Measuring Customer and Service Profitability – Introduction

Coleago Consulting Ltd
Martin Duckworth, Director
29 November 2004

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Ground Rules

- Ask questions at any time
- Steer discussion in the direction which interests you
- Turn mobiles off (or meeting mode)

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This introduction

- Agenda for today
- Why estimate profitability?
- Commercial break
  - Introduction to Coleago

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Agenda for Today

- Introduction
- Session 1 : What to measure
- Session 2 : Modelling costs
- Session 3 : Modelling revenues
- Session 4 : Putting it into practice

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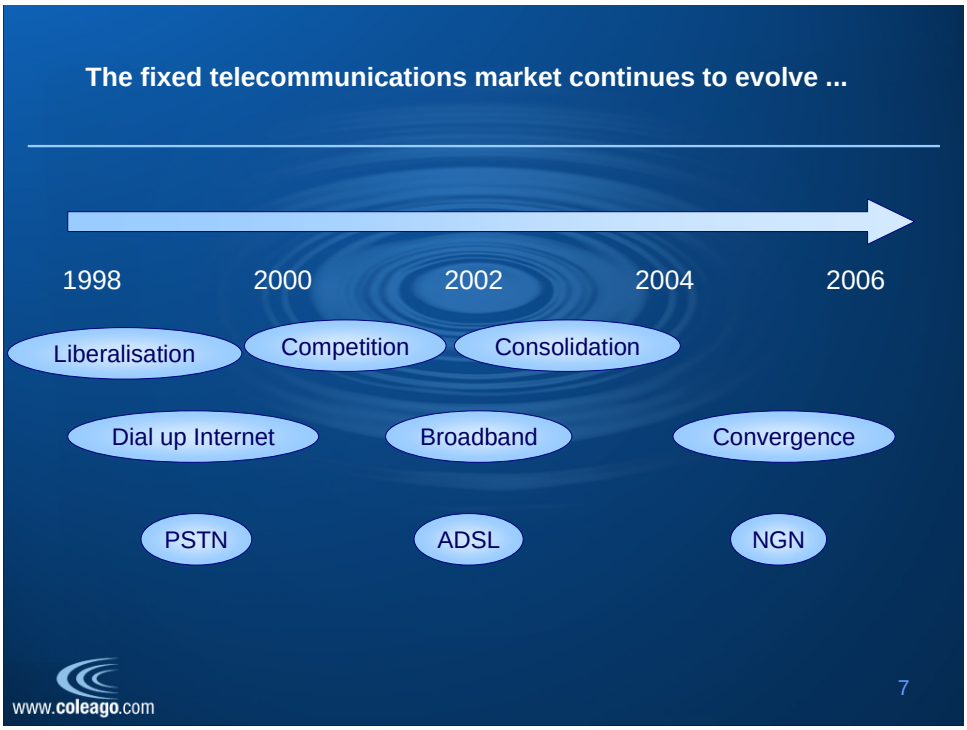
Objectives for the day

- Provide an overview of the basic toolkit
- Explain some of the advantages and pitfalls of various approaches

Why estimate profitability?


The fixed telecommunications market continues to evolve ...
1998
2000
2002
2004
2006
Liberalisation
Competition
Consolidation
Dial up Internet
Broadband
Convergence
PSTN
ADSL
NGN
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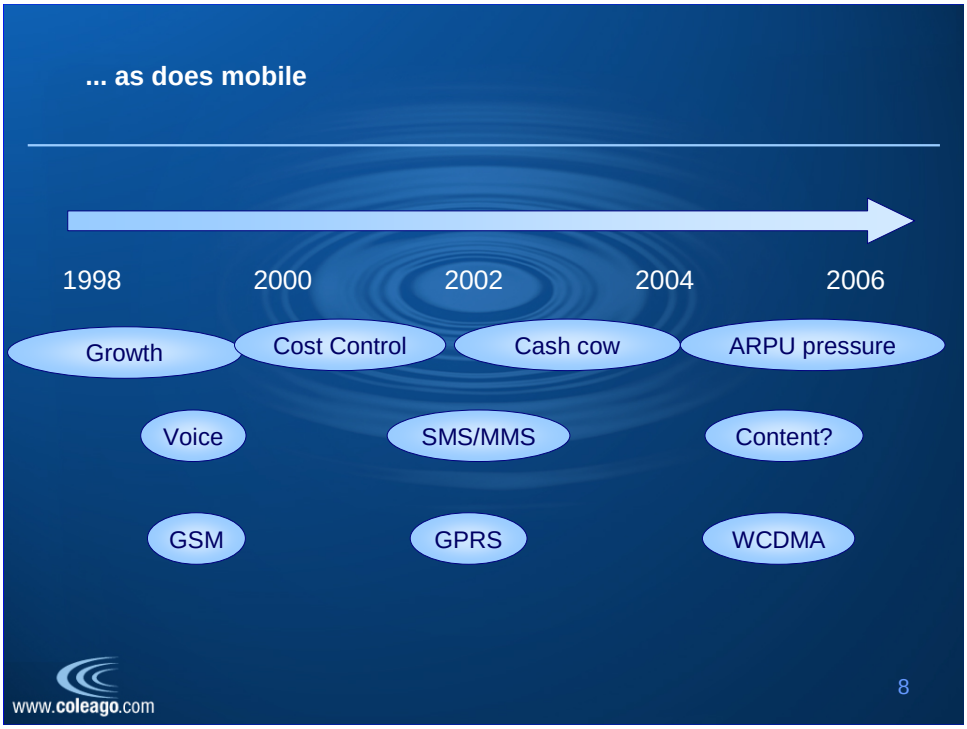
... as does mobile
1998
2000
2002
2004
2006
Growth
Cost Control
Cash cow
ARPU pressure
Voice
SMS/MMS
Content?
GSM
GPRS
WCDMA
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In the early stage of a business profitability is important

- Product launch
  - Is the product viable?
  - Setting prices at a profitable level
- Customer acquisition
  - How much can I spend to acquire customers?
  - Which customers should I target?

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... becomes more important as the business matures...

- Pricing
  - Setting prices to maximise profits
- Cost control
  - Are there customer segments or products that are fundamentally unprofitable?
  - Are there some costs which outweigh their benefits?

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... and when profitability is threatened

- Competitive threat
  - Which customers should I make efforts to retain?
  - Which prices can I reduce?
- Regulation
  - Demonstrating that prices are cost oriented

About Coleago

Coleago Consulting

- Coleago is a small, niche firm providing highly specialised consulting services to the converging telecommunications, media and technology sectors
- Coleago was created in March 2001 and has created a dedicated team of highly skilled and experienced industry professionals sharing a common approach
- Our consultants' skills are multi-disciplinary covering the areas of strategic planning, market research, market forecasting, model building, project management, regulatory advice, network design, network performance improvement, licence bids and due diligence

Coleago's structure provides 6 points of differentiation from our competitors

- Experienced Professionals
  - The Coleago consulting team comprises only highly skilled and experienced industry professionals
  - Coleago does not employ any junior or support staff
- Dedicated Service
  - As a small firm, Coleago provides unrivalled personal service
  - Clients can be sure that the consultant they meet today will be the same consultant who delivers the assignment
- Bespoke Solutions
  - Coleago recognises that all businesses are different and provides tailored solutions to meet specific client needs

Our low overheads also implies that Coleago can offer greater value compared to other consultancies

- Rigorous Analytical Framework
  - Projects are underpinned by rigorous quantitative analysis, often incorporating the use of a business model
  - Quantitative analysis allows our consultants to focus on the real drivers of value
- Independent Opinions
  - Coleago focuses only on providing independent advice, we have no commercial interest in recommending infrastructure investment or system implementations
- Practical Solutions
  - Coleago's industry consultants work alongside clients as "one of the team" to ensure that their recommendations are realistic, practical and achievable

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Coleago is a niche firm specialising one specific sector but offering a range of services

	Telecoms, Media and Technology
Strategy	Analysis, scenario planning, asset valuation and pricing, positioning, targeting, business simulation
Marketing	Marketing strategy and planning, pricing, forecasting, market research, new services, revenue optimisation, churn reduction
Technical	Network planning, capacity optimisation, cost analysis, auditing, training courses, traffic simulation
Regulatory	LRIC and other cost modelling, interconnect rates, competition review
Business Planning	Business modelling, due diligence, valuation, profitability analysis, risk analysis, cost reduction, planning support

Underpinned with facilitation, project management and bespoke modelling skills

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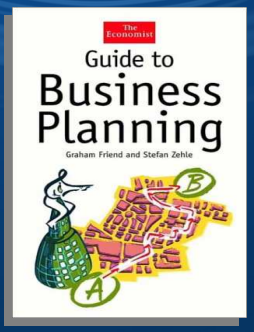
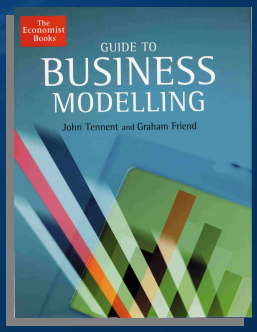
Coleago's consulting services are based on rigorous technical analysis

- Coleago prides itself on the strong academic credentials of its consultants
- Two of the directors, Graham Friend and Stefan Zehle, have authored books for The Economist
  - The Economist is recognised around the world for the clarity and lucidity of its writing





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Coleago is based in the United Kingdom but our consultants have carried out assignments around the world

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Canada, USA

Caribbean, El Salvador, Mexico, Panama

Argentina, Brazil, Venezuela

Sudan, South Africa, Algeria

Kuwait, Jordan, Syria

Australia, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Maldives, Pakistan, Taiwan, Singapore, Sri Lanka

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Measuring Customer and Service Profitability – Session 1

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Agenda For This Session

- Traditional measures of profitability
- Customer or service profitability
- Forward looking profitability
- Cost of Capital
- Treatment of Assets

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Traditional Measures of Profitability

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Traditional MEASURES of profit are not adequate to answer these questions

- At a company level
- Backwards looking
- Pay little regard to the cost of capital
- Treatment of assets based on accounting convention

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Accounting profitability is measure for the past

- Useful for shareholders
  - Judge the competence of management
  - Can be combined with other information to give useful measures (ROCE)
- Less useful for managing the business

  "driving using the rear view mirror"

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Instead we need to ESTIMATE profitability that is:

- For individual customers
- Forwards looking
- Includes opportunity costs, including the opportunity cost of capital
- Recovery of the costs of assets based upon use

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Profit estimation raises a number of issues

- Profit estimates will always have a margin of error
  - "Better to be approximately right than exactly wrong"
- There will never be a single correct answer
  - There are always a range of different methodologies which are valid
- Estimates need to be "fit for purpose"
  - Correct methodology
  - Keep It Simple...

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Customer or Service Profitability

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Traditional service costing approaches are effective where...

- Customers may buy a single product
- Pricing is simple
  - Little price discrimination between customers
  - Linear pricing (price is proportional to quantity)
- Customer related costs are low

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Telecommunications pricing is complicated

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Complex (non-linear) pricing with price discrimination makes it difficult to assign revenues to services

- Some revenue can be seen as common to several services
- While allocation is possible, it will be to an extent arbitrary
  - E.g. splitting a subscription with bundled usage into a traffic component and a customer service component

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A further problem is how to recover customer driven costs

- Customer driven costs can be substantial
  - Subscriber acquisition costs
  - Retention programmes
  - Customer care costs
- These costs are recovered across a range of services
  - Again any allocation of these costs will be somewhat arbitrary

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For these reasons the emphasis is generally on customer profitability

- No need to allocate revenues
  - Use billed revenues for each customer/segment
- Customer related costs – acquisition, retention and customer care – can be allocated directly to customers
- Allows management to make decision with respect to individual customers or customer segments

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Customer profitability can be measured...

- Using a cross sectional approach
  - "How much profitability did the customer generate last quarter?"
- On a forward looking basis
  - "What is this customer worth to me?"

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Customer Lifetime Value

- NPV (Cash flow from customer)
  - "DCF for customers"
- Lifetime is finite
  - Simply estimated as 1/(churn rate)
  - Unlike business DCF's no "terminal value" issues

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Service Costing may still be useful

- Regulatory cost accounting
  - Requirement to “unbundle” services on non-discriminatory terms
- In fixed networks
  - Simpler pricing
  - Customer related costs can be allocated to line rental
- New services
  - Not yet bundled

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Calculating CLV (or service/customer profitability) requires determining the cost of serving the customer

- Fully Allocated Costs
  - Traditional service costing approach
  - Allocate the existing costs of an operator to the range of services delivered by the operators
- (Forward Looking) Long Range Incremental Cost
  - More recent approach
  - Attempt to measure the cost of delivering a given “increment” of service – the avoidable cost

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Measuring Cost

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Any assignment of costs to customers or services should follow the principles of causality

- Direct costs
  - Costs directly driven by an increment of demand
- Indirect costs
  - Costs which vary depending on the level of demand
  - Support functions
- Fixed, joint and common costs
  - Costs which do not vary with variations in demand for the defined increment

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In terms of types of cost

- Fully Allocated Costs
  - All costs are allocated
  - Direct + Indirect + Share of Common Costs
- Incremental Costs
  - Only avoidable costs are allocated
  - Direct + Indirect Costs

Both approaches have their benefits

Fully Allocated Costs

- Relatively easy to construct
  - Do not need to distinguish between common and incremental costs
- All costs are allocated
  - If revenues exceed sum (FAC), then the business as a whole will be profitable

LRIC

- Constructing LRIC models provides more information on the relationship between costs and volumes
- Provides a unique answer
- Consistent with economic theory
  - In a competitive market prices are driven down to LRIC

Ideally we would calculate both FAC and LRIC

- FAC provides a target level for prices
  - If prices are on average greater than FAC, then the business is profitable
  - However some prices can be below FAC
- LRIC provides a cost floor for prices
  - All prices should be above LRIC
  - However if prices are set to LRIC, common costs (and sunk costs) are not recovered

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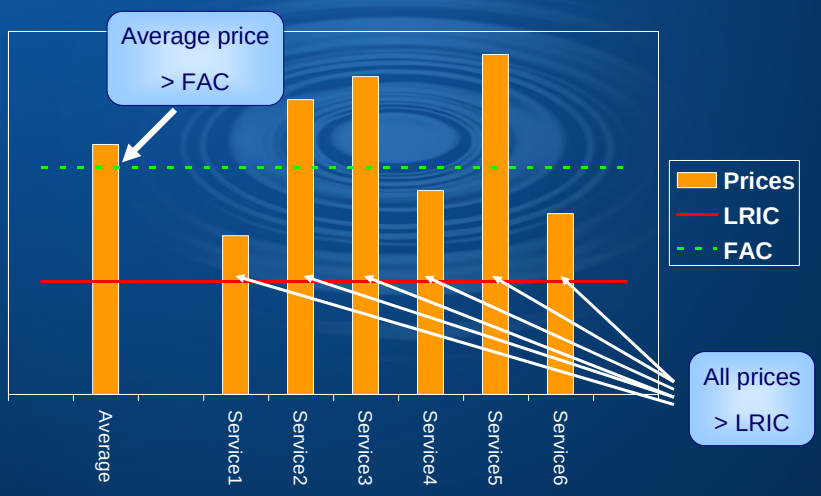
Relationship between FAC and LRIC



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FAC is neither unique nor useful for go/no-go decisions

Forwards Looking Profitability

In order to make decisions about the future we need to understand profitability in the future

- Forward looking cash flows
- Changes in prices
  - Driven by competition
- Changes in demand
  - Penetration
  - Demand elasticity
- Changes in cost

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While profitability should be forward looking, only backward looking data is available

- Predicting the future is hard
  - Simple projections may be misleading
- Recent past is often the best estimate of the immediate future
  - Cross-sectional approach
  - Even cross section contain implicit assumptions about the future (economic life of assets)

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Treatment of sunk costs

- FAC
  - No attempt to identify sunk costs
- Forward Looking LRIC
  - In theory sunk costs should be ignored as they should not affect decision making
  - In practice sunk costs are often included (avoidable in the “Long Run”)

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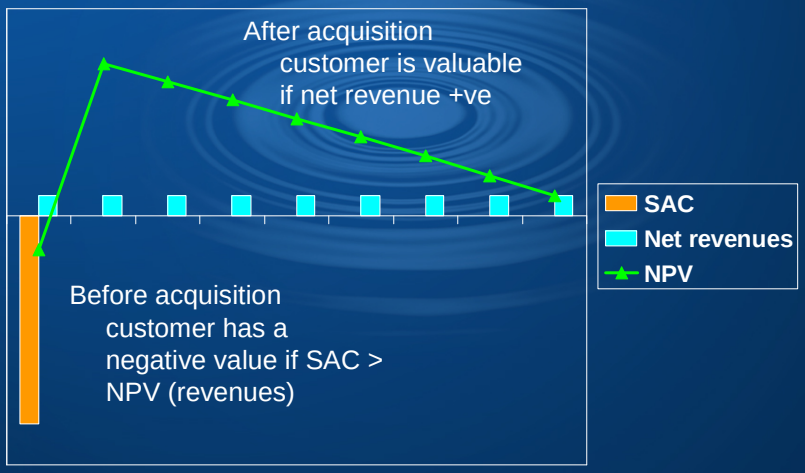
Simple example of sunk costs – Subscriber Acquisition Costs



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Once costs are sunk, they should not affect decisions

- Acquisition strategy should attempt to ensure the cost of acquisition is not greater than the value of the customer after acquisition
  - If unprofitable customers are being acquired, prices should be increased or SAC reduced
- After acquisition, SAC is irrelevant
  - Only customers who are unprofitable going forwards should be "encouraged" to leave the network

Relationship is similar to that for common costs

- FAC, including sunk costs, provides a price target
  - However if individual customers or services may not recover sunk costs
- Forward Looking LRIC provides a cost floor
  - If prices < forward looking costs, the customer or services is destroying value

Cost of Capital

Cost of Capital

- Cost of capital can be seen as the opportunity cost of capital employed
  - Ensures that shareholders get a reasonable return on equity
- Other approaches such as profit margins will distort investment
  - Products with higher capital requirements need higher profit margins

The cost of capital can be included in two ways

Cross-sectional Approach

1. Impute the cost of capital for each asset and allocate it with other costs
2. Allocate capital employed for each asset and calculate the Return On Capital Employed at the end of the process

Time series Approach

1. Calculate an IRR
   - IRR > Cost of capital
2. Conduct a DCF
   - NPV > 0

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Customer Lifetime Value uses both of these approaches

- Costs calculated including a return on capital employed
- The resulting cash flows are then discounted

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Cost of Assets

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Two areas raise issues

- Treatment of Intangible Assets
- Net valuation and depreciation

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Accounting conventions may favour robustness over accuracy

- Some costs which deliver benefits over a long period of time are expensed
  - Brand and marketing expenses
  - Sales expenses
- Accounting depreciation, when combined with the cost of capital, may not reflect cash flows from those assets

Expenditure should be capitalised if it delivers benefits over a length of time – creating an intangible asset

- Subscriber Acquisition Costs clearly deliver benefits over the lifetime of the customer
  - However in most jurisdictions they are expensed
- Most marketing expenditure are designed to provide long term benefits
  - Customer acquisition
  - Brand development

In general these issues can be addressed or ignored

- Customer Lifetime Value calculations to deal with SACs
- If marketing expenses are relatively constant, then expensing them only causes limited distortions

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Accounting Depreciation Suffers From Two Problems

- Historic Cost Accounting does not take account of changes in the price of assets over time
- Straight Line Depreciation produces costs which do not reflect cash flow generated by these assets

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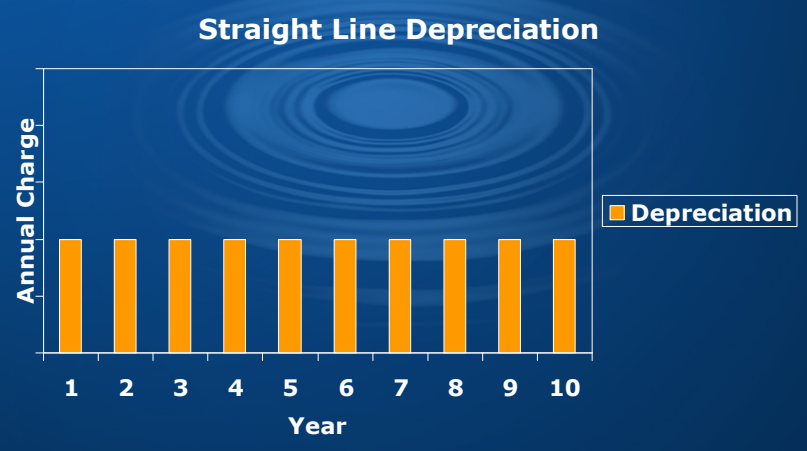
Under straight line depreciation, the depreciation expense is even over the lifetime of an asset...



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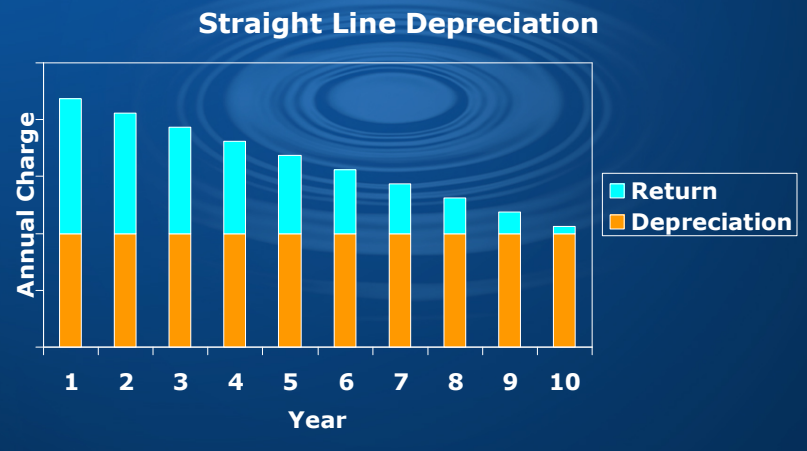
... once the cost of capital is added the profile is descending costs



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This declining capital charge is inconsistent with economic reality in many cases

- When networks are being built up traffic, and hence revenues (and cash flow from the asset) tends to increase
  - Straight line depreciation suggests that cash flows from assets should decrease
- In competitive markets prices are set by the cost base of entrants
  - Current costs

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A combination of straight line depreciation and expensing of sales and marketing expenditure can distort estimated costs

- Costs are overstated at in the early years of a network using accounting frameworks
  - High sales and marketing costs are being expensed
  - High capital charges when utilisation is low
- Costs can be understated when networks are mature
  - For example when some assets are fully depreciated
- Important when businesses are young or have cyclical upgrade cycles
  - Mobile network “generations”
  - Move to NGN’s in fixed

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Solutions

- Economic depreciation
  - Asset value is based on forward looking cash flows
  - Requires making assumptions about forward looking utilisation and prices
- Use a DCF approach
  - Indifferent to assumptions about depreciation and capitalisation
  - Again requires forecasting
  - More sensitive to input assumptions

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In practice HCA is often used

- Both DCF approaches and economic depreciation approaches are difficult to apply
  - Require forecasting traffic and costs over the lifetime of the assets
- In many cases HCA may be a reasonable assumption to use
  - If the network is mature and there is a mix of asset vintages

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Summary

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Summary

- Customer profitability and Customer Lifetime Value are key measures
- Profitability analysis should be forwards looking
- We must allow for the (opportunity) cost of capital
- Accounting depreciation may be misleading

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Measuring Customer and Service Profitability – Session 2

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29 November 2004

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Agenda

- Calculating Costs
- Allocation of Costs
- Incremental Costs
- Current Costs and Economic Depreciation

Calculation of Costs

All types of costs should be included

- Cost of sales
- Operational Expenditure
- Depreciation
- Cost of Capital

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Cost of Sales and Operational Expenditure

- Cost of sales should be identified separately
  - Can be allocated directly to services
- Operational Expenditure can generally be used without adjustment
  - Although we should be aware of expenditure that creates intangible assets

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Depreciation and Amortization

- Depreciation also generally taken directly
- Need to consider how write downs and write offs should be considered
  - Generally not included

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Cost of Capital

- Cost of Capital = Mean Capital Employed x WACC
- Capital employed should be consistent with the depreciation approach adopted
  - Financial Capital Maintenance

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Capital Employed

- Fixed Assets
  - Net of accumulated depreciation and amortization (consistent with depreciation used)
- *Plus* Current Assets
  - Adjusted to remove non-operating current assets (e.g. excess cash)
- *Less* Current Liabilities
  - Adjusted to remove non-operating current liabilities related to the financing of the business (e.g. current part of long term debt)

Working Capital

- Woking capital should be allocated on the basis of the transactions generating the capital
  - Accounts receivable directly to customers
  - Accounts payable along with the corresponding cost/asset category

Calculating Mean Capital Employed

- Typically use a simple average of the opening and closing base
  - "Triangulation"
- If opening or closing working capital is not representative, quarterly/monthly/weekly averages could be used

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Calculating the Cost of Capital

- Use the standard WACC formula

$$WACC_{pretax} = \frac{Debt}{(Equity + Debt)} \times Cost\ of\ debt + \frac{Equity}{(Debt + Equity)} \cdot \frac{Cost\ of\ equity}{(1 + Tax\ rate)}$$

- Typically use the CAPM to estimate the cost of equity
  - Other methods such as Dividend Growth Model or Arbitrage Price Theory and more difficult to populate

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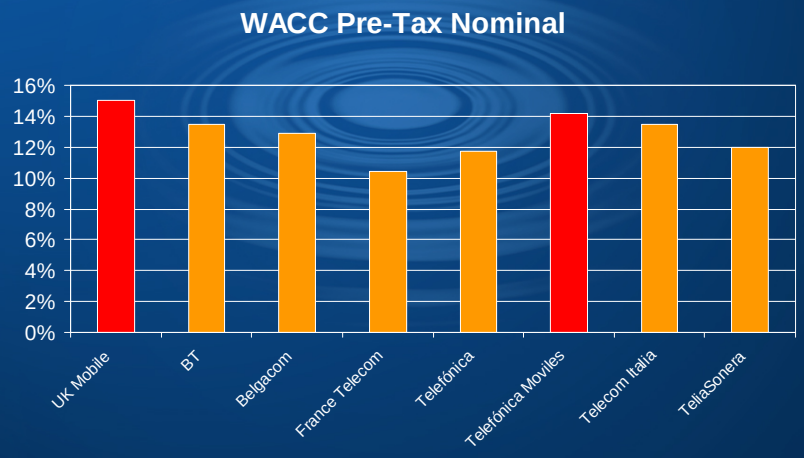
Data required to calculate the WACC

- Risk free rate
  - Based on the yield of long term government bonds
- Debt margin
  - Available directly or by comparing spreads for bonds issues by similar companies
- Equity Risk Premium
  - Typically estimated to be around 5%

Calculating the cost of capital

- Equity Beta
  - Calculated directly or by benchmarking unleveraged (asset) betas from comparable companies
- Corporate Tax Rate
- Gearing
  - Based on market valuation of debt and equity

WACC estimates tend to be in a relatively tight range



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Allocation of Costs

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Examples based on Fully Allocated Costs

- Allocation of costs to customers
  - But similar principles apply for service costing
- Not mobile or fixed specific
- We show one allocation methodology
  - It is not the only way of allocating costs
  - Other methods may be more appropriate for certain purposes

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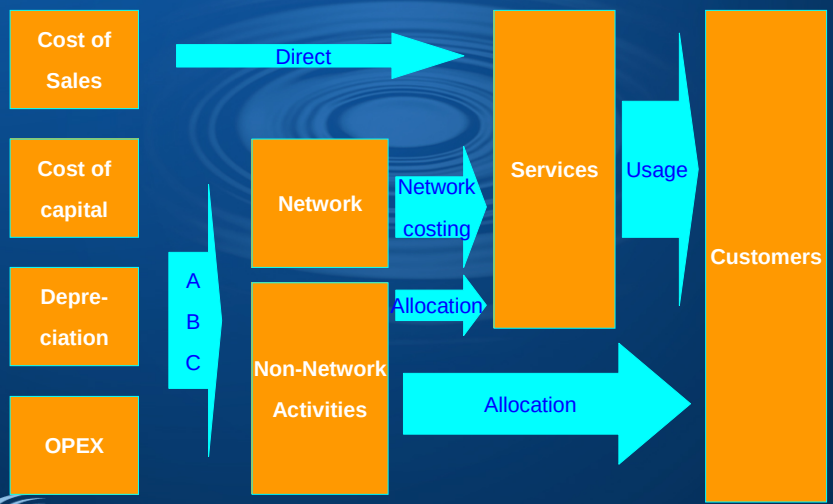
Overview of Allocation Process



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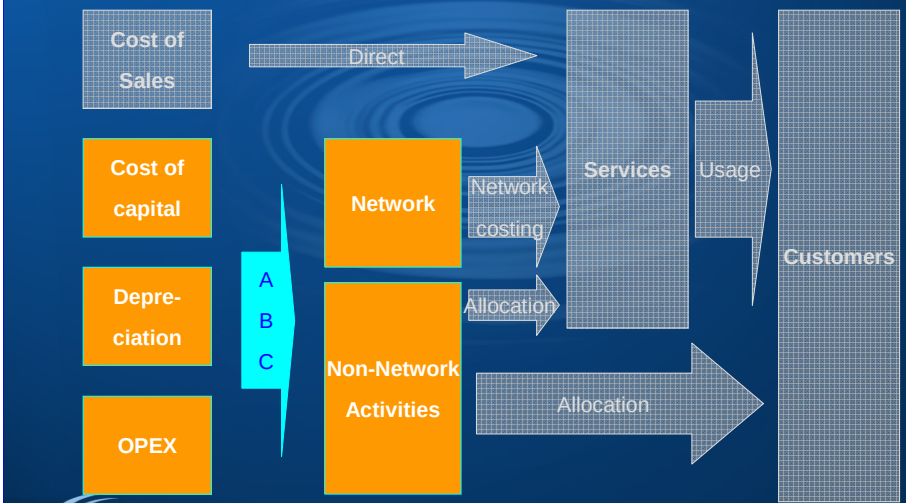
Step 1 : Allocation to Activities



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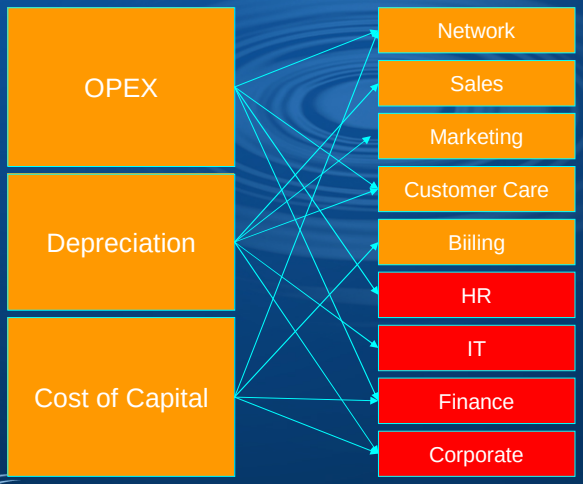
Costs should be allocated initially to Activities



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Activity Based Costing

- If costs are available with a sufficient level of granularity most will be direct costs
  - Directly allocated to the relevant department
- May require some intermediate allocation stages

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Support Activities are then be allocated to customer facing Activities

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Allocation of Support Costs

- Typically based on Activity Based Costing
  - Time spent supporting each department
- A number of other drivers can be found
  - IT support allocated by number of PCs
  - HR costs by number of employees
- Allocation is recursive
  - Support functions support each other

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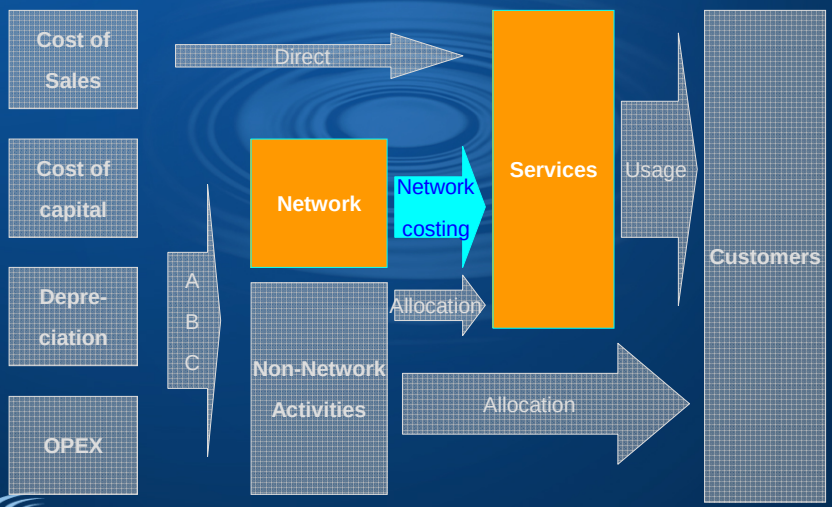
Allocation of Network Costs to Services



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Allocation of Network Costs to Services is Key

- Network costs are a large proportion of the costs of telecommunications business
- The relationship between costs and volumes is complex
- Network services are the fundamental building blocks of regulation

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The allocation of network costs to services can be split into three stages

- Allocation of network costs to network components
- Calculation of unit costs for network components
- Calculation of network service costs

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Customer sensitive and traffic sensitive costs

- Network components can be divided into customer- and traffic-sensitive components
- Customer sensitive costs increase with the number of customers, but not with the level of traffic
  - In fixed wire line networks, access networks, line cards, etc.
  - In mobile networks these costs are minimal (e.g. location registers)
- Traffic sensitive costs increase with the level of traffic
  - Switching and transmission
  - Radio access network in cellular networks

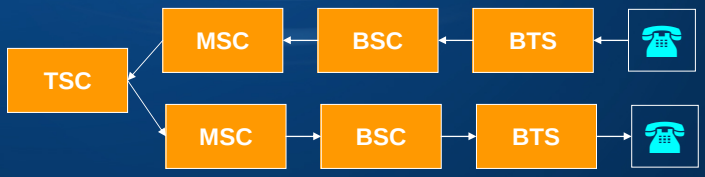
Treatment of traffic and customer sensitive costs

- In fixed networks, customer sensitive costs typically get allocated to line rental services
  - Importantly, these costs are excluded from interconnection charges
- In mobile networks there are no material customer related costs
  - Hence no network service equivalent to line rental

Different types of call make differing use of network components

Call Termination

On-net Mobile to Mobile Call



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This can be expressed in a routing table

Call type	BTS Usage	BSC Usage	MSC Usage	TSC Usage	POI Usage
Mobile to fixed	1	1	1	1	1
Call termination	1	1	1	1	1
On-net	2	2	1.75	.75	0
…	…	…	…		

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Because of this complexity it is necessary to allocate costs to each component

- Separate costs for Access, Local Exchanges, Transit Exchanges, Transmission, Points of Interconnection, etc, in fixed networks
- Separate costs for BSS, MSC, TSC, Transmission, etc. in mobile networks

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Allocation drivers are often driven by the capital cost of each item

- Asset register provides sufficient detail to directly allocate capital costs
  - OPEX is usually assumed to be proportional to asset cost
- The more detail that is available about the costs of each component, the less allocation is required
  - For example if network O&M is broken down by network subsystems
- It may be able to allocate some operational costs, such as personnel, by specific drivers
  - Timesheet information

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Calculation of component unit costs

- Component total costs are available from the previous stage
- Component usage can be calculated by multiplying the volume of traffic for each service by a routing factor for the service
- Dividing the component cost by the total usage of the component gives a unit cost

Calculation of service network costs

- The usage of network components by each service is available from the routing table
- The unit cost of each network component is available from the previous stage
- Service network costs can be calculated by multiplying the usage of each component by the cost of that component

Illustrative example of calculation of service network costs

	POI →	TSC →	MSC →	BSC →	BTS → ☎
Unit cost	0.2	0.3	0.4	0.5	0.6
Service Usage	1	1	1	1	1
Service Cost	0.2	0.3	0.4	0.5	0.6

Total Service cost = 2.5

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De-averaging by time of day

- The previous stages provide an average unit
- This cost is often “de-averaged” to give different prices for different charge bands
  - Requires the “tariff gradient” to be set so that non-busy hour calls have lower costs
  - Combined with data on traffic distribution to give a “multiplier” for each time of day
- Estimation of the appropriate tariff gradient is complex
  - Incremental cost of calls outside the busy hours is zero

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Summary : Calculation of Network Service Costs

- Calculate the cost of each component in the network
- Calculate the total usage of this component and hence the unit cost
- Multiply the unit cost by the routing factor for each network service to give the network service cost
- De-average by time of day if necessary

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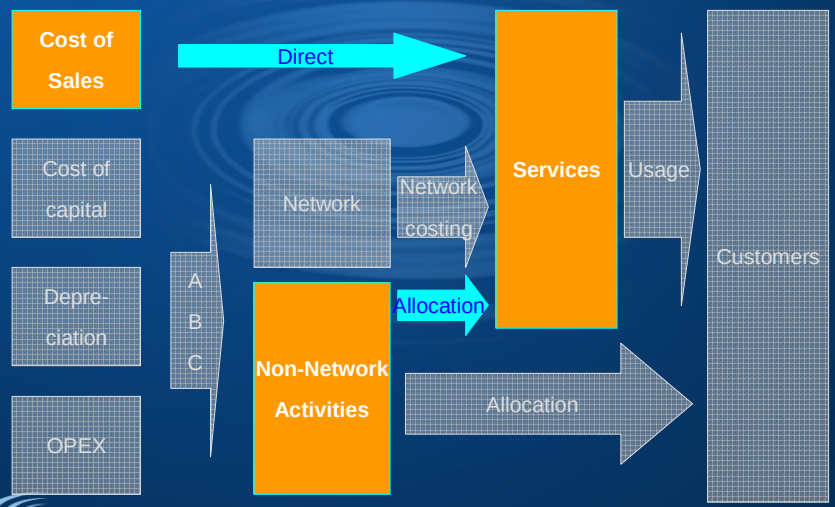
Allocation of non-network costs to services



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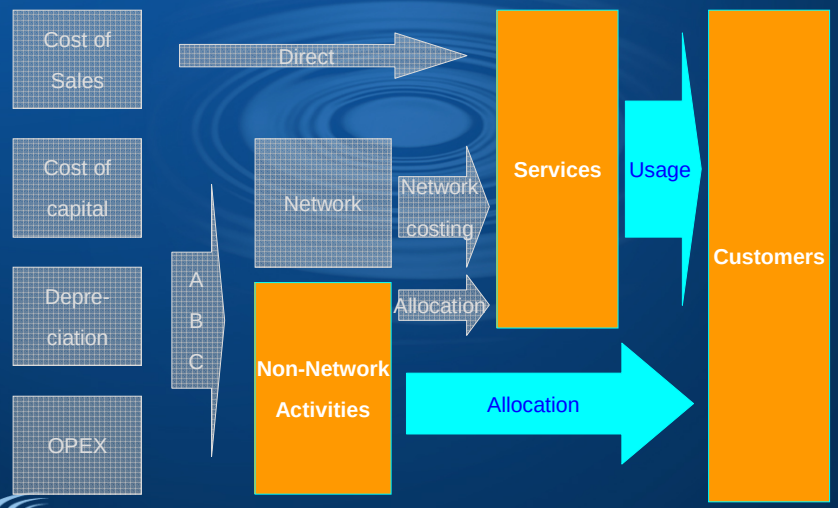
Allocation of non-network costs to services

- Some non-network costs may be specific to services
  - Marketing campaigns for a specific services
  - Customer care enquiries related to the service
  - Billing systems development
  - Etc.

Allocation of cost of sales to services

- Sales costs related to customer acquisition can be allocated to customers
- Other cost of sales can generally be allocated directly to services
  - Out-payments for call termination
  - Content costs

Allocation of non-network costs to services



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Allocating Service Costs to Customers

- Service costs can be allocated directly to customers based on usage
- For each service : customer cost = unit cost x customer usage
  - e.g. Cost per minute x minutes per year

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Allocating non-Network Costs to Customers

- Sales costs can be allocated directly to customers
- The simplest allocation is to allocate equally to all customers
- However, often there is information that can be used to alloacte costs more accurately
  - Number of customer care calls made by different customer segments
  - Marketing for a specific service

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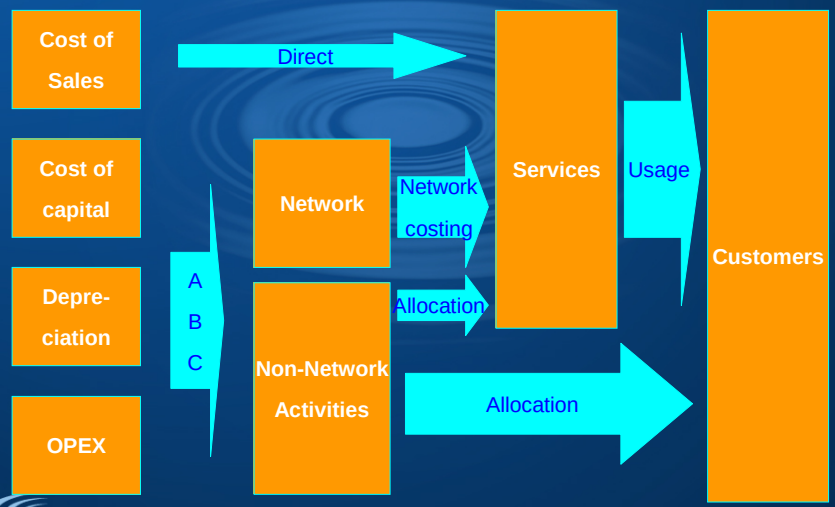
Overview of Allocation Process



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Incremental Costs

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Incremental Costs

- Set a cost floor for revenues

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Three approaches to estimating incremental costs

- Identification of fixed and common costs
- Observation of cost volume relationship
- Bottom up model

Identification of fixed and common costs

- If fixed and common costs can be identified and excluded, then the resulting costs should be the incremental costs
- Costs can be allocated using a similar methodology to FAC
  - Cost of implementation is relatively low if FAC has been implemented
- We have to make implicit assumptions about the increment

Separation into fixed and incremental costs - Network

	Fixed and Common	Incremental
Switching	Switch sites	Processors Ports
Transmission	Duct and fibre	Transmission equipment
Radio Access	Basic coverage network	Additional TRXs Additional cells
Fixed Access	?	Copper loop Line cards

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Separation into fixed and incremental costs – non-Network

	Fixed and Common	Incremental
Sales		Processors Ports
Marketing	Branding	Product marketing
Customer care	CRM development costs	Customer care staff and workstations
Billing	Billing system development costs	Cost of bill generation

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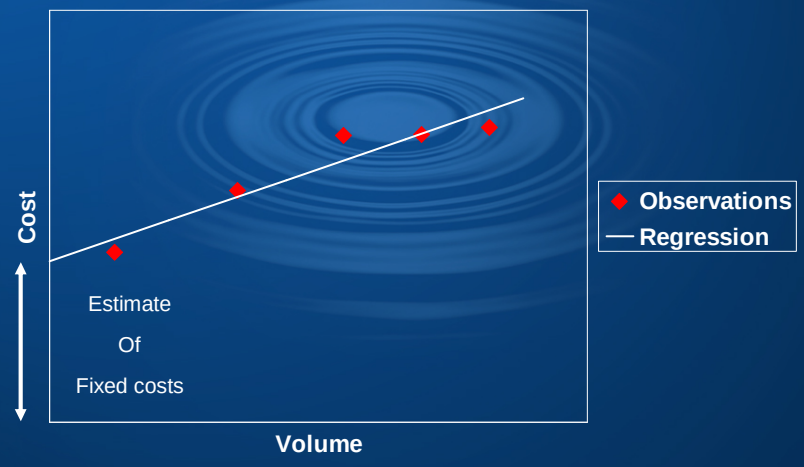
Historic data may give good information about cost volume relationships



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However observations may be distorted by other effects

- Changes in the quality of service over time
  - Costs will increase if blocking rates are reduced
  - Increased coverage in mobile networks will lead to increased costs, above those required to deliver traffic
- Changes in “build ahead” for expected demand
  - In high growth periods

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Models

- Engineering models of the network can be implemented to calculate incremental costs
  - "Top down" models using the existing network structure and dimensioning as a base
  - "Bottom up" models starting from a clean sheet of paper
- Incremental costs can then be calculated
  - Difference between the cost of the base level of demand and base demand +/- the increment

Bottom up models

- Models are relatively robust for core switching and transmission networks
  - Well understood engineering rules
  - Limited number of network nodes
  - Similar in every country
- Models exist for access network (e.g. Hybrid Cost Proxy Model) but
  - Engineering rules are not as well defined
  - Millions of network nodes to be modelled
  - Access networks are sensitive to geography

Regulators like incremental cost models

- Regulators believe that competitive prices are set using incremental costs
- The modelling process allows identification of “inefficiencies”
  - Although bottom up models tend to over-simplify

Current Costs and Economic Depreciation

Current Cost Accounts

- Current Cost Accounts attempt to update asset valuations to take account of asset price movements
  - Thus provide a better estimate of the value of assets than historic (acquisition) cost

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Asset Valuation - CCA

- (Net) Value of an asset can be defined as:

*Min (**Net Replacement Cost** , Max (Realisable Value , NPV (cash flows))*

- For telecommunications assets, Net Replacement Cost (NRC) is typically calculated for CCA accounts
  - Realisable value is minimal (except for property)
  - NPV is not known

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CCA Methodology

- Estimate Gross Replace Cost (GRC) of Assets
  - Cost of buying similar assets today
- From GRC we can calculate NRC and hence depreciation

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Two Types of CCA: Operational Capital Maintenance (OCM) vs. Financial Capital Maintenance (FCM)

- **OCM** is concerned with maintaining the capacity of the **business** as an entity while **FCM** is concerned with maintaining the capital of the **shareholders**
- FCM is usually used
  - Allows investors to recover the cost of their investment
  - Includes holding gains and losses as well as depreciation

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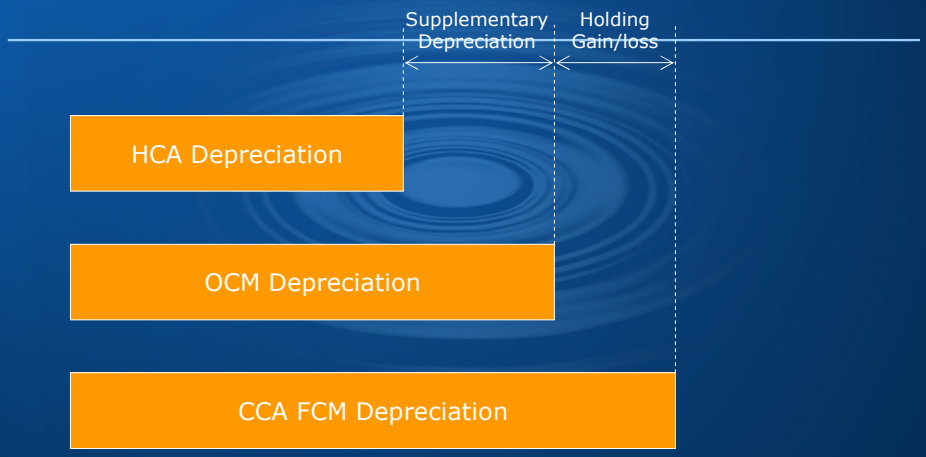
Relationships



Not to scale

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Alternative Gross Replacement Cost Methodology

Direct Method

- Estimate the cost of buying the asset(s) at the valuation date
- Where asset is obsolescent use Modern Equivalent Asset philosophy
  - Replace with an asset that offers similar "service potential"
- Requires detailed information on current prices

Indexation

- Use a price index to measure the price change between when the asset was purchased and the valuation date
- Requires relevant price indices

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Three methods of calculating NRC and depreciation

- Direct method
  - Directly calculate NRC for every asset
- Ratio method
  - Estimate NRC(/Accumulated depreciation) for each asset class
- Roll over method
  - Estimate OCM depreciation and holding gains/losses for each asset class
  - Hence calculate accumulated depreciation NRC

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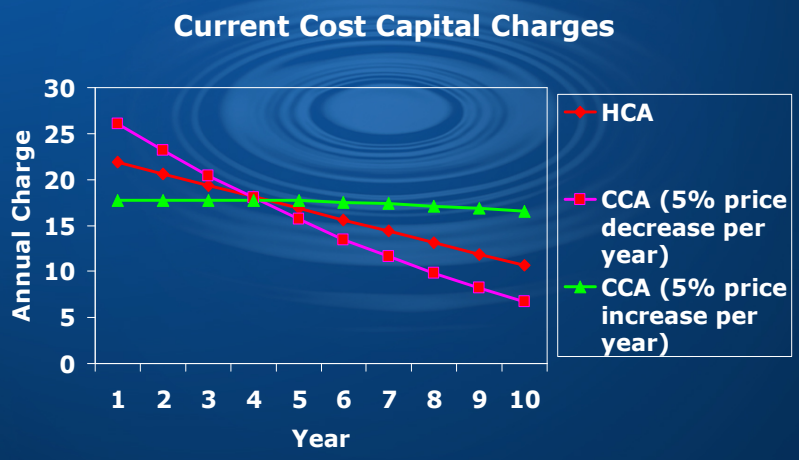
CCA effectively "tilts" the recovery of costs



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Asset Valuation – Economic Depreciation

- (Net) Value of an asset can be defined as:

*Min (Net Replacement Cost , Max (Realisable Value , **NPV (cash flows)**)*

- Economic depreciation assumes that straight line depreciation is not appropriate
  - Instead of making assumptions about depreciation we make assumptions about the profile of future cash flows

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Cash Flow Assumptions

- Cash flow assumptions can take into account a number of forecast developments
  - Utilisation
  - Change in the cost of assets
  - Price evolution
  - Changes in operating expenses of the asset

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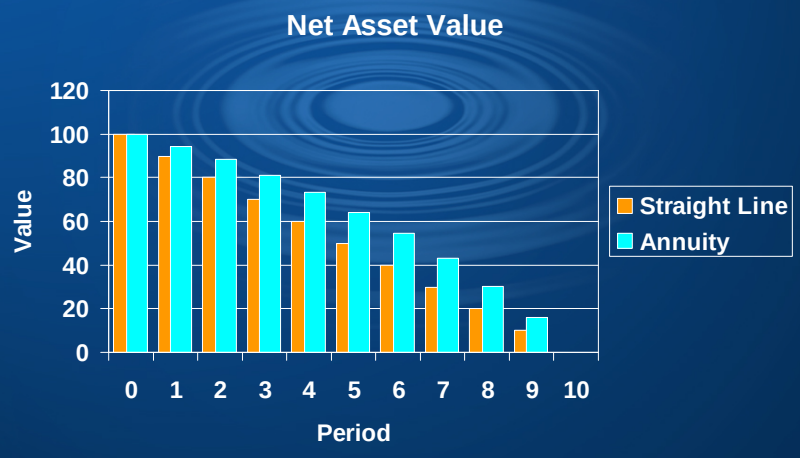
The simplest assumption is that cash flow will be constant – an annuity



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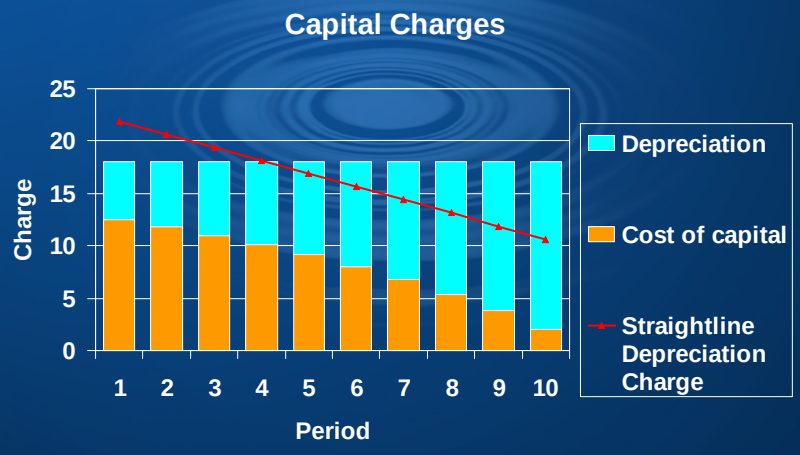
Capital charges are of course constant



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CCA and Economic Depreciation

- CCA is relatively easy to implement
  - Although the data requirements are significant
- Economic depreciation is more difficult, but more realistic
  - Requires forecasting future cash flows

Summary

Summary

- Calculate total cost
- Allocate using an appropriate methodology
- Attempt to identify incremental costs
- Adjust asset value for economic effects if possible
- “The devil is in the detail”

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Measuring Customer and Service Profitability – Session 3

Coleago Consulting Ltd
Martin Duckworth, Director
29 November 2004

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Agenda

- Case study – Mercury one2one
- Forecasting penetration
- Forecasting usage and revenues

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Why forecast demand?

- Estimate the revenue side of forward looking demand
- Understand the impact of price changes on profitability
  - Elasticity analyses
- As an input to cost estimates
  - Economic depreciation
  - Optimal allocation of common costs (“Ramsey Pricing”)

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A Case Study
Mercury one 2 one launch

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Background

- The UK was a two player market from 1984 to 1993
  - (BT) Cellnet (now O2) and Vodafone
  - TACS-900 followed by GSM-900
- Three “PCN” licences issued in 1991
  - Two of the licensees merged
- Penetration stood at around 2.5% at the end of 1992

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one 2 one strategy

- Mobile telephony as a mass market service
  - "Eighty percent of the population anticipates they will be regularly using a mobile phone within the foreseeable future.”
- Targeting un-served niches
  - Teenagers not “yuppies”
- Competing on price with both fixed and mobile
  - Partial fixed substitution

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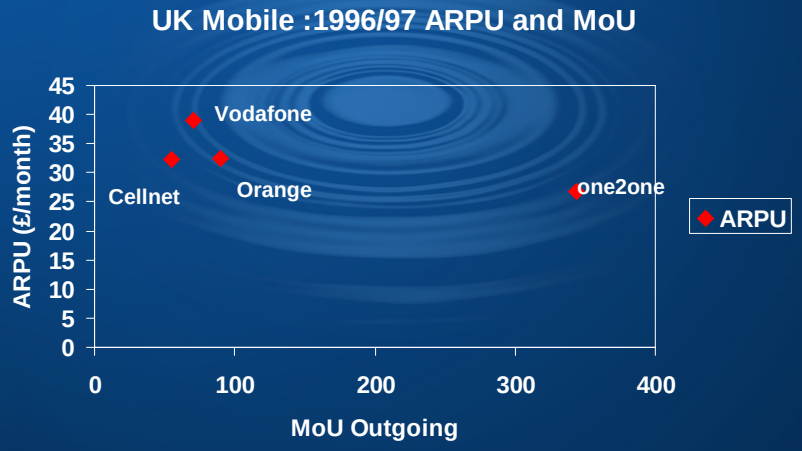
[Orange Strategy]

- Branded as a high quality service
- Targeted un-served niches
  - High income residential customers
- Undercut existing operators
  - Similar monthly subscription but including bundled minutes

One 2 one implementation

- Free local calls between 1900 and 0700 and at weekends
  - Competitive rates at other times
- Limited coverage at launch
  - Initially London
  - Slow roll out to the rest of the country
- Promotion offering free international calls on Christmas Day 1994

Results



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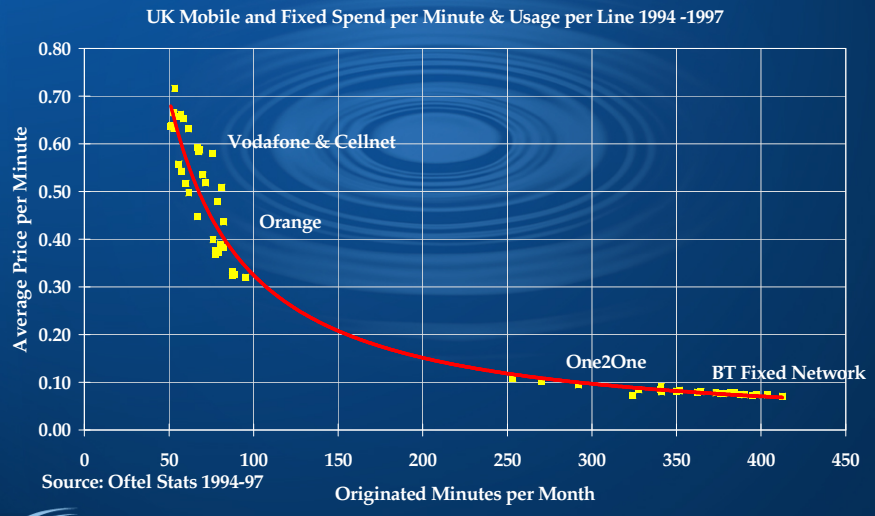
One2one's fixed substitution strategy was perhaps too successful



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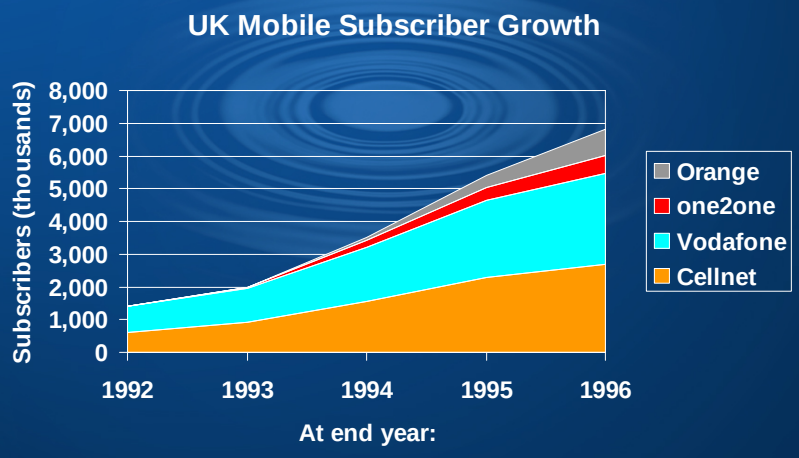
Except at attracting customers



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Results: By 1996 one2one had

- Lowest number of subscribers and rate of subscriber growth
- Lowest ARPU
- Revenue per minute less than 25% of its competitors
- A congested network

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One2one were forced to back track

- In March 1995 one2one increase monthly subscription by 20% while keeping unlimited local off-peak calling
- In September 1995 it introduced new packages offering unlimited calls only at weekends
- Finally ended up offering no consumer packages with unlimited calling
  - Offered them to business with much higher subscription (£75/month compared to £15/month) and with controls usage

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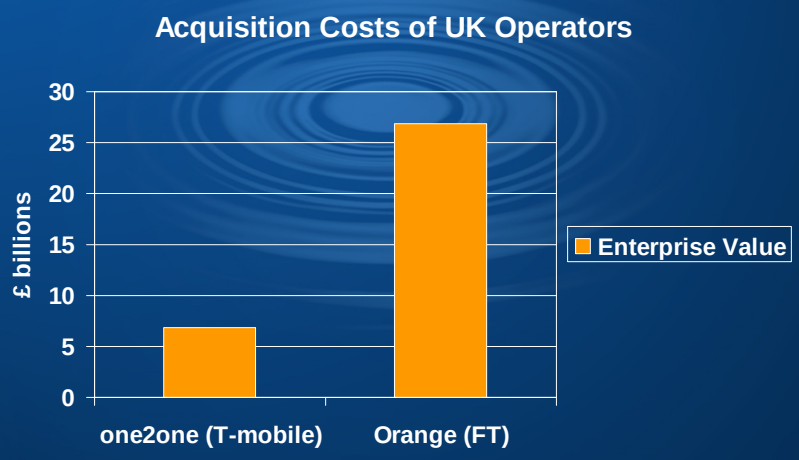
Even in five years after launch, the poor performance of one2one had a significant impact on its valuation



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What went wrong?

- Not accounting for demand elasticity
- Marginal price below incremental cost
- Low value proposition

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Demand elasticity

- With zero price, the customer has no dis-incentive to make calls
- Customers are self selecting, with customers who value high usage more likely to be attracted to such a package

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Marginal pricing below incremental cost

- Marginal pricing below incremental cost is not in itself a problem
  - Many services with two part pricing offer low or zero marginal pricing
- However incremental costs were significant
  - Marginal costs of call termination
  - GSM-1800 equipment was expensive and the network became loaded quickly
- As a with relatively low subscription costs, even with relatively low usages, customers became unprofitable
  - No limits on abusive usage

Low value proposition

- Despite pricing below competitors, one 2 one's market show was the lowest of four operators, i.e. customers valued its services below that of the other operators
  - Partly due to smaller network hence smaller addressable market
- Positioned as a youth brand
  - Contrast with Orange
- Low perceived quality
  - Low quality of services due to network congestion
  - Limited coverage

Lessons

- Mis-pricing can have a huge effect on the value of the business
- Analysis of profits need to take account of the demand side
  - Value perception for customer acquisition
  - Demand elasticity for customer usage

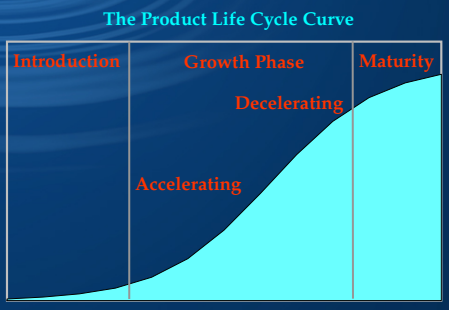
Forecasting Penetration

Determine potential demand for new services.

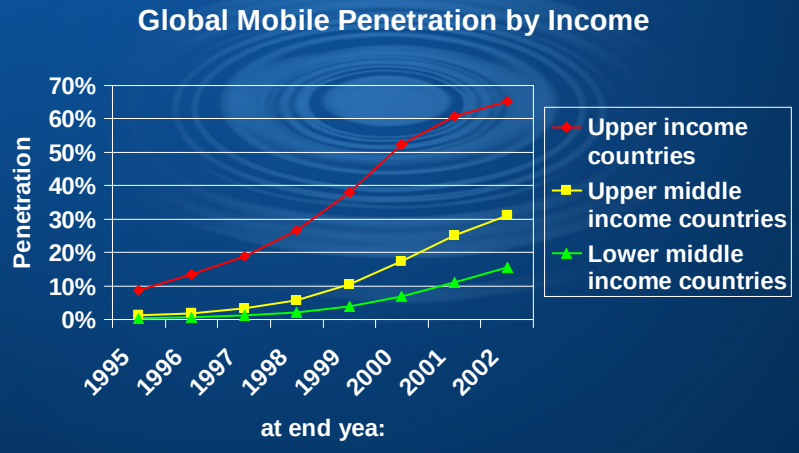
- The main objective of market sizing is to determine potential demand.
- Ideally a large scale quantitative survey amongst a representative sample of the population provides the main input into a forecast.
- In a questionnaire based survey demand is likely to be be underestimated - develop a questionnaire structure that compensates for this.
- Primary market research will underpin any assumptions made using economic analysis or benchmarks.
- Use a mixture of primary market research, economic analysis, benchmarks and vision.

The mobile subscriber market penetration forecast can be based on the product life cycle concept and curve fitting.

- Curve fitting to forecast the penetration. An extensive body of research (Chambers, Jantsch, Bewley & Fiebig and others) on the use of curve fitting to forecast the product life cycle for telecoms markets and similar markets underpins the validity of this approach.
- A penetration curve which fits well with historic market data determines a trend based on the product life cycle. There is an element of self-validation.
- If historic data is not available benchmarks can be applied.



S-shaped curves are common to all markets



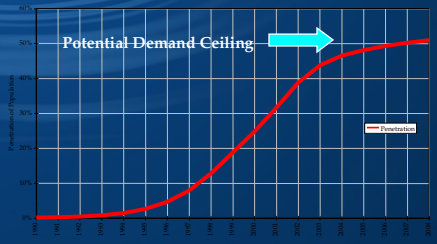
Various s-shaped growth curve functions are available, must be asymptotically bounded function.

- The upper asymptote is the potential demand identified in market survey.
- Pearl's equation logistic curve has advantages in terms of manageability in the forecasting model.

	Product Life Cycle Model Formula
P_t =	$(1 + a * e^{-b*t})^{-1}$
	where:
P_t =	% of the maximum potential penetration year t
t =	years from launch
a =	a factor skewing the curve
b =	a constant
	and
b =	$1 / t_m * (\ln ((a / (1 / 0.99)- 1)))$
	where:
t_m =	total number of years to maturity

Maximum potential demand assumptions for each segment should be anchored in consumer and business demographics.

- Segmentation must be appropriate to long term forecasting. This may not be the same as segmentation for other purposes.
- The potential demand assumptions should be linked to changing demographic patterns and changes in income.
- The potential demand sets a penetration ceiling, conceptually the maximum potential penetration is the level at which the product life cycle curve reaches its upper limit.



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Potential demand is a sub-set of the addressable market.

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To measure the addressable market we need to conduct market research

- Questionnaires typically under-report potential demand
- We need to stimulate potential demand
  - Look at the impact of price reductions
  - Explain the proposition fully

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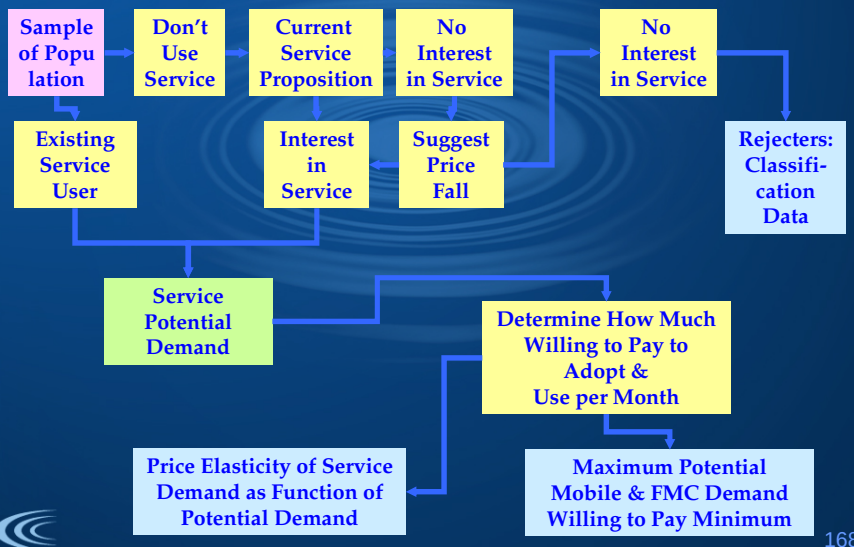
Questionnaire to determine potential demand and price elasticity of demand.



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Summary : Forecasting Penetration

- Simple uni-variate approach
  - Fitting a s-curve
  - Multi-variate approaches (i.e. regression) do not seem to offer any greater accuracy
- The key variable is the maximum potential demand
- Market research is needed
  - Needs to be structured so as to capture potential demand

Forecasting Usage and ARPU

Demand is the result of a range of decisions

- Subscription decision
- Call initiation
- Call duration
- Change package/provider
- Disconnection

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Customers purchase when ...

(perceived) Value > (perceived) cost

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Telephony services are unlike many other products

- Value of an individual call to the consumer is clear
  - Repeat purchase
  - Value is not a function of the provider
- However the customer does not know the price of the call prior to consumption
  - Customers awareness of price levels is limited
  - Bundling and volume based discounts make the marginal cost unknown even if the customer knows the list price

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However the decision to subscribe to a new service is different

- Typically the customer is aware of the price
  - Although total cost may not be clear and price may be presented in a way that is attractive to the customer (handset subsidy)
- However the value of the service may not be clear to the user
  - Only after a period of use does the value become clear
  - Value may change over time due to network effects

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Much of the literature on pricing assumes good price information

	Price Unknown	Price Known
Value known	**Telephony usage**	*Fast Moving Consumer Goods*
Value unknown	(New data services)	**Telephony penetration** *Durable goods*

How decisions are made may reflect a number of factors

- Cost as a proportion of disposable income
  - Budgeting as a necessity
- How subscribers gather price information:
  - At time of subscription
  - After consumption (SMS notifications for pre-paid)
  - From monthly bill
  - Via marketing/advertising
- Homogeneity of price/value relationship

Purchasing decisions will be influenced by the relationship between price and value to the consumer

- Customer may see value on a individual decision basis...
  - "Is this call worth more to me than its cost?"

- ... or on an aggregate basis
  - "Is my current usage worth more to me than my monthly bill?"

Budgeting behaviour may be influenced by pricing structure

- Bundled minutes or pre-paid vouchers with limited validity encourage budget decisions
  - Customers attempt to match usage to the usage level which has no marginal cost
  - Pre-paid facilitates budgeting by giving immediate feedback on spending
- Volume based discounts encourages value decisions
  - Decreasing marginal cost reflects decreasing marginal value

We measuring price elasticity of demand with regards to monthly cost of ownership for users.

- Based on Van Vestendorp approach to price elasticity testing: “What is the highest price which you would consider paying in respect of your average monthly bill?”
- Most respondents think in monthly budgets rather than minutes of use, the monthly budget is in effect the monthly bill a new mobile subscriber is prepared to pay.
- Analyse data points to determine link between the monthly bill marginal subscribers are prepared to pay and penetration of maximum potential demand.

Price elasticity of demand of existing subscribers.

- Conventionally the price elasticity coefficient indicates the effect a change in the price of a good will have on the quantity demanded.
- In the Coleago model the price elasticity coefficient is applied to the monthly bill instead of quantity demanded.
- Values for the price elasticity coefficient are similar to the conventional method, it is essentially the same concept.
- Avoids some of the complexities (e.g. different elasticities for line rental,. call charges, etc.) and produces a good result.
- Use benchmarks to determine coefficients.

Price elasticity of demand formula.

Price Elasticity - Conventional	
$Q_2 =$	$Q_1 * (1 + \Delta P * -E)$
	where:
$E =$	the price elasticity coefficient
$Q_{1,2} =$	the quantity demanded in year 1, 2
$\Delta P =$	the % change price from year 1 to year 2
Price Elasticity - Applied to Monthly Bill	
$B_2 =$	$= B_1 * (1 + \Delta P * (1 - E))$
	where:
$E =$	the price elasticity coefficient
$B_{1,2} =$	the average monthly bill in year 1, 2
$\Delta P =$	the % change in tariffs from year 1 to year 2

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Voice traffic forecast in minutes of use.

- Based on benchmarks make assumptions on the % split outbound vs. inbound traffic, international calls, roamed calls.
- The average monthly bill forecast divided by the average per minute price produces the average number of minutes per month per subscriber.
- Decline in tariff will drive increase in usage.
- Price elasticity also depends on mobile tariff relative to fixed. Substitutional usage is generated as people start using mobile as primary phone.

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Identifying Elasticity Effects

- For a single price change, and analysis of the level of demand before and after will be robust
- For price elasticity over a longer period, with a number of price changes, a regression based approach is more suitable
  - However specifying an appropriate model is difficult

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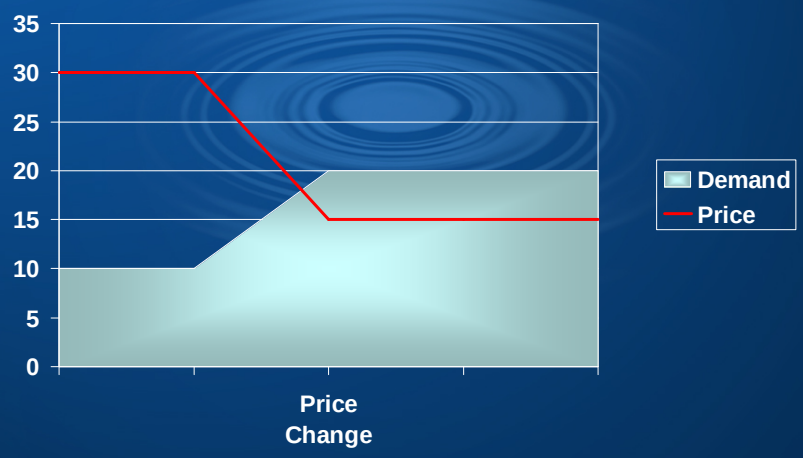
Text book examples assume a simple “before” and after



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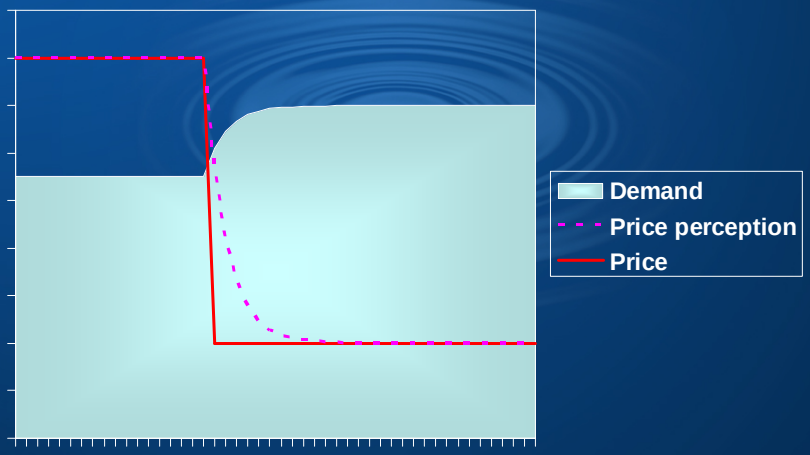
In telecommunications the response to the price change is unlikely to be a simple step change



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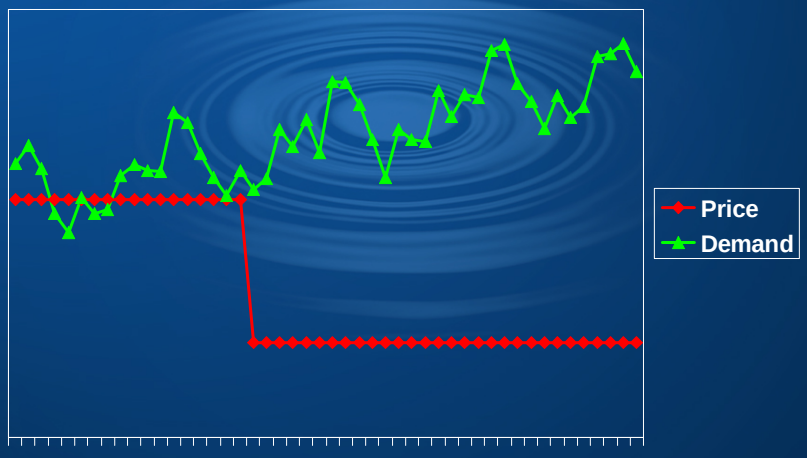
In addition demand is not constant, before and after the price change



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Time Series Analysis

- Time series analysis consist of decomposing the time series into a number of components:
  - Seasonality
  - Long term trends
  - Elasticity effects
  - Unexplained variation (“noise”)

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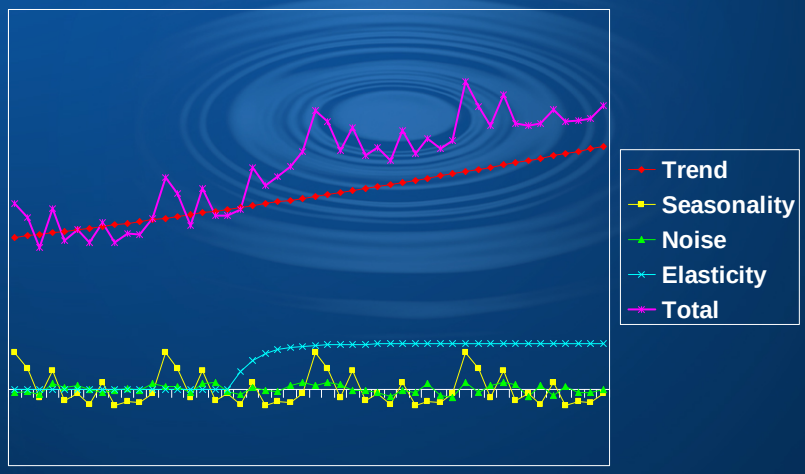
Time series decomposition



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Defining Homogeneous Customer Segments

- Longer term demand growth has been dominated by customer growth
- Constant churn means it is not easy to identify new and existing customers
  - Using a fixed panel will lead to survivorship bias
- Lack of demographic data makes segmentation difficult
  - Using customer spend can lead to circularities when analysing elasticity

Real vs Nominal Price Changes

- In a high inflation environment, prices are constantly falling in real terms
  - This may be offset by increased in nominal prices
- In a low inflation environment, customers are far more sensitive to price increases – “prospect effect”

Co-linearity in longer term trends

- To understand longer term trends we need to decompose a number of factors
  - Price
  - Macro-economic factors
  - Subscriber growth
- Co-linearity in the series (all tend to be monotonic) will make this difficult
  - There are also causality issues with increased demand being a driver for lower prices as well as a result of lower prices

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Use of temporary “campaign” price changes

- For competitive reasons prices tend to be “sticky”
  - Few price changes in nominal terms
- However responses to campaign prices may not be a good indicator of responses to permanent price changes
  - Related marketing may influence purchasing decisions
  - Changes in customers’ price perception and actual price changes may not be simultaneous

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Summary on estimating usage

- For customers total spend is a more valuable concept the estimating usage
  - Estimate traffic as a derivative

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Summary on estimating usage

- We need to understand customer behaviour as a first step
- For many customers total spend is a more valuable concept the estimating usage
  - Estimate traffic as a derived value
- Measuring elasticity accurately is difficult but worthwhile
  - Better to be approximately right than exactly wrong

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Summary on demand forecast

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Summary on demand forecast

- Demand forecasting is vital to understand future profitability
- Forecasting of penetration is relatively robust
  - But understanding long run penetration is vital
- Forecasting the usage of current customers is harder
  - Difficult to get adequate elasticity estimates

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Measuring Customer and Service Profitability – Session 4

Coleago Consulting Ltd
Martin Duckworth, Director
29 November 2004

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Agenda

- Regulatory Cost Modelling
- Commercial Case Studies

Regulatory Cost Modelling

Regulatory Cost Accounting

- Regulation has been a key driver for the development of cost accounting systems in many fixed incumbents
- Beginning to be introduced into the mobile market

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Regulatory Cost Accounting has been used for a variety of services

- Fixed interconnection prices
- Mobile call termination
- Fixed retail pricing
- Wholesale access services
  - Bitstream access to ADSL
  - Unbundled local loop

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Objectives of regulatory service costing from the perspective of the regulator

- Enabling competition
- Sending correct pricing information to wholesale customers and end users
- “Fair” distribution of costs
- Provide incentives for efficient investment
- Predictability

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Relationship with between retail and wholesale

- The margin between retail prices and wholesale prices is critical for competition
  - Arbitrage opportunities if margin is too high
  - “Margin squeeze” if margin is too low
- Costing methodologies should be consistent
  - Ensure margins reflect cost
  - Prevent double recovery or under-recovery of costs
- Incentive regulation with interconnection prices may be difficult
  - In fixed they are a small proportion of revenues
  - In mobile the “waterbed” effect may mean the impact on profitability is limited

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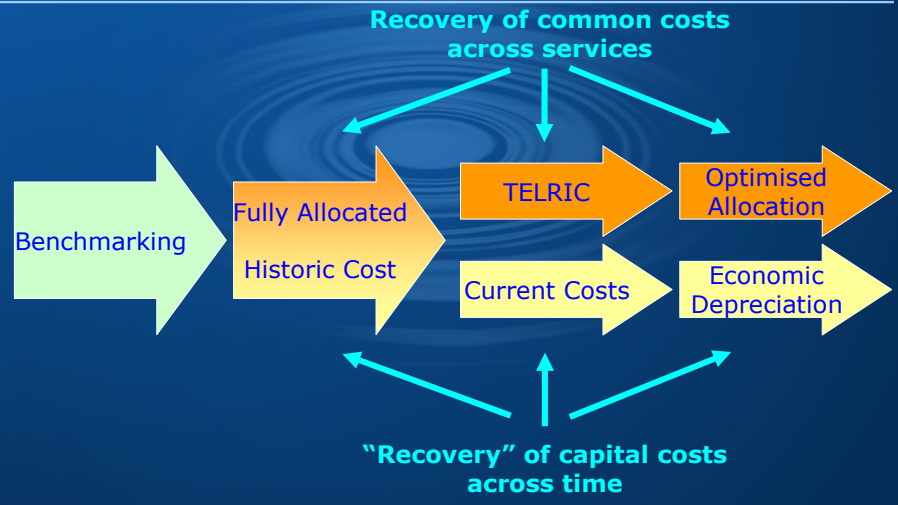
Most regulators take an evolutionary approach to move towards the objectives



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Benchmarking

- Simple benchmarking is quick and easy to carry out
  - Useful to spot if the results of a service costing exercise are plausible ("tall poppy" approach)
  - Benchmarking against neighbouring countries ensures that cross border payments reflect traffic flows
- Where nothing else is available it may be the least worst solution
  - It may form a useful provisional rate while cost accounting work is ongoing

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Benchmarking Problems

- Benchmark data may not be available
  - For example if the service is not regulated in other jurisdictions
- Costs vary between operators for a range of reasons
  - Efficiency
  - Level of GDP per capita (feeding through into capital vs labour decisions)
  - Size of operator
  - Population density
  - Calling rates (MoU)
  - Geography
- Fully controlling for all of cost differences would require the construction of a bottom up engineering model

Basic Service Costing (Fully Allocated Historic Costs)

- Producing a basic service costing methodology as part of an Accounting Separation framework is relatively straightforward
  - Data is readily available
  - “best practice” is well established
- Fully allocated historic costs have known deficiencies
  - Allocation of common and joint costs will be somewhat arbitrary
  - Provides no information on whether costs are efficiently incurred
  - Historic costs may be a poor estimate of the current value of long life assets

Current Cost Accounting

- CCA adjusts the current value of assets to reflect current replacement costs
  - Depreciation also adjusted, and generally holding gains and losses are calculated
- Requires information on current prices (Direct Approach) or historic price trends (Indexation)
- Effect of CCA is to shift the recovery of costs within the lifetime of the asset

LRIC

- It has become dogma that LRIC models are the best way to set interconnection prices
- LRIC requires a better understanding of cost volume relationships which can lead to identification of inefficiencies
- Many LRIC implementations ultimately allocate costs in a similar way to Fully Allocated Costs
  - Element Based Costing (Total Element LRIC)
  - Equi-proportionate mark ups of common costs

Top Down vs Bottom Up Models

- Regulators have used both bottom up and top down LRIC models
  - "Bottom up" starting with a clean sheet of paper
  - "Top down" based upon the existing network structure
- Dual approach has been preferred with reconciliation between the two models
  - Top down models may include inefficient investment
  - Bottom up models tend to over simplify

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Optimising the Allocation of Common Costs

- In simple LRIC models the allocation of common costs may be sub-optimal in economic terms
  - Allocation implicitly based upon Equi-Proportionate Mark ups (EPM)
- Ramsey prices are often suggested, with allocation of common costs based on price elasticity
  - Price elasticity for telecoms services are notoriously difficult to measure
  - Unclear whether "Ramsey prices" are truly optimal in a dynamic market
- Ad hoc adjustments may be made, for example for "network externalities"
  - Again the accuracy and relevance of such adjustments is open to discussion

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Economic Depreciation

- Straight line depreciation results in the high capital costs early in the life of assets
  - Typically when utilisation of assets is at its lowest
- Economic depreciation sets asset value to be equal to the discounted free cash flow generated by the assets looking forwards
  - For regulated services this results in a circularity
- When implemented by regulators, economic depreciation is typically set with a stable capital charge (annuity) or stable unit cost

Points to note

- Even in the most developed markets, few regulators have "optimised" prices using economic depreciation and optimised allocation of common costs
  - Limited resources
  - Lack of powers
- More developed methodologies require more resources and are also less precise
  - Raising the risk of challenge
- Changing methodologies, especially for depreciation, may result in discontinuities
  - Holding gains or losses

The choice of costing methodology will also depend on service to be regulated

	Fixed – core network	Local loop	Mobile network
Competition enabler?	Yes	Yes	No
Network competition?	Yes	Limited	Yes
Wholesale as %age of revenues	Low	Low	High
Position in lifecycle	Mature	Mature	Maturing
Asset lives	Medium	Long	Medium
Upgrade cycle	Continuous	?	Cyclical
Bottom up models	Simple	Difficult	Difficult

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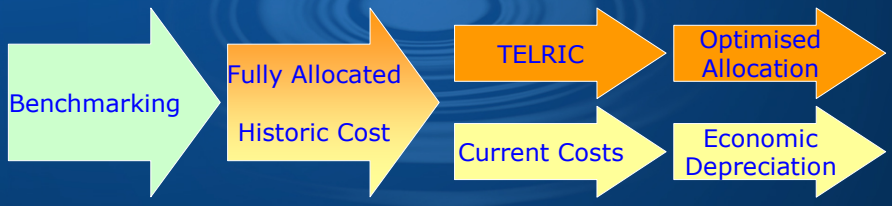
Summary

- Regulatory service costing is an ongoing process
  - There is always scope for improvement and optimisation



- How far along the road to go is a question of balancing the (incremental) costs and benefits

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Case Studies

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Case Study : New Entrant Mobile Operator Background

- Entered during a period of exponential growth
  - Subscriber base doubling in a year
  - Heavy handset subsidies
- After growth had slowed conducted a CLV exercise
  - Found that around half of the customers acquired were worth less than acquisition cost

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Case Study : New Entrant Mobile Operator Actions

- Reduced handset subsidies for pre-pay
  - Offset by falls in handset costs
- Introduced a retention scheme for pre-pay

Case Study : New Entrant Mobile Operator Results

- Reduction in churn rate
  - Retention scheme
  - Reduction of handset subsidies means that there is less incentive to disconnect and reconnect to get a new handset
- Increase in CLV for acquired customers
  - Reduction in SAC
  - Reduction in churn rate boosts expected life and hence CLV

Case Study : New Entrant Mobile Operator
Lessons

- Once customers are acquired, profit maximisation requires extracting the most value possible from them
  - Value can be increased by reducing the churn rate
- However estimating CLV before customer acquisition is preferable

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Case Study: Large Monopoly Operator
Background

- Conducted a FAC costing exercise
- International call services found to be the most profitable

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Case Study: Large Monopoly Operator Actions

- Concentrated resources on international network
  - Increased budgets for international network (international gateway) at the expense of other parts of the network

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Case Study: Large Monopoly Operator Results

- Profitability of international calls was reduced
- Poor quality of services in the national network led to sharp loss in market share when competition was introduced
  - Congested national network meant that customers were unable to make international calls

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Case Study: Large Monopoly Operator
Lessons

- High profitability is not an excuse to increase costs
  - Profit is never too high
- Focus on the customers generating the profits, not the network infrastructure

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Case Study : Second National Operator
Background

- Launched offering services to business customers only
- Conducted a costing study which found that its unit costs were higher than the incumbent
  - Network was “empty” outside office hours
- Entered the residential market to lower overall network costs

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Case Study : Second National Operator
... A number of years later

- Market beginning to be liberalised
- FAC costing exercise shows that the majority of profits come from business customers
- Exits the residential market
  - Concentrate on “core business”

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Case Study : Second National Operator
Results

- Rapid decline in market share as no longer price competitive
- Other new entrants had lower network costs
  - Used wholesale channels to service residential customers

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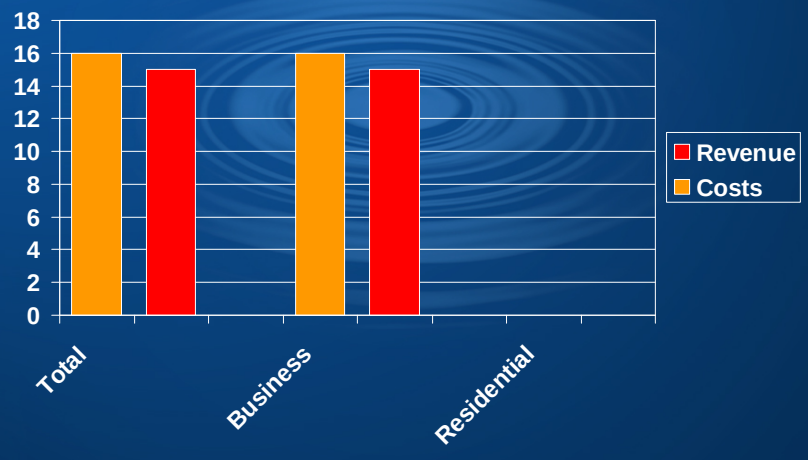
Business customers alone were a marginal business



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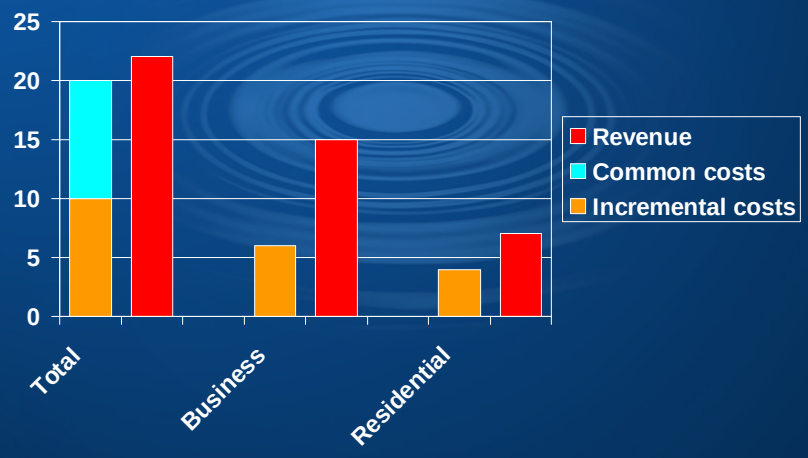
But a significant proportion of costs are fixed if residential services are launched



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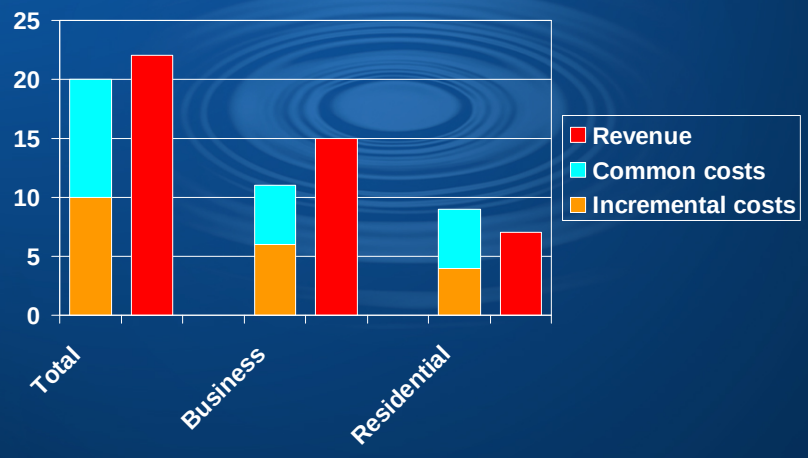
However on an FAC basis residential customers appear to be unprofitable



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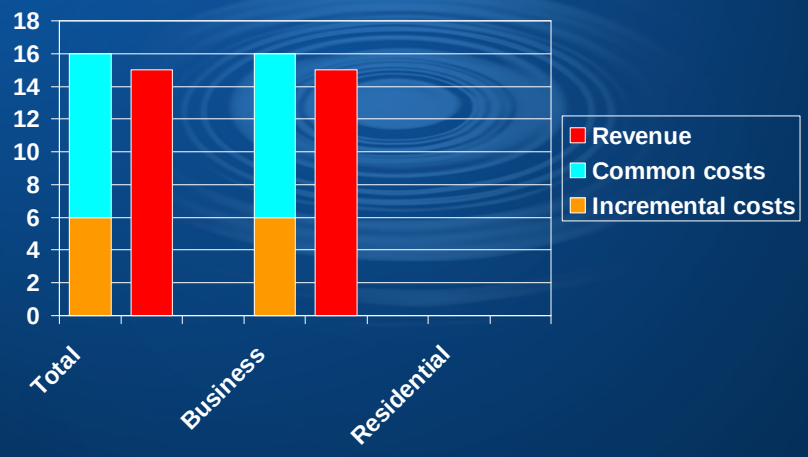
Dropping residential customers brings us back to the beginning



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Case Study : Second National Operator Lessons

- Understanding which costs are fixed is vital for making decisions about expanding the business
  - Any new business that covers its incremental costs and makes a contribution to common costs increases profitability
- Incremental cost, not FAC, is the correct basis for making decisions about exiting businesses
  - Although we should also take into account the opportunity cost of management time

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Case Study: Wholesale International Voice Provider Background

- Following liberalisation in Europe there were a large number of competing operators offering wholesale international voice services
- While some operators where pure wholesale players, others used wholesale as another channel to market
- Operators built (or leased) competing international switching and transmission networks
  - High fixed costs

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Case Study: Wholesale International Voice Provider Actions

- In order to attract customers, operators used “forward pricing”
  - Setting prices based on their forecast future cost base, not the current cost base
  - As long as prices were above “forwards” incremental cost, the customer was profitable
- Aim was to build scale rapidly
  - “Get big fast”
  - Investors were also more interested in revenue growth than profitability

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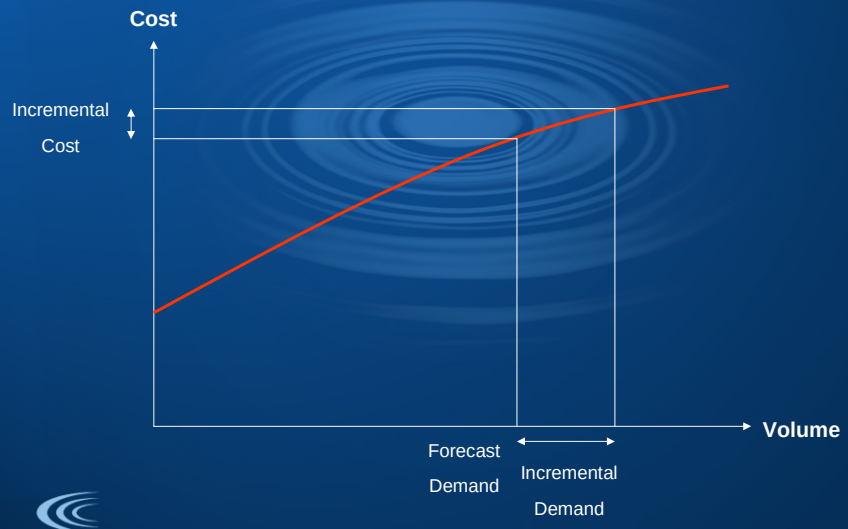
Forward pricing “theory”



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Case Study: Wholesale International Voice Provider Results

- Providers became engaged in a vicious price war
  - In the wholesale market there is little customer loyalty
- New entrants built bigger networks
  - Lower “forward” incremental costs
- Prices got driven down to incremental cost

Case Study: Wholesale International Voice Provider Lessons

- To successfully enter a market with high fixed costs, you need to have (or develop) pricing power
  - To prevent prices being driven down to incremental cost

Summary - Case Studies

- Setting strategy is difficult
- Profitability analysis can help inform strategy
- If misused profitability analysis can mislead

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