Telecommunications demand – a review of forecasting issues

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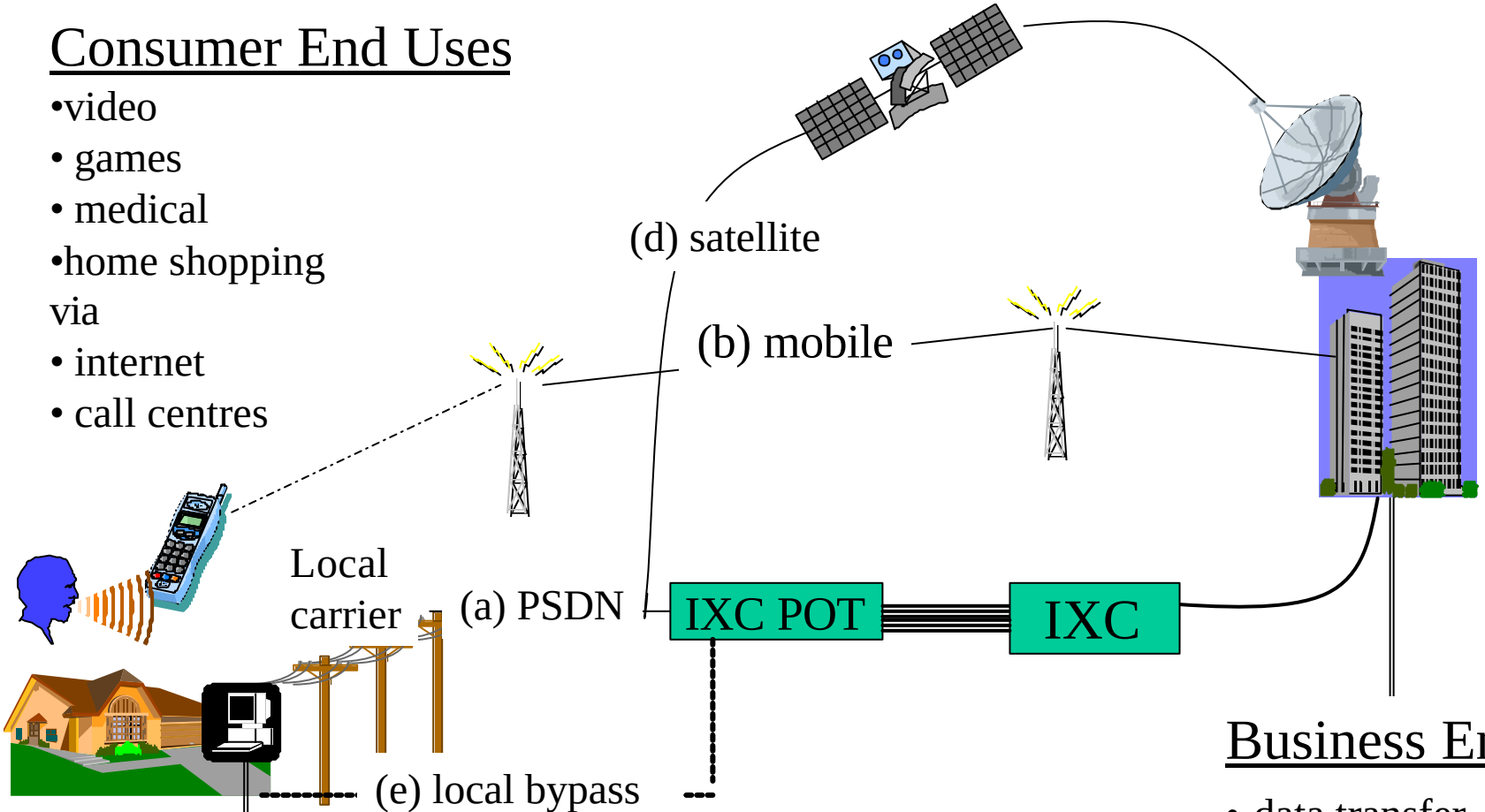
This paper is based on on work published in the *IJF: 2002(4)* as part of a special issue on Telecoms Demand Forecasting.

The text downloadable from Science Direct

Consumer End Uses

•video
• games
• medical
•home shopping
via
• internet
• call centres

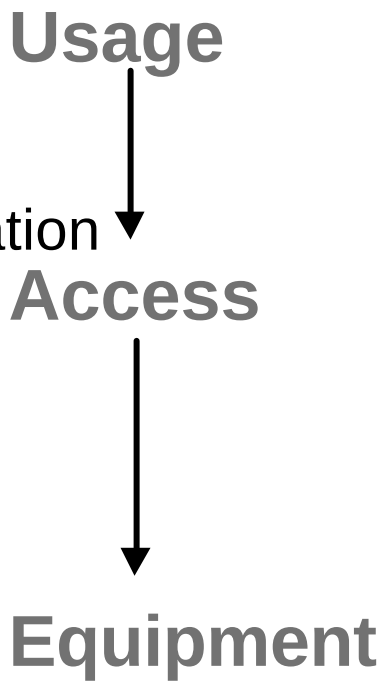


Business End Uses

• data transfer
• video conferencing
• group work
• CAD/CAM

•A Hierarchy of Forecasts

- Overall demand for an application
- Competition within technologies to service application
- Competition between suppliers



- **Once investment in place**
  - operating costs are minimal

Forecasting Implications

- e.g. for entrants, price collusion, price leadership

Types of Telecommunications Forecasting Problems

- **Stable Markets - aggregate**
  - Public Switched
- **Stable Markets - disaggregate**
  - Calling patterns
- **Growth Markets**
  - **Special Services**
  - **New services**
    - ADSL
- **Operations**

- Corporate/ regulator data available
- Surveys, customer behaviour
- Intentions Surveys
- Feature evaluations
- Trial markets
- Analogies
  - other products
  - other countries
- Delphi/ Expert judgement
- Statistical time series methods

Different problems - different organisational responsibilities

Stable Markets

- Point-to-point PSTN
  - Local, long-distance, international
- Drivers
  - Price, income, advertising, ‘value-for-money’
- Problem-specific drivers
  - Call-back on international
- Price elasticity declining
  - Depends on price, culture

US international message telephone service (IMTS): (Econometric comparisons, Madden et al, IJF)

Econometric models with
Focus on price elasticity estimation

Conclusions - Stable Markets

- **Increasing econometric sophistication**
  - model specification (externalities: market size)
  - diagnostics
  - multicollinearity - the interrelationship between the explanatory variables,
    e.g ownership of durables and income

- **But no stability or forecasting tests**

- **Time varying coefficients?**

Missing out or including inappropriate variables

- *mis-understanding the market*
- *poor forecasts,*
- *bad policy*

Does the model work better than alternatives?

Is the market changing, are new services getting more acceptable, is quality becoming more important?

Stable Markets – Disaggregate

Access & Usage

- Based on Cross-sectional household data
- Conditional models of usage, given choice of technology or carrier
- Focus on price elasticity
  - By household demographics to support universal service analysis
  - Linked to marketing planning

Evaluation:

Despite their use for forecasting

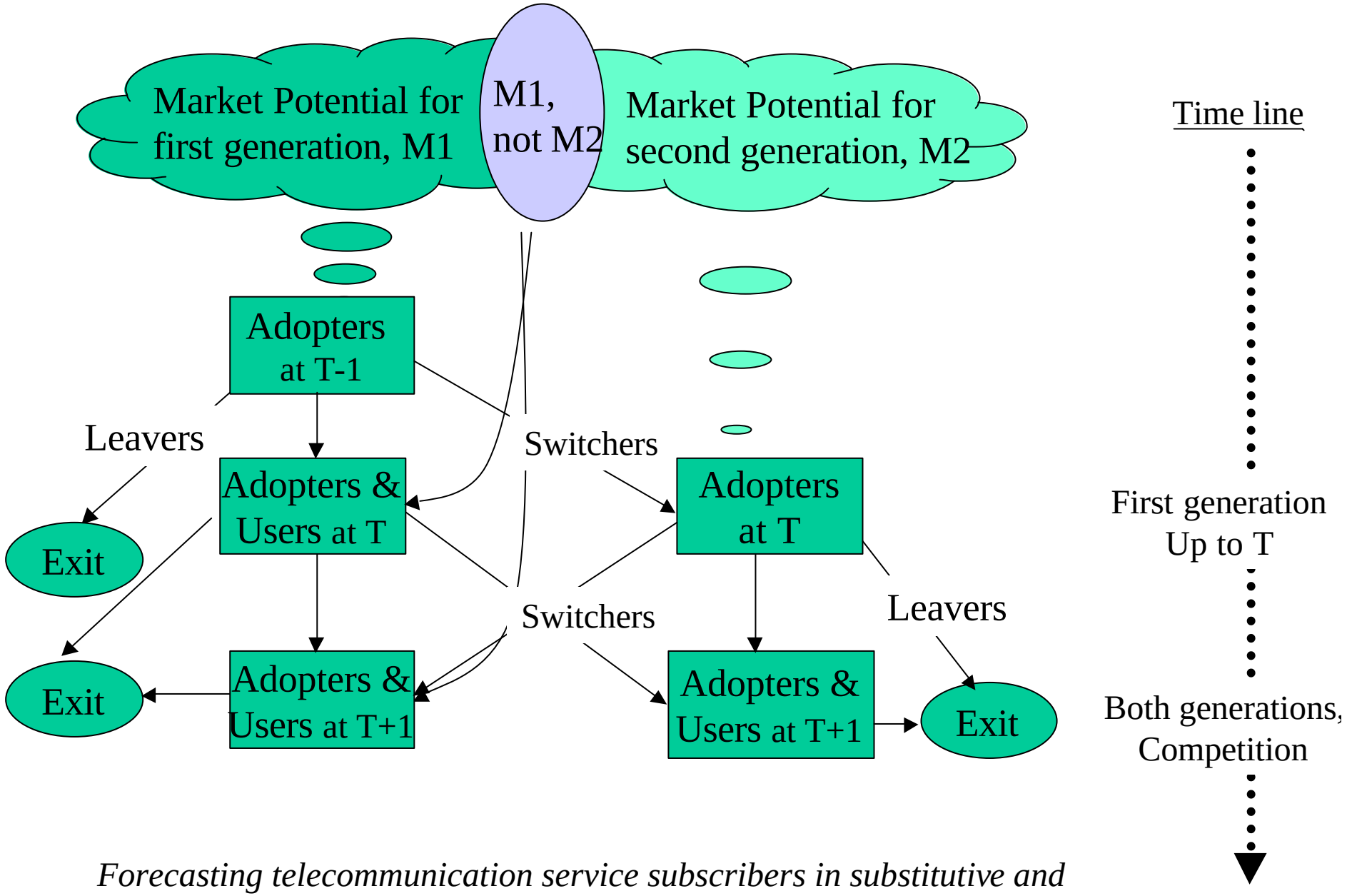
- Dynamics of change not taken into account
- No forecasting evaluation

New Products & Services

- Market Potential
  - mobile
  - ‘really new products’, e.g. 3G

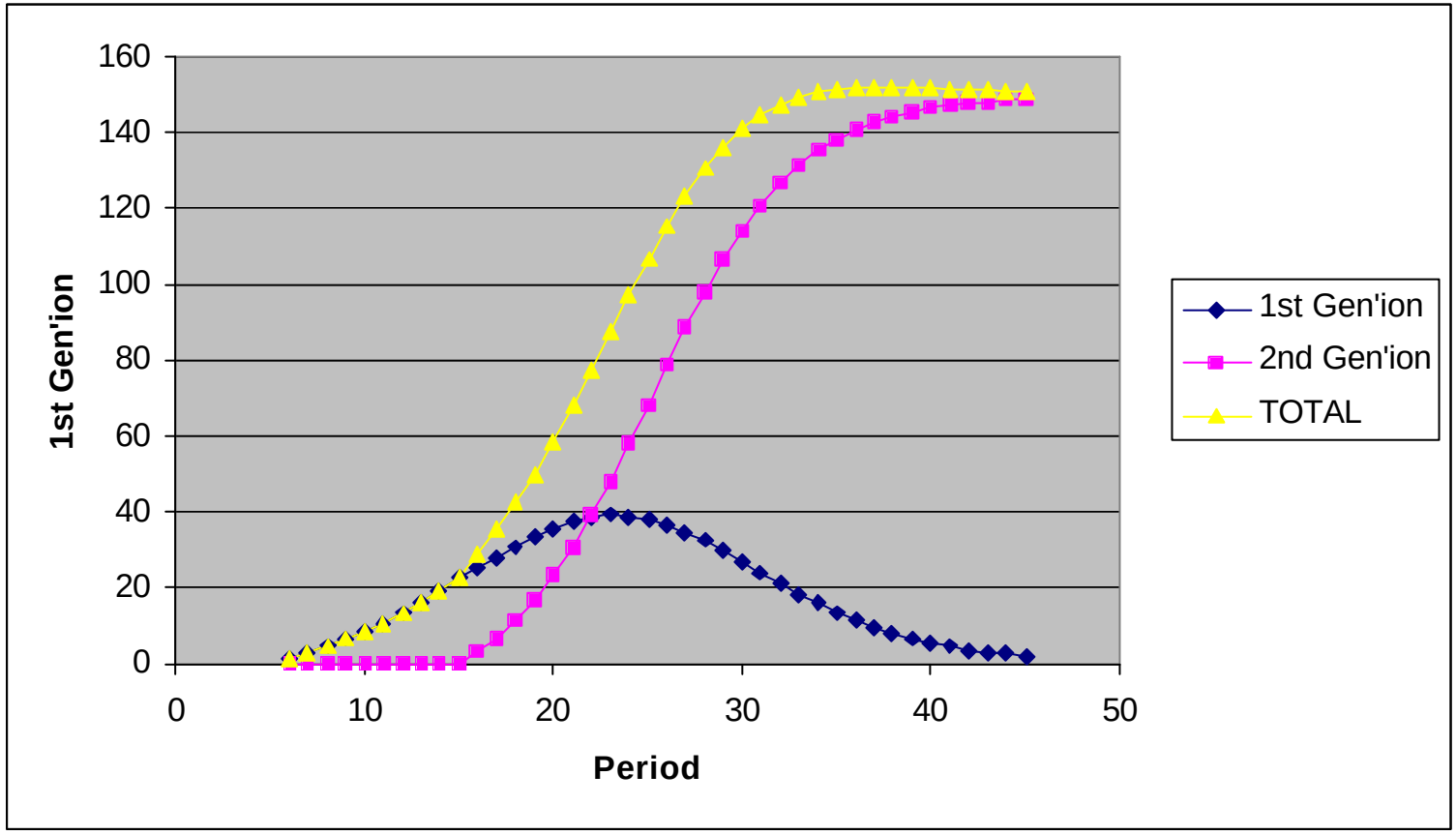
- Diffusion Path
  - E.g mobile
    - But now market dominated by ‘switchers’?

- **Intentions Surveys**
- **Feature evaluations**
- **Choice models**
- **Trial markets**
- **Analogies**
  - **other products**
  - **other countries**



Forecasting telecommunication service subscribers in substitutive and competitive environments, Jun et al, IJF, 2002

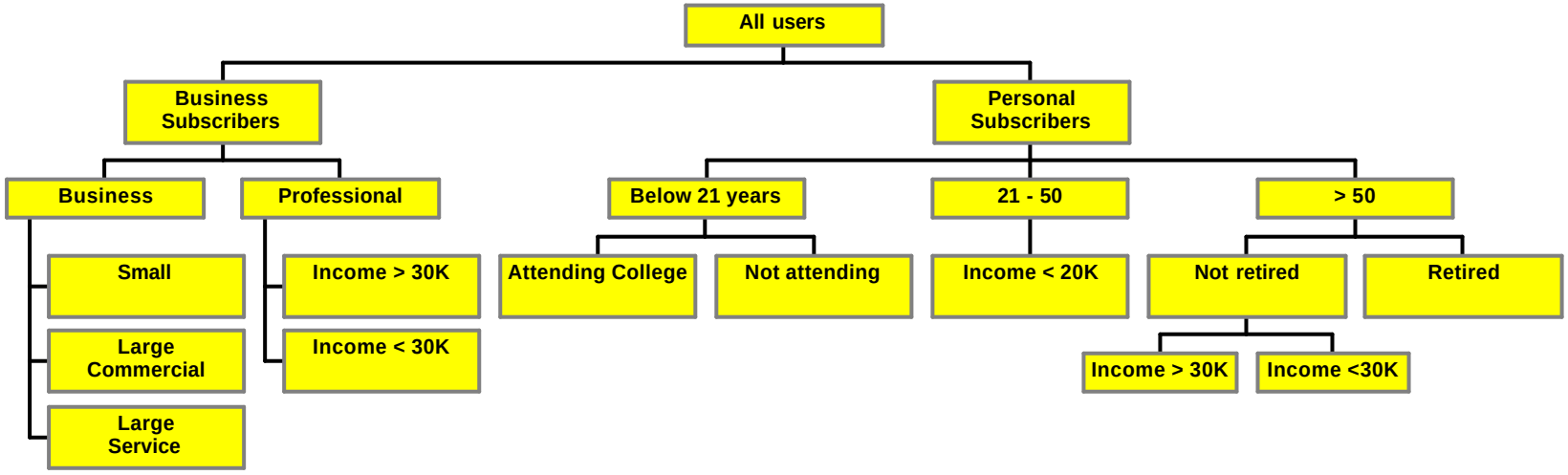
Competition between Technologies



Market Potential -Decomposition Methods I

(applies to new and established markets

Segmentation Approaches to Forecasting)



- Forecast consumption in each segment
- Project numbers in each segment

} and multiply

Decomposition Methods II

Step:

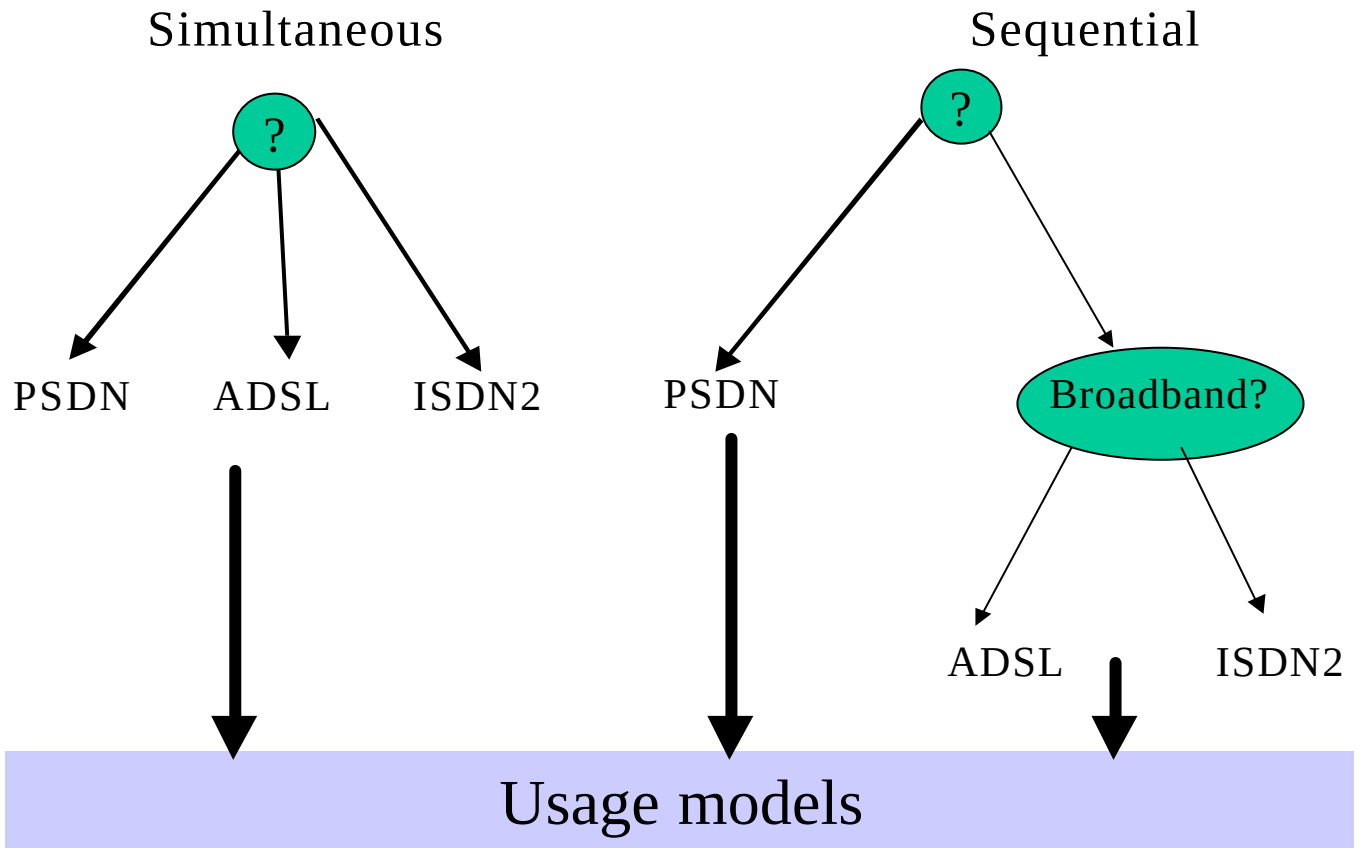
1. Identify the most important services (in terms of load in bits per second on the network).
2. Segment the population, e.g business and consumer, high and low intensity users.
3. Using ideas of a time budget (the number of hours a day available for telecoms related use) estimate the services each segment might use, by service, and the level of usage.
4. Model the changes in the segments over time.
5. Obtain total traffic by aggregating the individual forecasts of the usage profiles.

Market Potential - Decomposition Methods III

Alternative Models of choice

& Usage - for households with Internet Access

(see Rappaport et al, 2001)



Choice Models - segmenting consumers and forecasting each segment

Used in <u>stable</u> & <u>growth</u> markets

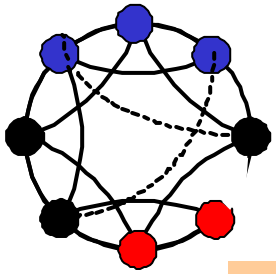
- **market research based**
  - observed data
  - hypothetical questions for new products/ services

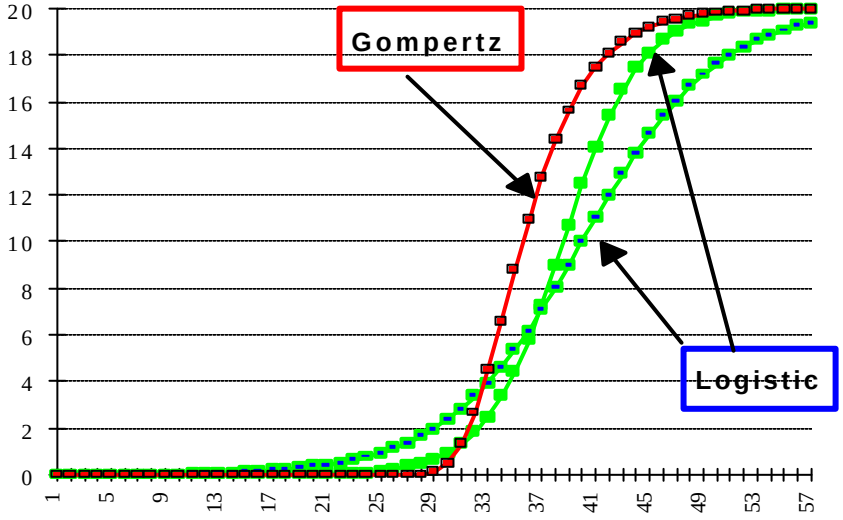
Problems

- sample size in small populations
- dynamics
  - how do the parameters change over the planning horizon
- price dependency
  - measurement (quality)
  - projected behaviour

The Bass Model: basic segmentation

- Two types of people:
  - Innovators
    - They adopt because of their attitude to technology
  - Imitators
    - They adopt when exposed to consumers who have adopted already





Red: adopters
Black: potential adopters
Blue: lacking information

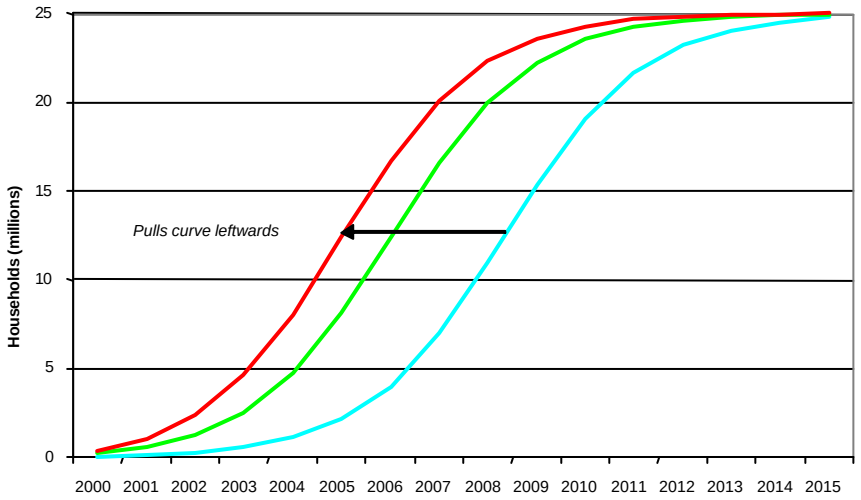
Estimating the Diffusion Path:

- limited if any sales data
- S-Shaped curve used to represent adoptions
- different curves and parameters
  - ➢ different market potential and uptake trajectory
  - ➢ dependent on key parameters

Issues:

- *data limitations*
- *market potential affected by product/ social factors*

The Effect of Increasing Innovation in the Social System



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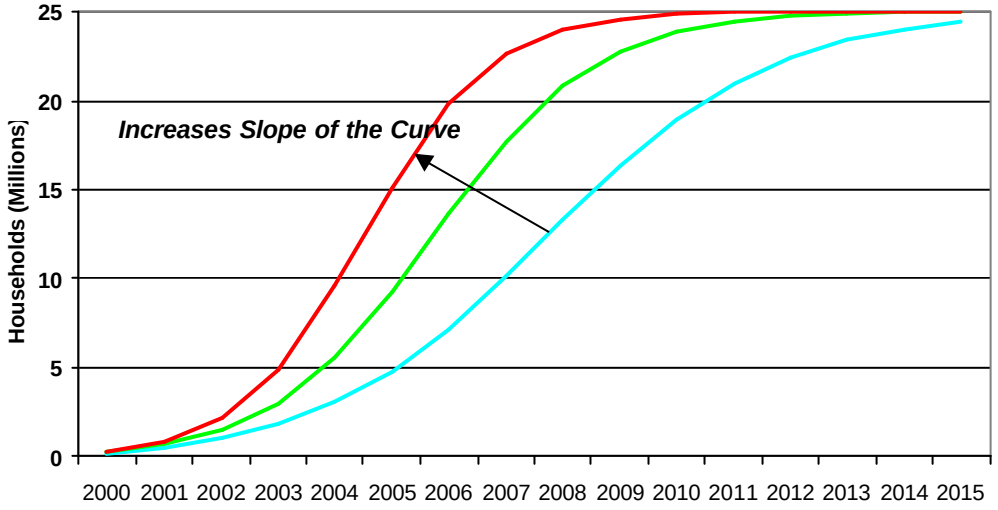


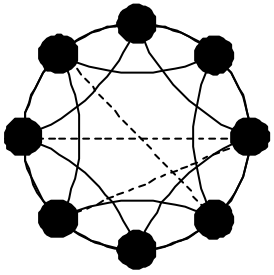
Modelling multinational telecommunications demand with limited data, Islam et al, IJF, 2002

The impact of networked groups

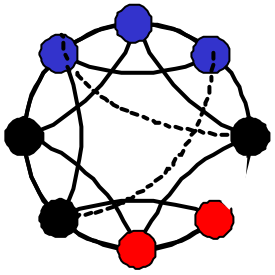
(Bass defines a simple network)

Models of Interacting Individuals

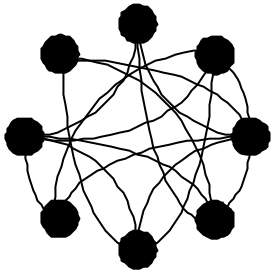
- Different networks of consumers
  - ➢ **Different adoption patterns**



Connected to your two nearest neighbours



Connected to near neighbours but with other links



Connected at Random

•Each group of individuals has its own rules of behaviour and interaction

• affected by its environment

How can these ‘Agent based models’ be used (Collings, BTExact)

- Aim to understand behaviour of interacting markets
  - Diverse individual behaviour
  - Asymmetric information and motivation

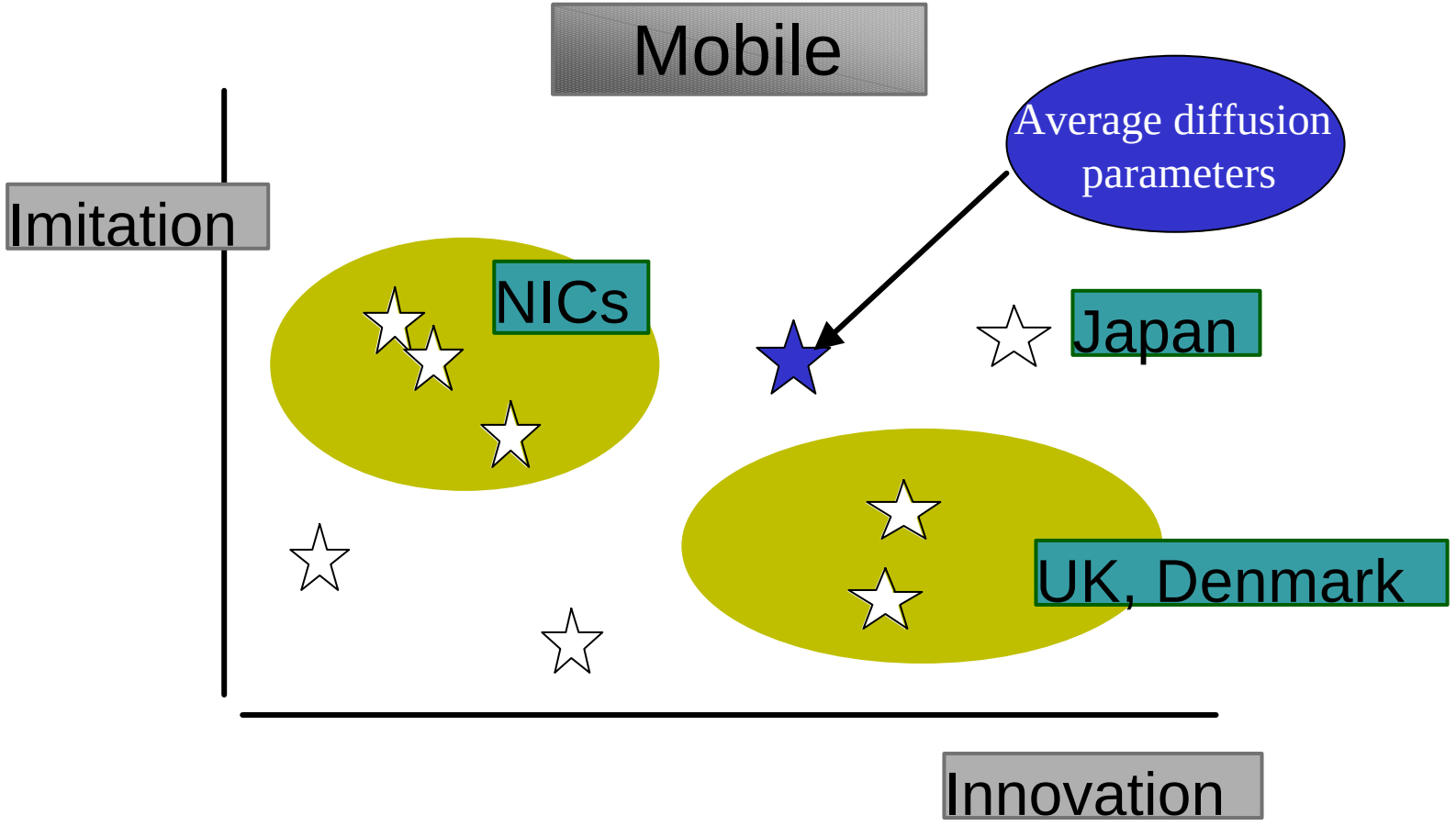
- Examples
  - Financial markets
  - Customer relationship management

EXTENSIONS and ISSUES

- Can include marketing and economic variables
- Estimation (analogy or numerical methods)
  - Meta Models
    - link the diffusion parameters to market characteristics
    - to other products, other markets
  - Genetic algorithms
- Incorporation of effects from other products/ markets
- Supply restrictions (in regulated markets)
- Disaggregate models (e.g. to industry specific uptake of fax)

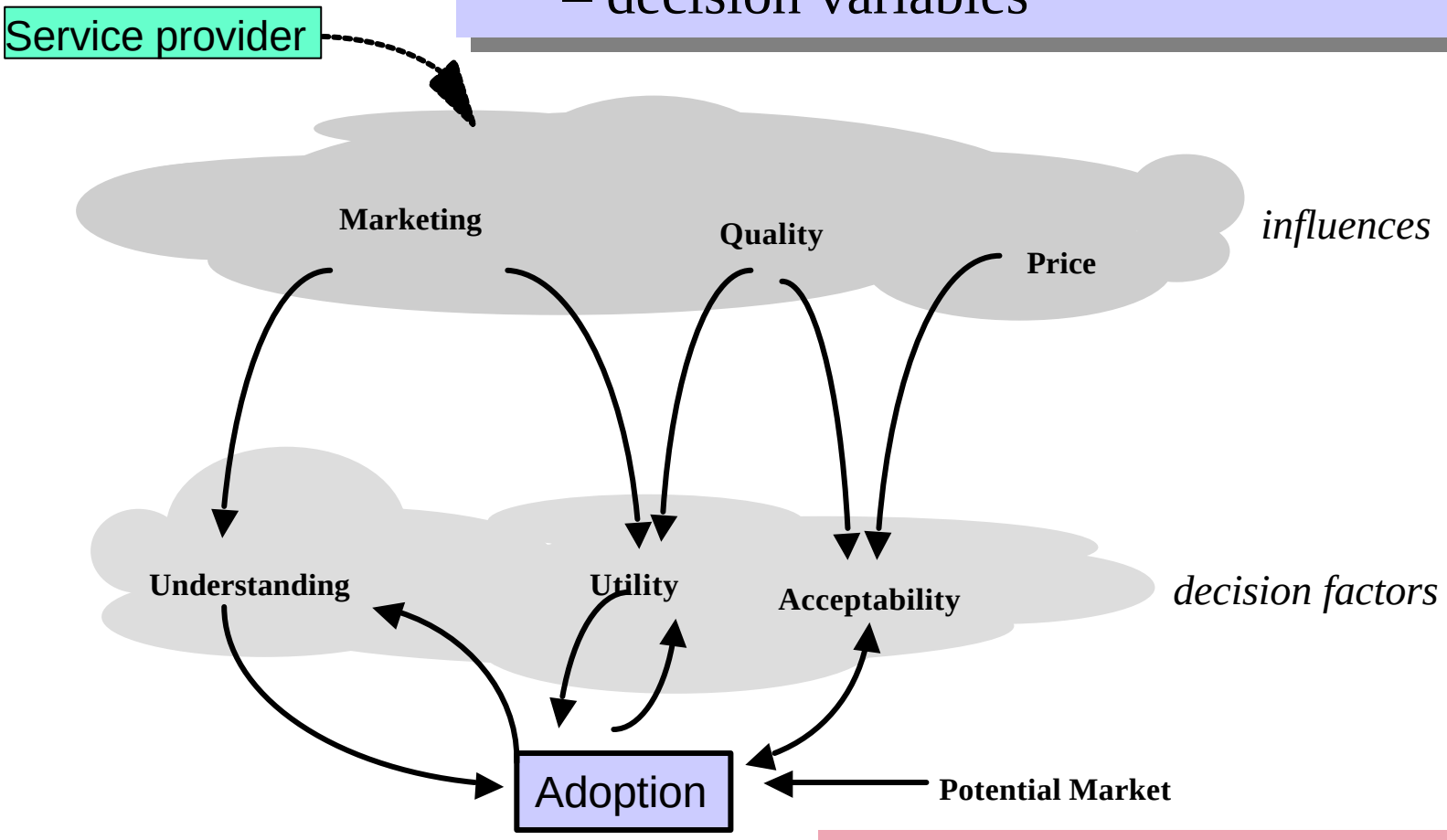
Bass Model - Diffusion Parameters and Meta Model

Describing the speed and shape of the adoption path



Simulation Modelling

- system dynamics replicate diffusion curves
- offer more flexibility for incorporating
  - information and processes
  - decision variables



Key benefit: transparency of model

Evaluation - Models of Market Potential

- Choice Models
  - Based on intentions data

- Models of Market Penetration
  - define potential = CM(t) where M(t) is determined by the economic/ social system of the market
  - Based on analogous products and countries

Problems

- ‘current intentions
- changing valuations

- unvalidated
- c depends on time

Evaluation - Models of the Diffusion Path

- Aggregate Bass-type diffusion

- Simulation

- Limited forecast validation
  - short term (if any)
  - use too much data
  - poor benchmarks
- No forecast validation
- Limited parameter validation

Final comments

- Widespread interest in telecoms forecasting
- Survey evidence suggests organisations which adopt a more ambitious and rigorous approach do better
- Primary methods 'naïve qualitative'
  - despite major investments (and disasters) riding on the results of a forecas
  - Structured use of judgement (E.g. Delphi: Knut Blind)
- Too little academic research
  - too hard?
  - Too messy *(Forecasting category sales and market share for wireless telephone subscribers: a combined approach, Kumar et al, IJF, 2004)*

IJF Seminar objectives:

- *identify where progress has been made*
- *'gap' analysis*