Big Data Economics

towards

Data Market Places

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Overview:

- Part I: Right to be forgotten
- Part II: Asymmetry in Digital Revolution/$\varphi_2$: « the age of data »
- Part II: If unpaid work = slavery, then unpaid data = ???
Part I
Right to be forgotten?

*RTBF in EN, not in BE 😊
Right to be forgotten?

- This is 0 or 1
  - Opt-in (1) for \([t_0, t_1]\), then opt-out (0) at \(t_1\)?
- Erase everything, forget anything about me
  - Opt-out (0) until \(t_0\), then opt-in (1) for \([t_0, t_1]\)
The Pharaoh’s algorithm

- Target = « be forgotten by t1 »
- **Procedure begin**
  - Build Pyramid, complete before t1
  - Have your mummy in Pyramid before t1
  - Have architect killed in Pyramid, to be fully forgotten by t1
  - Close Pyramid by t1
- **End**
Right to be forgotten?

• The pharaoh’s algorithm is cruel, brutal and does not work
  – Have you visited the Louvre, the British Museum, the Egyptian museum of Turin, the Pergamon museum?
  – There will always be an archeologist out in the wild, able to find the pharaoh
Dissuasion by persuasion

• **Money can buy anything**
  - almost, « according to 90% of people asked » 😊

• **Price of data**
  - What it does: replace Boolean opt-in/out (1 or 0)
    by real variable $p$, adjustable, demand/supply, wider more flexible scope (money)
  - Data owner
    • Grant data access at $t_0$ for agreed price $p^*$
    • Revise data access price at $t_1$ for new price $p’ > p^*$
  - Data collector stops using data, because price $p’$ at $t_1$ is beyond their acceptance range
  - Assumptions
    • Contract for granting data access rights from owner to collector at price $p$, during agreed timeframe $[t_0,t_1]$
    • Optimal price $p^*$ accepted by both parties
    • Enforcement mechanism for data rights (grant/block) as for Content Rights (Content Protection, Conditional Access)
Part II
Asymmetry in Digital Revolution/φ₂: « the age of data »
\( \varphi_1: \text{« Moore’s Law »} \)

\( \varphi_2: \text{« the age of data »} \)

- **Moore’s Law**
  - transistors, devices, computational capabilities
  - leads to commoditisation in pure digital electronics
- **« The age of data »**
  - Real world, real people
  - Digital representation
  - Data goes from:
    - Owner to Collector
    - Collector to User

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Asymmetry?

• Enterprise case
  – B2B, it’s business, markets at play

• Data owned by people
  – About what they are and what they own
    see Arthur Schopenhauer « von dem was man ist, von dem was man hat, von dem was man vorstellt » (Aphorismen zur Lebensweisheit)

• Data suppliers
  – Billions of them: humans and their things

• Data collectors
  – 4 or 5 of them

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Asymmetry as a supply-chain management problem

• **Automotive**
  – from 200-300 suppliers earlier, to few tens

• **Consumer Mass Markets**
  – Few product models x 1000 000 or 1000 000 000
  – Scales: sell to millions, billions (mobile, e.g.)

• **Reversal**
  – Billions of data owners, producers, generators
  – 5 collectors
Asymmetry: rebalancing an economic relationship

• Coffee production
  – Very fragmented farming/production
  – Few large coffee brands aggregate production in customer products
  – Volatile commodity price: weather, market, etc

• Fair Trade scheme
  – Aggregate supply: less fragmented, stronger in negotiation
    – Provide stabilised economic framework
Part III

Unpaid data, why?
Two viewpoints, two equations...

An Internet company usually operates as a two-sided platform. Such a platform hosts users/consumers on one side of the platform, and a variety of B2B partners and platform ecosystem participants on the other side of the platform.

Notations:
- the revenue (or utility) of user $u$ is denoted by $r(u)$
- the value of the content license granted to $u$ is $c(u)$
- the value of the software license granted to $u$ is $s(u)$
- the loss caused by data exposure is valued $d(u)$ (not offset by any revenue from data access granted currently)
- the loss caused by time consumed by potentially unwanted advertisement is valued $a(u)$

Then, a simple consumer/user-side model is:

$$r(u) = c(u) + s(u) - [d(u) + a(u)]$$

Per user $u$, the revenue for the platform is:

$$R(u) = D(u) + A(u) - [C(u) + S(u)]$$

where
- $D(u)$ is the data revenue from $u$ minus its cost (NB the cost is currently zero! Unpaid data)
- $A(u)$ is the advertising revenue from $u$
- $C(u)$ is the content license purchase cost for user $u$
- $S(u)$ is the software license cost (either internal as a software development cost, or external as a software procurement cost)
The Loyalty scheme model

The net value $r(u)$ for a “valued customer” user $u$, of a loyalty scheme of brand $B$ (possibly the loyalty scheme can be multi-brand scheme named $B$ for the sake of simplicity), can be measured by

$$r(u) = r^*(r^+(u), D(u)) - d(u)$$

where

- $r^+(u)$ is the basket of purchases up to now
- $D(u)$ is the data set to which access has been granted to $B$ by $u$
- $r^*(.)$ is the reward from $B$ to $u$, increasing with the basket of purchase and the data set granted access to.
- $d(u)$ is the value, in the perception of $u$, of the access to data set $D(u)$

The value to brand $B$ brought by the loyalty scheme for customer $u$ is

$$R(u) = p(r^{++}(u)) + D(u) - r^*(r^+(u), D(u))$$

where

- $r^{++}(u)$ is the next purchase basket or estimate of the next purchase basket of $u$, $p$ is its value
- $D(u)$ is the revenue for $B$ from data set $D(u)$
- $r^*(r^+(u), D(u))$ is the cost of the loyalty scheme from $u$, for $B$, in other terms the rewards for $u$. 

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Conclusions

• Prices help
  – Lagrangian optimisation
    • Constraint C multiplied by factor $\lambda$
    • If $\lambda$ is a price, set to zero, the constraint C is not taken into account
  – No price, no Walrasian adjustment towards a Pareto optimum

• Symmetry and fairness
  – Stimulate digital innovation, and maximise associated benefit for society and markets, incentive for innovators

• Business Model engineering for data
  – Re-purpose proven economic components:
    • Data Access Right Management: -build on Content Market Places
    • Data Access Contracts: -build on Software Licensing
    • Data Access Pricing: -build on Loyalty schemes
Priced data, and non-priced data, Market Places for Data

Scope: real world, real time, automation

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