Experimentation and the Diffusion of Technology in China - using Big Data to explore Consumer Channel Choice

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Studying the Diffusion of Technology


1936 US drought
Different adoption rates of Electromechanical vs. Biological innovation in Farming

(Photo credit: Bob Nichols, USDA. Public domain.)
Diffusion of Innovation

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%
Diffusion: an insight into the Hype Cycle?

Gartner Hype Cycle for Emerging Technologies, 2017

- **Brain-Computer Interface**
- **Artificial General Intelligence**
- **Smart Dust**
- **Autonomous vehicles**
- **Blockchain**
- **Commercial UAVs (drones)**

Plateau will be reached in:
- ○ less than 2 years
- ▲ 2 to 5 years
- ▲ 5 to 10 years
- ▲ more than 10 years

As of July 2017
Diffusion: an insight into the Hype Cycle?

The Demise of Big Data: "we did it to move the big data discussion past hype and into practice"

Gartner Hype Cycle for Emerging Technologies, 2017

- **Autonomous vehicles**
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- **Commercial UAVs (drones)**
- **Smart Dust**
- **Artificial General Intelligence**
- **Brain-Computer Interface**

**Timeline:**
- **Innovation Trigger**
- **Peak of Inflated Expectations**
- **Trough of Disillusionment**
- **Slope of Enlightenment**
- **Plateau of Productivity**

**Plateau will be reached in:**
- less than 2 years
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Key Question: If ‘diffusion’ is the link between an ‘Innovation Trigger’ and ‘Productivity’, do you accelerate the diffusion process by targeting your new technology at ‘Innovators’, ‘Early Adopters’, or something else?
Big Data and the answer to the (often?) missing premise

the study of adoption behaviour requires significant numbers of both users and non-users to be sampled in a common frame

- similarity between users does not infer difference from non-users
- dissimilarity between non-users does not distinguish between the unwilling and the excluded!
Scaling up for just one synchronous market!

- 1/4 of the world’s population
- Most of the world’s growth
- Accessed through Trans-Eurasia Information Network (TEIN)

- Sample: millions of consumers = Big Data!
Characterising propensity to experiment with new technology

OLD TECH. (Shop)

NEW TECH. (Internet)

Innovators 2.5%
Early Adopters 13.5%
Relating channel choice & payment

Channel - Payment Method mapping

PRODUCTS
(The What)

Mixed Transactions

PEOPLE
(The Who)

MAKING CHOICES
(The How)
Relating channel choice & payment

Channel - Payment Method mapping

PRODUCTS (The What)

MAKING CHOICES (The How)

PEOPLE (The Who)

Order Volume/Value

Time

Channel

Payment Method

CH6
CH5
CH4
CH3
CH2
CH1

eCommerce
Telephone
Fax
eMail
Shop

Mixed Transactions
Internet channel trajectories

Sales Channel used by PC Internet Users

Messy!
Channel choice

**Experimenter** – one who tries a wide range of active option, including those less popular in the population overall

**Resistant** – one who tries a wide range of active options in terms of popularity, but confines this to fewer options

**Reluctant** – one who tries a narrow range of options and sticks only to the most popular

**Inert** – one who never experiments and stays only with the ‘default’ option – in this case uses only the shop.
Empiricist score
– identifying choice: activity
Channel choice

Behavioural Traces

More Experimental

Case 1
ORDER SEQUENCE (Variable Time Increment)

Case 2
ORDER SEQUENCE (Variable Time Increment)

Case 3
ORDER SEQUENCE (Variable Time Increment)

Case 4
ORDER SEQUENCE (Variable Time Increment)

Less Experimental

Equal Weights

Experimenter
(Conversion vs. Rejection)

Time Weighted

Case 1
ORDER SEQUENCE (Variable Time Increment)

Case 1'
ORDER SEQUENCE (Variable Time Increment)

SD < SD’

SD = SD’
Empiricist score – identifying choice: *relative trajectory*
Empiricist score – identifying choice: *absolute timing*

- Separating over 1 million customers over two years.
c5.0 Data Mining:
Can types be predicted?

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<th>Description</th>
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<td>(a): class Default (only ever use 1 Channel – the Shop)</td>
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<td>(b): class Myopic (only combines Shop with next most common Channel)</td>
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<td>(c): class NarrowFocus (use few Channels, no close substitutes)</td>
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<td>(d): class BroadFocus (use more alternatives, some close substitutes)</td>
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<td>(e): class Experimenter (use multiple close substitutes)</td>
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<td>(f): class Hyperopic (exclusively uses uncommon channels)</td>
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Evaluation on training data:

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(a): Default class
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(d): BroadFocus
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(f): Hyperopic
Prediction – yes, but .. does prediction give insights?

Internet Use > 0:
  ...Shop Use > 21:
    ...Credit Card Payment > 55: NarrowFocus
    : Credit Card payment <= 55:
      : ...Internet Use <= 2: BroadFocus
      : Internet Use > 2: Experimenter
  Shop Use <= 21:
    ...Bank Transfer Payment > 9: Experimenter
    Bank Transfer Payment <= 9:
      ...Credit Card Payment > 9: Experimenter
      Credit Card Payment <= 9:
        ...Age <= 64: Hyperopic
        Age > 64: Experimenter

- Internet use has significant information value, but does not define type
- Older users combine a variety of close alternatives, whilst younger users are more likely to switch directly
What happens when we suppress Channel as a potential proxy?

- ePayment now the most significant split, suggesting use of channel driven by volume/value of transactions?
- As order volumes increase, users converge on fewer channels, becoming more ‘focussed’?
We argue that ‘Experiri’ – to try out, is a necessary precursor to ‘early adoption’ and that this category captures both early adoption and early rejection.

Companies seeking to innovate with technology need this ‘techne’ insight for fast success, and the economic benefits of fast failure! Targeting of consumers who are ‘empiricists’ and fast feedback must be supported by business intelligence systems if the company is to innovate in ways that sustain competitiveness.

‘Big Data’ (1m customers, 1000 products, 5 channels, 2 years) gives the required scale to resolve both early adoption and early rejection.

Initial results suggest that the ‘what’ of target behaviours are predictable, with the potential to offer insights into the ‘why’ that is needed for further product and service innovation.
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