ENGINEERING COLLECTIVE INTELLIGENCE: THE RIDESHARING EXAMPLE

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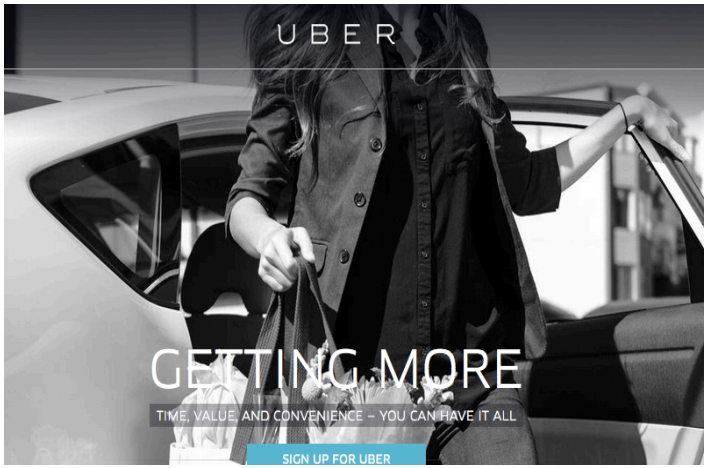
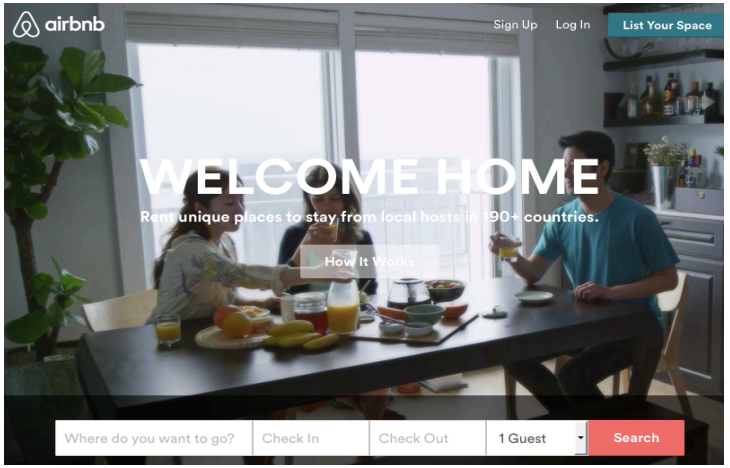
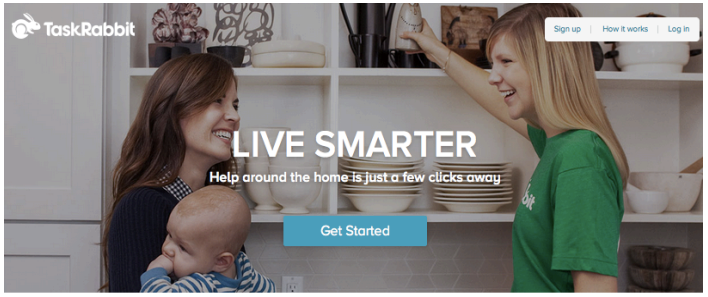
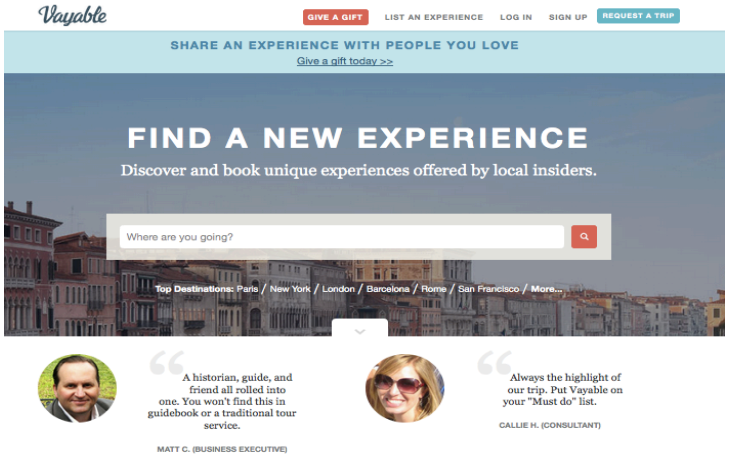
The Sharing Economy

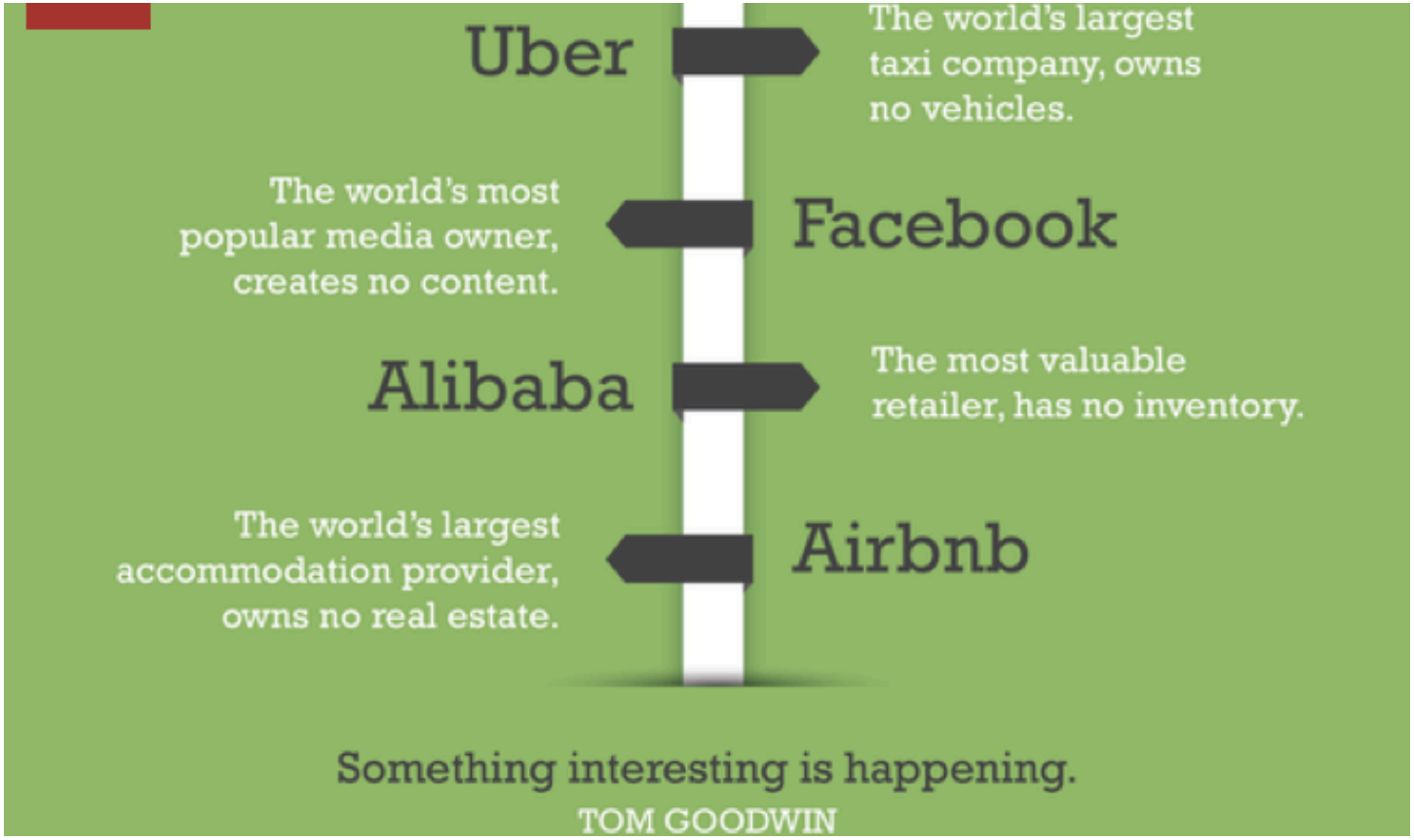






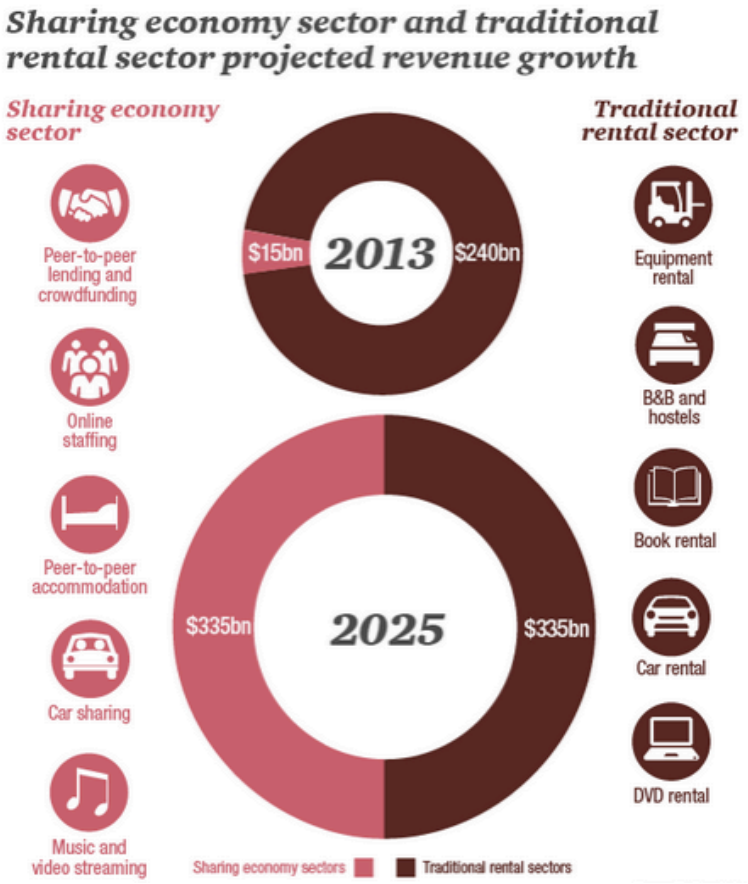


The Sharing Economy



Source: @WetPaintMENA

The Sharing Economy



source: PriceWaterhouseCoopers

Example: Ridesharing

- Over the past two years we've built the web-based ridesharing system *SmartShare*
- Study of human behaviour *in situ* to test models of human collaboration and algorithms for supporting it
- Part of a €6.8M project on *hybrid and diversity-aware collective adaptive systems*
- Preliminary user study in Israel, upcoming larger trial in Italy + lab experiments

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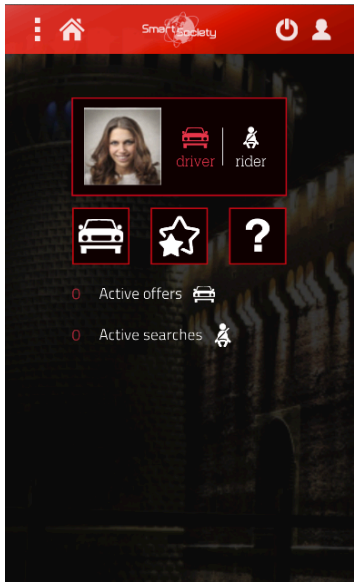
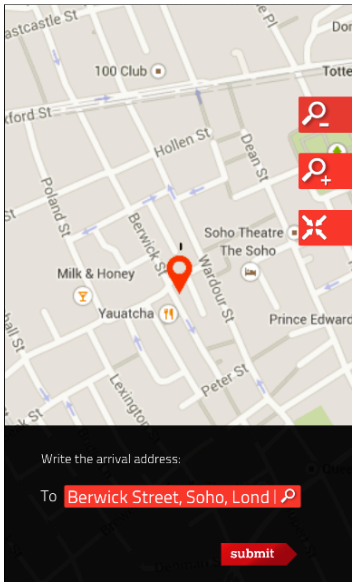
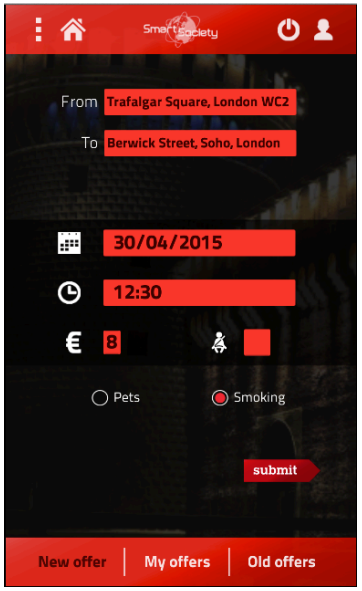
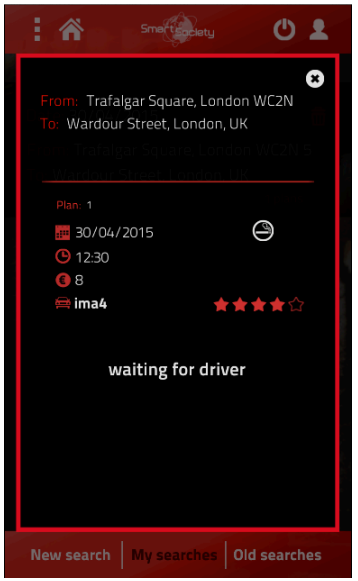
SmartShare

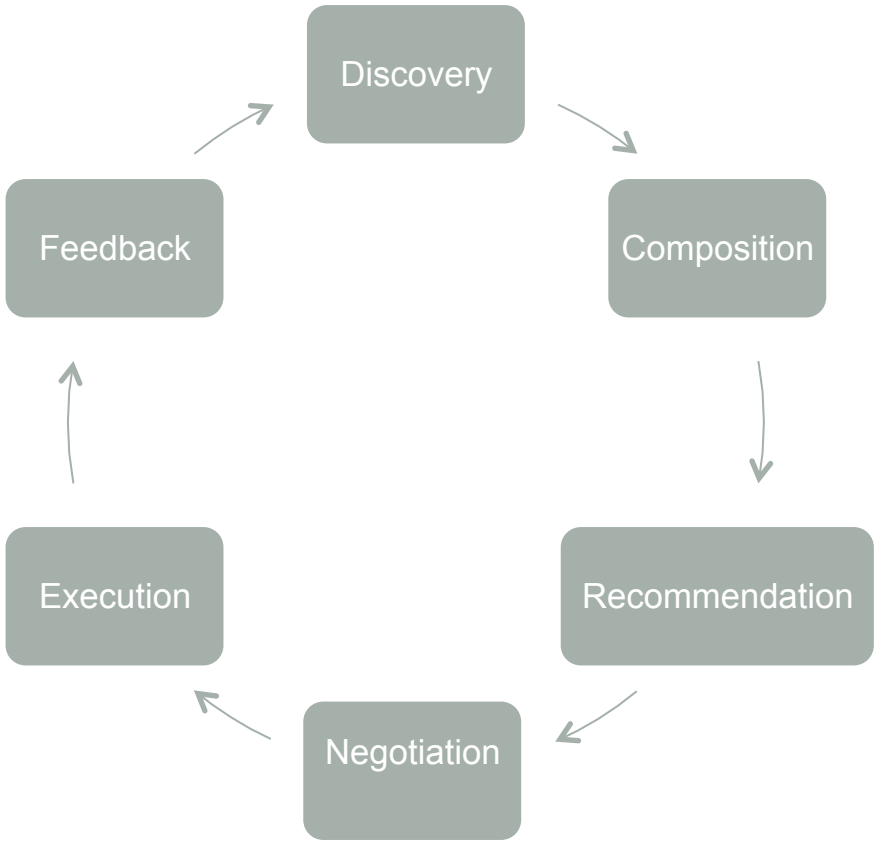

driver
rider
0 Active offers
0 Active searches


100 Club
Hollen St
Dean St
Poland St
Berwick St
Wardour St
Soho Theatre
The Soho
Milk & Honey
Yauatcha
Peter St
Write the arrival address:
To Berwick Street, Soho, Lond
submit


From Trafalgar Square, London WC2
To Berwick Street, Soho, London
30/04/2015
12:30
€ 8
Pets
Smoking
submit
New offer
My offers
Old offers


From: Trafalgar Square, London WC2N
To: Wardour Street, London, UK
Plan: 1
30/04/2015
12:30
8
ima4
waiting for driver
New search
My searches
Old searches

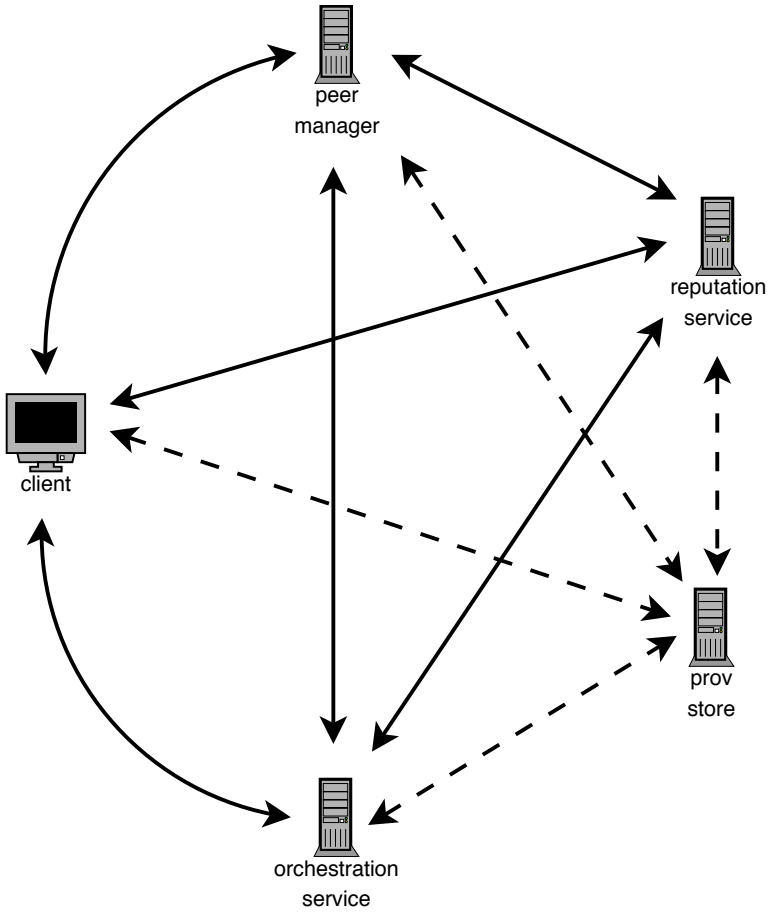
Sharing app orchestration cycle



Sharing app orchestration cycle

Implemented orchestration architecture

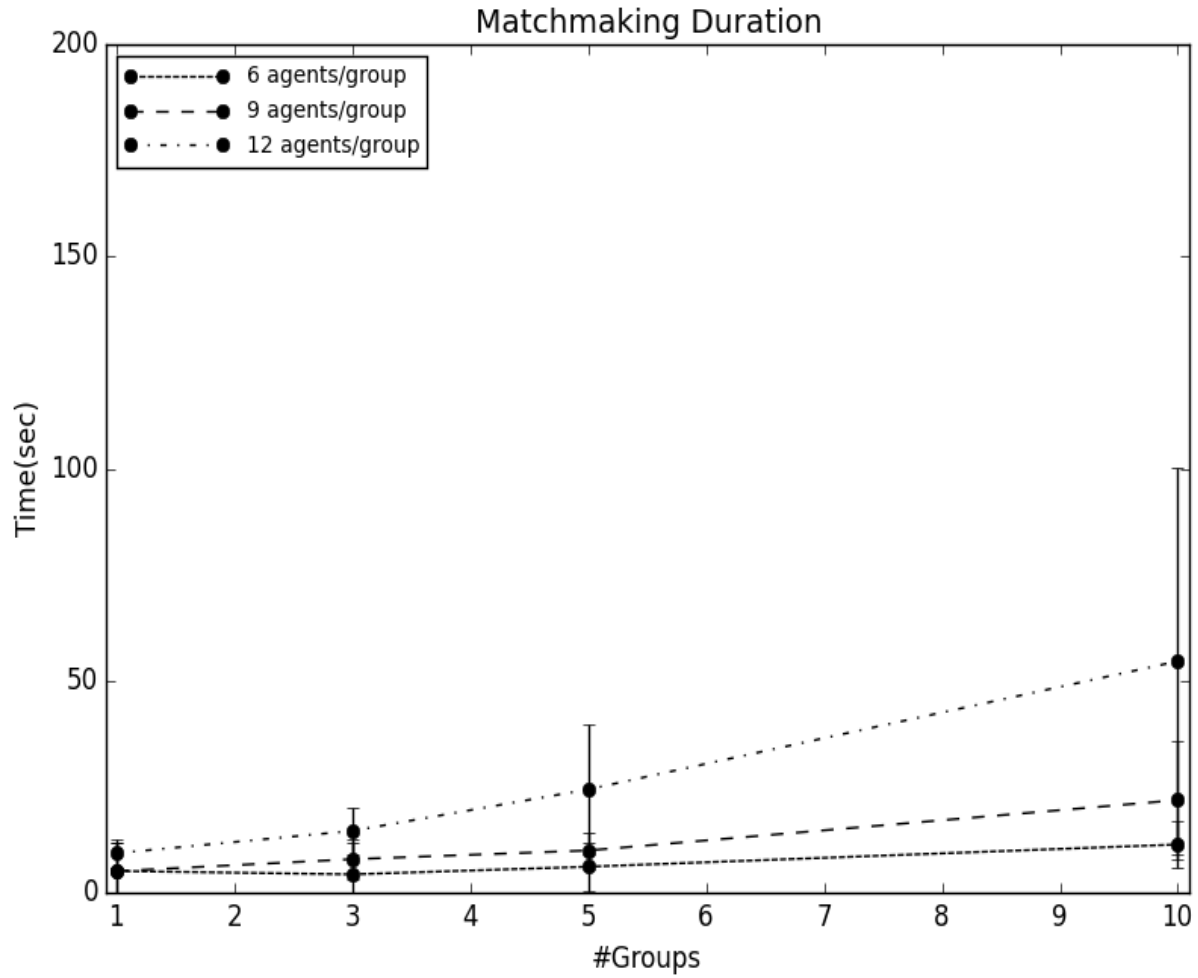
- Flexible management of complex interactions between services
- Fully data-driven design of all components
- Blueprint for social computation platforms



Compositionality

- The meaning of 1+1 depends only on “1” and “+”
- If “1”=user and “+”=collaboration, what is “1+1”?
- Can we predict/determine global outcome?
- **Compositionality = Collectives + Context**
- Two key questions
  - How to deal with large numbers of users and solutions
  - How to capture context accurately
- Long-term answer: allow users to influence algorithms
- Short-term answer: **coarseness** of user types and preferences

“Simple” matching

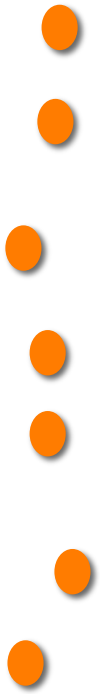


Complex planning

- Calculatin **strategically stable** routes using UK public transportation data and cars (>200,000 connections)

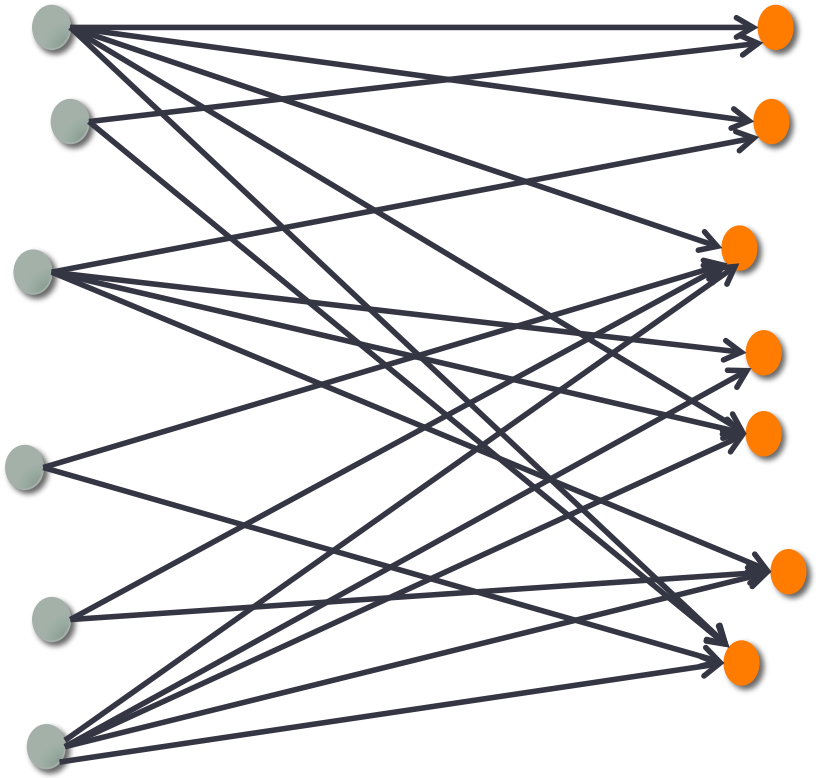
Composition

Users

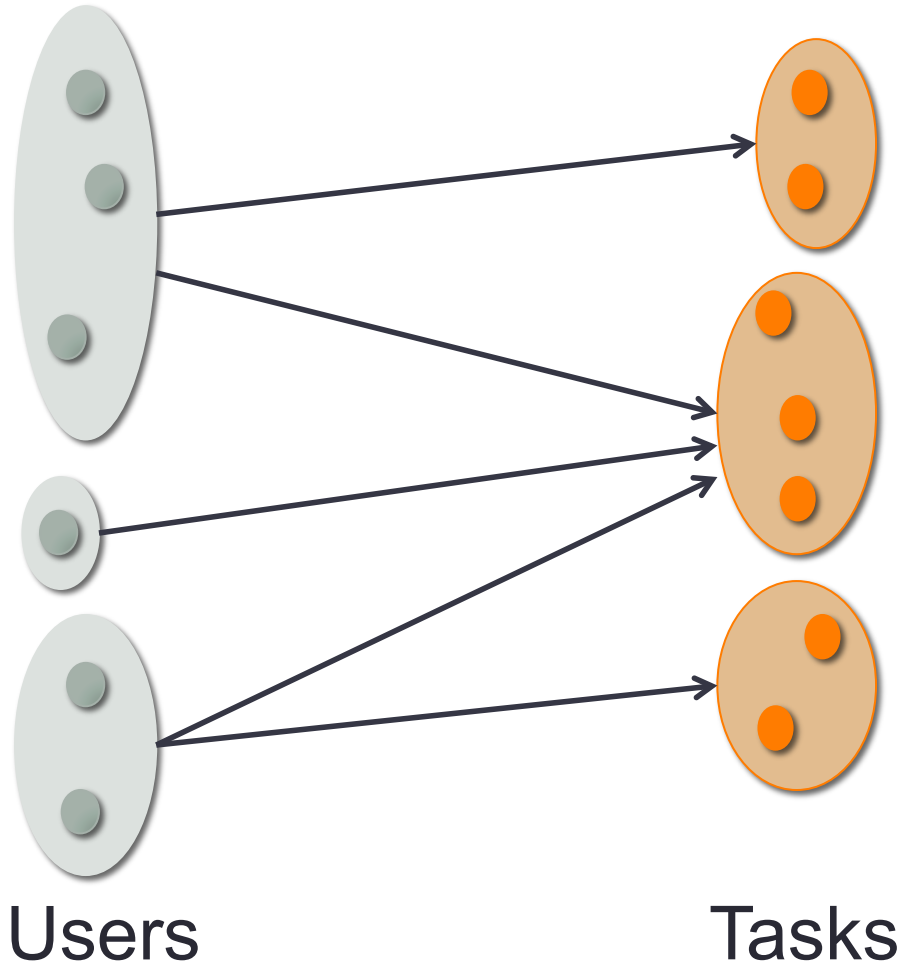


Tasks

Composition



Composition



Problems

- Different dimensions of collectives
  - As a type of similar people, or as a group of collaborators?
- Different properties of protocols for creating teams
  - Topological/hedonic preferences: different protocol requirements
- Different solution criteria depending on objectives
  - Optimality vs. availability vs. safety
- Eliciting user preferences while composing tasks

Designing incentives

- Global goals of interaction platforms can be supported by creating additional rewards
- Monetary and “virtual” benefits (badges, scoreboards etc) can be used – gamification
- Feedback mechanisms affect collective behaviour, provide additional incentives

The “social frame problem”

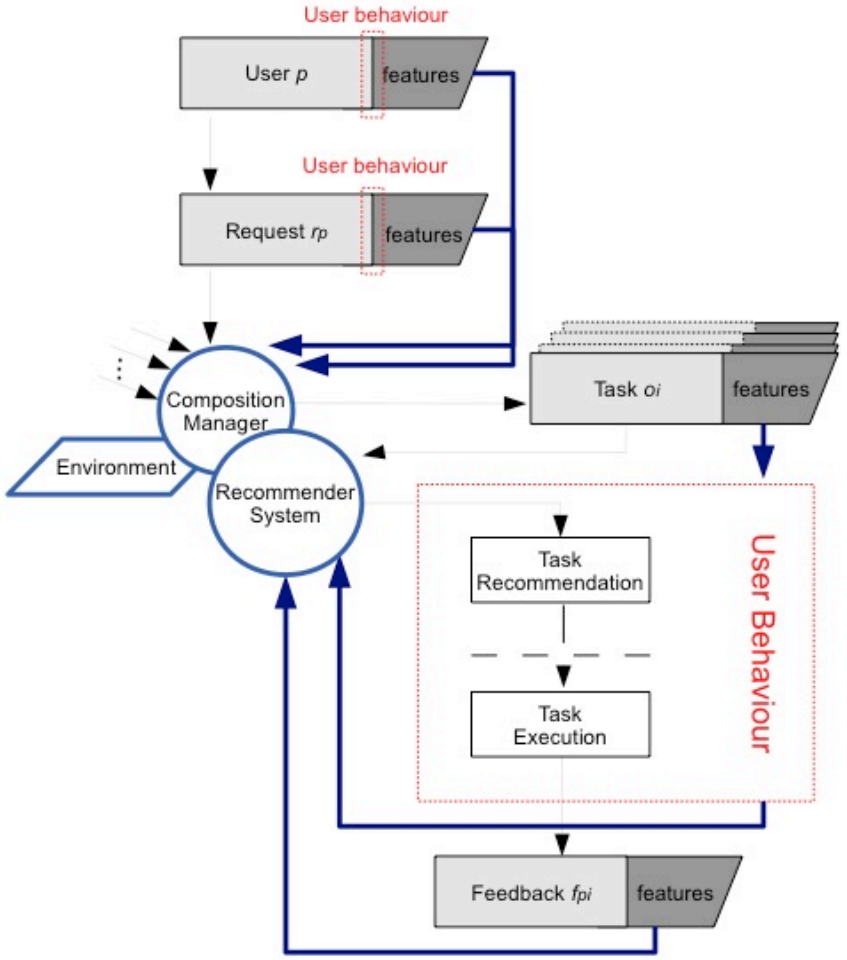
- Very large numbers of users, possibly small sets of user types/coarse preferences
- Parametrisation of search and solution mechanisms requires knowledge of parameters
- More customisability means less data – how can we balance adaptability with optimality?
- Recommendation and user-curated algorithm parameters might be the answer

Group task recommendation

- We don’t know whether a solution exists for a requested objective a priori (cannot just propose nearest “product”)
- Impossible to compute all possible solutions offline (and annotate them for retrieval), computation takes time
- We require agreement of all parties for a task to happen, i.e. solution must rank high on everyone’s preferences
- Data obtained from negotiation/execution/feedback refers to whole teams (correlated views), not just individuals

Toward adaptive orchestration

- Integrating data analysis/ prediction facilities in software
- Exploiting coarse preferences to recommend globally desirable solutions
- Exploration of different coalition formation and task allocation algorithms



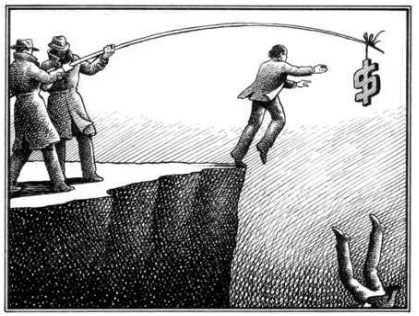
“The ethics slide”

Promise

Peril

Man-machine collaboration

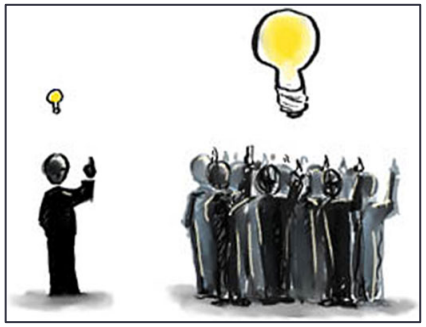
Manipulation



Personalisation

Surveillance

Collective intelligence



Humans as cheap labour

Conclusions

- Design of successful/useful sharing economy applications still a black art – ridesharing as an example
- Showed some early steps toward developing solid engineering principles for these types of systems
- Controversial: how much should we invest into
- Not discussed: Cultural and human factors – but extremely important!
- Long-term vision: Users co-design the systems and algorithms themselves, our systems provide support

Thank you!

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