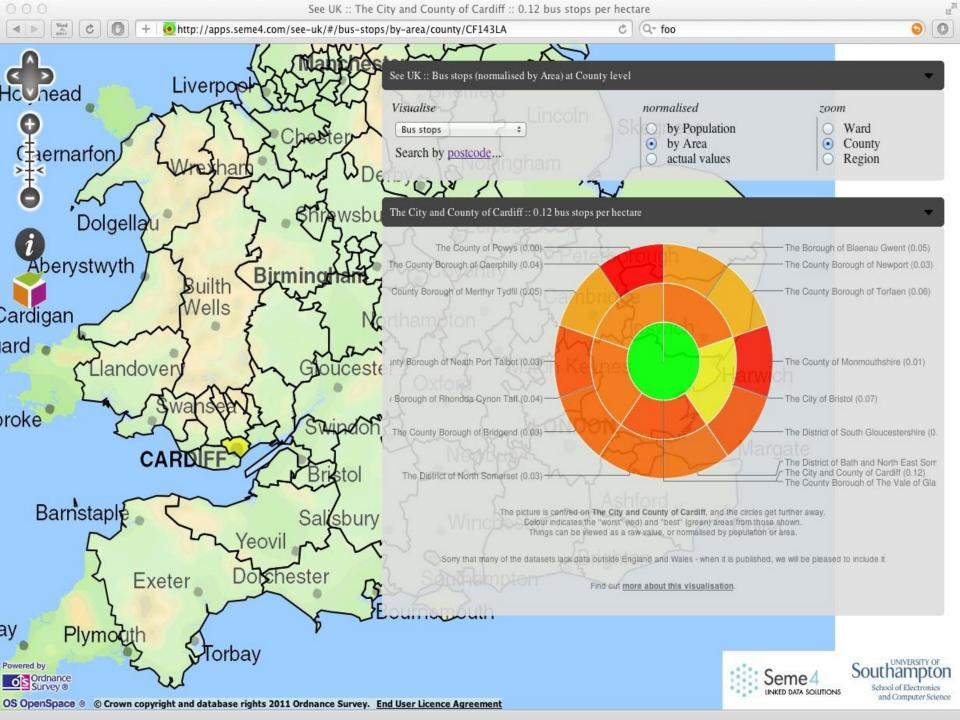
Click on any of the images to see a larger version

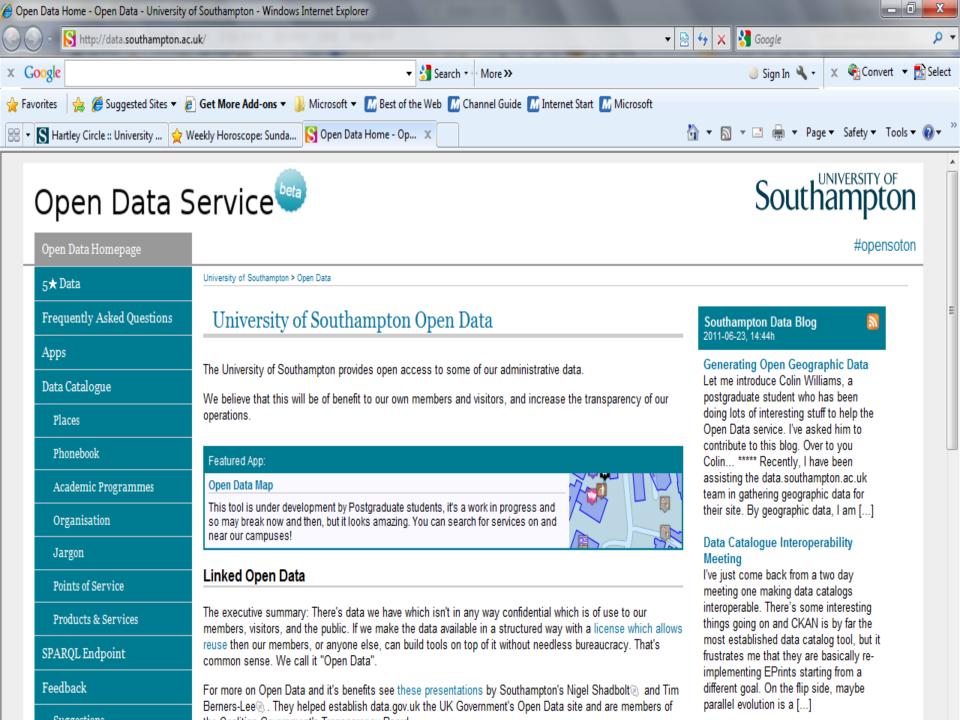


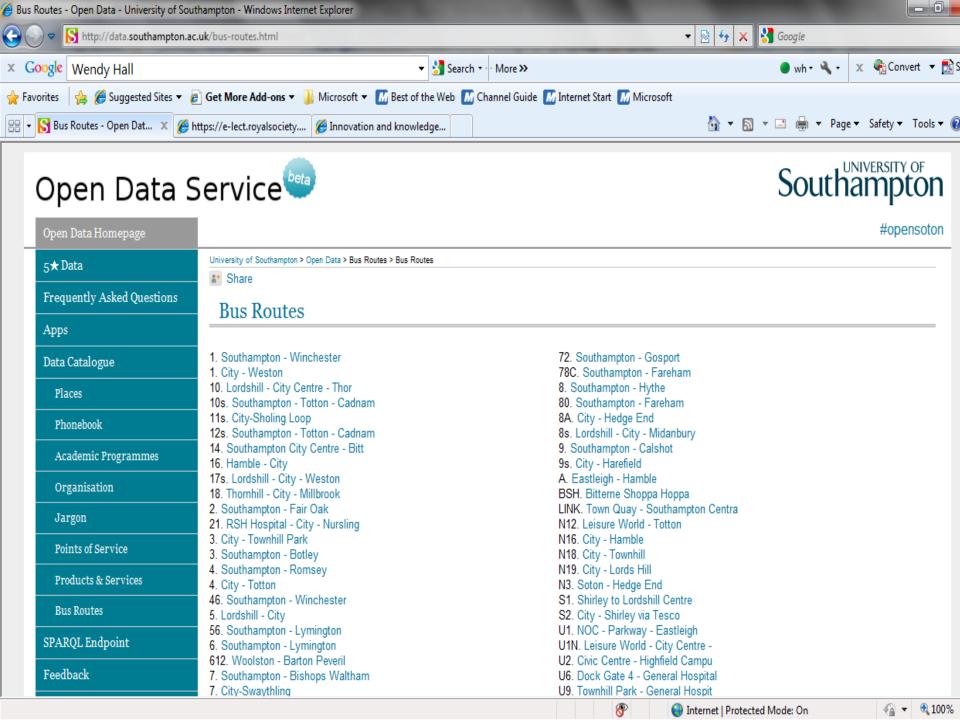


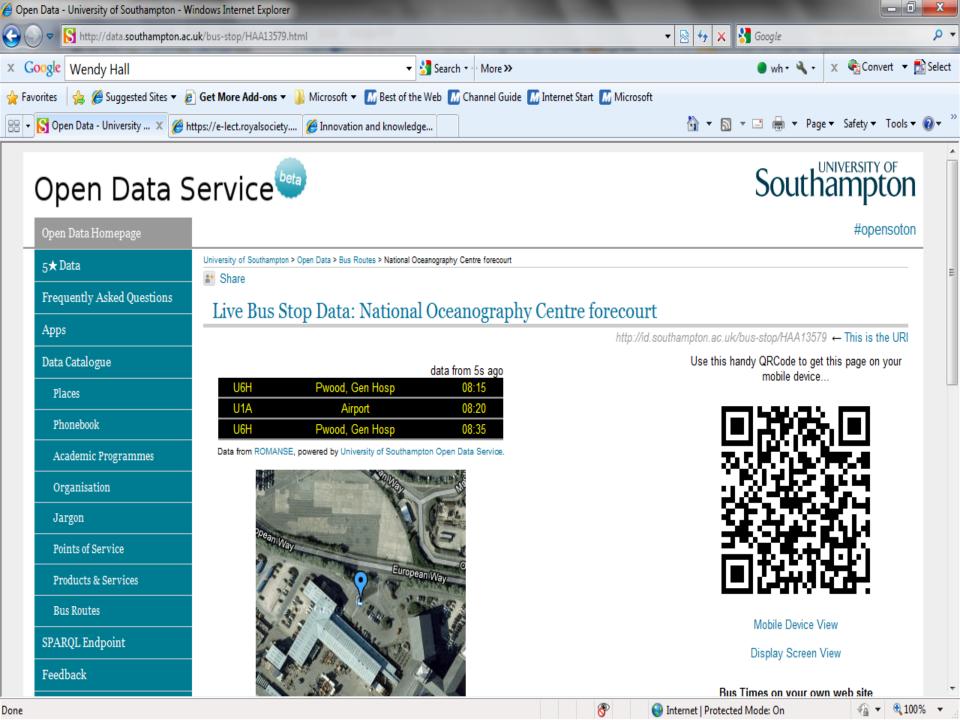


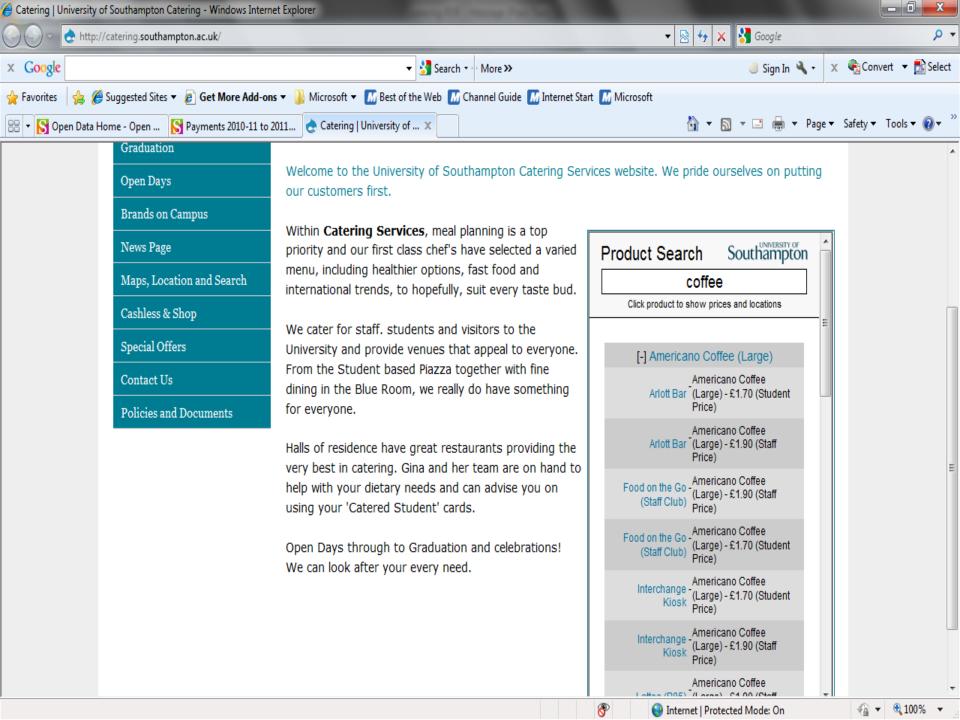


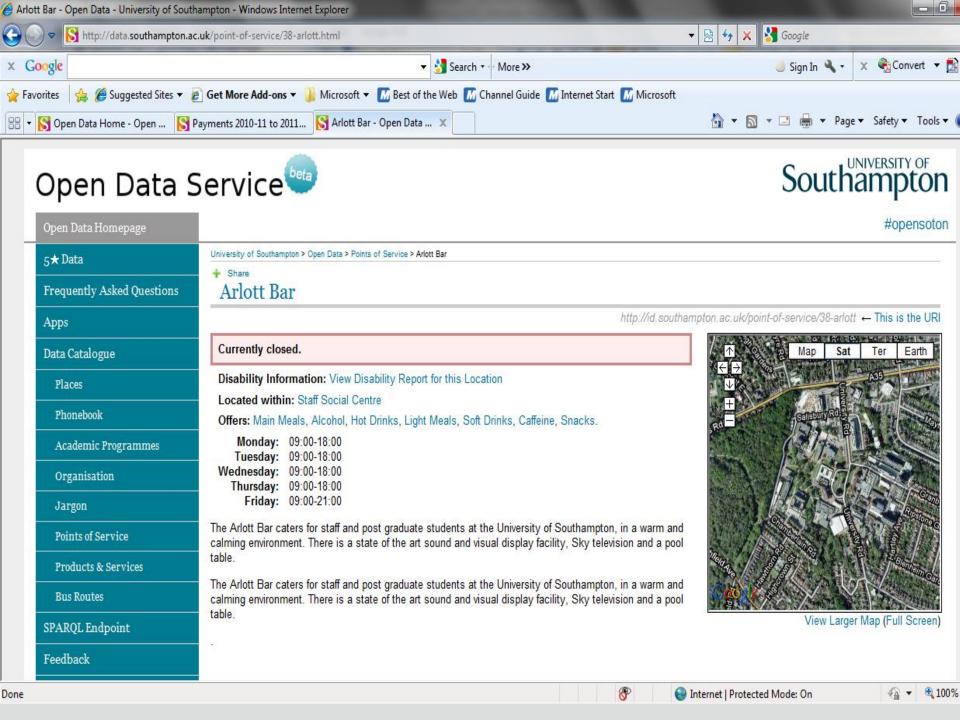


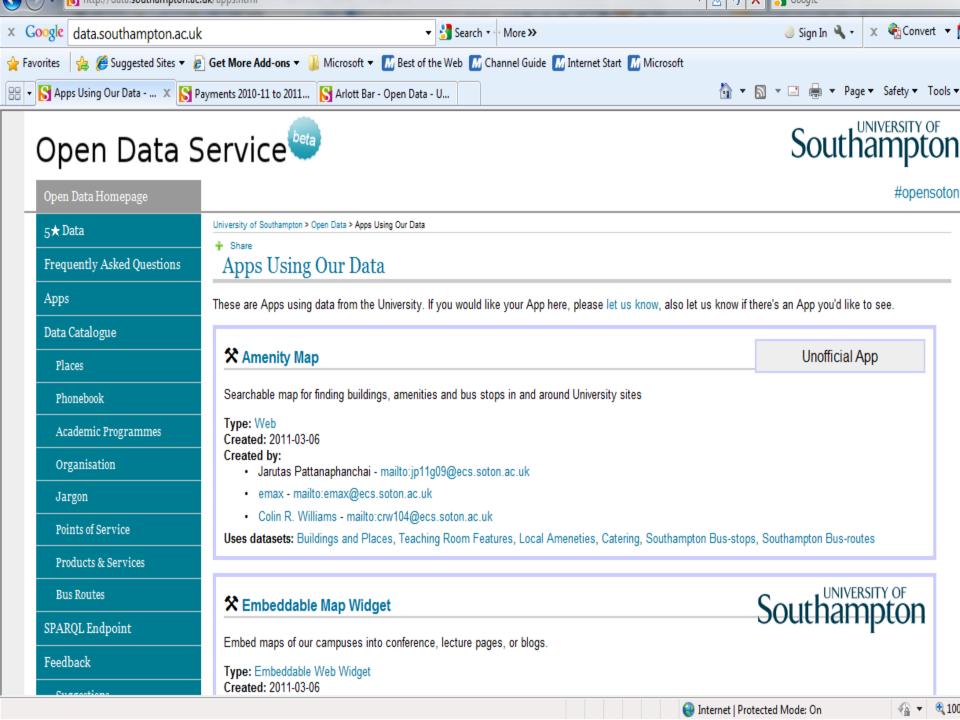












http://www.ecs.soton.ac.uk/people/dder



Search Enter keywords here

qo

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University of Southampton > ECS > People > Professor David C De Roure

#### Professor David C De Roure

Contact and Biography

#### Search People

Enter a name here Search





#### Professor David C De Roure

School of Electronics and Computer Science University of Southampton Southampton SO17 1BJ United Kingdom

Positions: Head of Group in Grid and Pervasive Computing Group, Academic staff in

Intelligence, Agents, Multimedia Group

Extension: 22418

Telephone: +44 (0)23 8059 2418 Email: dder@ecs.soton.ac.uk

URI: http://id.ecs.soton.ac.uk/person/47 [browse]

Interests: agent-based computing, amorphous computing, arts and humanities applications, audio, autonomic computing, chemoinformatics, collaborative tools, computers David works with: and music, decentralised systems, distributed programming languages, distributed systems, dr who, e-learning, e-research, e-science, e-social science, electronic lab notebooks, electronic systems design, environmental monitoring, folksomonies, grid, grid computing, grid standards, hardware-software codesign, hypertext, information systems, intelligent sensor networks, interaction, jpv6, linux, lisp, middleware, multi user dungeons, multicast, multimedia, music, music information retrieval, nature inspired computing, open access, open hypermedia, open journals, open source, pervasive computing, provenance, rdf, recommender systems, scheme, scholarly communications, scripting languages, selforganising systems, semantic annotation, semantic grid, semantic web, sensor networks, service-oriented architectures, simulation, social networks, social tagging, surge, technology-enhanced learning, ubiquitous computing, virtual research environments, visual programming, web, web 3.0, web science, web services, web standards, workflow

The group secretary for the Intelligence, Agents, Multimedia Group is Jane Morgan.

#### Biography

David De Roure is a Professor of Computer Science in the School of Electronics and Computer Science at the University of Southampton, UK. A founding member of the School's Intelligence, Agents, Multimedia Group, he leads the e-Research activities and is a Director of the Pervasive Systems Centre. Closely involved in the UK e-Science programme, David is National Strategic Director of e-Social Science, Chair of OMII-UK and a Co-Director of e-Research South. His work focuses on creating new research methods in and between multiple disciplines, and his projects draw on Web 2.0, Semantic Web and workflow technologies.



Professor David C De Roure

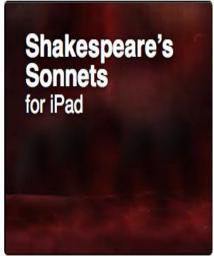
752	Professor Dame Wendy	(explain)
	Hall	(CXPIGIT)
	<ul> <li>Dr Danius T Michaelides</li> </ul>	(explain)
	<ul> <li>Dr Les A Carr</li> </ul>	(explain)
n	<ul> <li>Dr Mark J Weal</li> </ul>	(explain)
-	<ul> <li>Dr Don Cruickshank</li> </ul>	(explain)
	<ul> <li>Professor Nigel R Shadbolt</li> </ul>	(explain)
	<ul> <li>Kevin R Page</li> </ul>	(explain)
	<ul> <li>Dr Gary B Wills</li> </ul>	(explain)
	<ul> <li>Dr David E Millard</li> </ul>	(explain)
	<ul> <li>Professor Luc Moreau</li> </ul>	(explain)
	<ul> <li>David R Newman</li> </ul>	(explain)
	<ul> <li>Hugh Glaser</li> </ul>	(explain)
	<ul> <li>Dr Stuart E Middleton</li> </ul>	(explain)
	<ul> <li>Dr Nicholas Gibbins</li> </ul>	(explain)
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	<u>Jennings</u>	
er	<ul> <li>Professor Hugh C. Davis</li> </ul>	(explain)
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e	<ul> <li>Ken E Meacham</li> </ul>	(explain)
ic	<ul> <li>Professor AJG "Tony" Hey</li> </ul>	(explain)
is	<ul> <li>Dr Robert J Walters</li> </ul>	(explain)
is	<ul> <li>Christopher Gutteridge</li> </ul>	(explain)
13	Dr Harith Alani	(explain)
	Yang Yang	(explain)
	<ul> <li>Saad A Alahmari</li> </ul>	(explain)

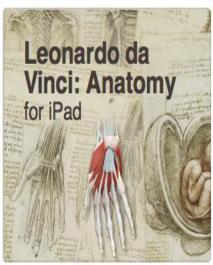
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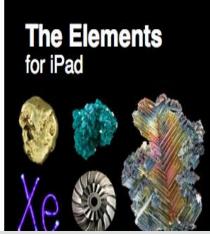
### Mobile Learning, Applications and Services

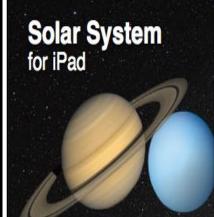
- The growth of tablets and smart phones is fuelling the development of a new market for multimedia applications
- But many of these don't take advantage of the interconnectedness we now take for granted on the Web
- They are not social machines- they are today's equivalent of the CD-ROM (or an illustrated book)















http://www.utem.euu.my/web20..





**Patrick Stewart** 



Kim Cattrall



**David Tennant** 

Browse all 154 sonnets







### 'So long lives this, and this gives life to thee'

The Sonnets by William Shakespeare allows you to enjoy, explore and understand these immortal works of literature as never before.

All 154 poems are performed to





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# Mobile Learning, Applications and Services (2)

- Building social machines is a much more powerful way forward
- Will lead to more enriched learning environments which actively engage the user as part of the learning experience



### Conclusions

- We are all learning all the time on the Web which is increasingly mobile
- We contribute to the development of learning environments through collective intelligence (e.g Wikipedia) and crowd sourcing or citizen science type social machines
- The future
  - need to learn more about building social machines (web science) to support learning
  - need to harness the potential of the Web of data to help us build powerful new learning environments