Learn Chemistry

Commercial Skills for Chemists: Market Research

Student Pack

Developed by Professor Colin Pulham, University of Edinburgh and Kevin Parker, KKI Associates Ltd

This resource was produced as part of the National HE STEM Programme

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Student Pack

Markets and Researching them

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Markets and Researching them

- Overview
- Task Briefing
- Lecture Resources
- Other Materials

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Markets – Task Briefing

- You are a group of technologists working for *Mega Chemicals plc*. Your work is to evaluate new technologies and recommend which ones *MegaChem* might wish to take to market. 5 new projects that *MegaChem* are interested in can be found on the following slides
- Your task, as a team, will be to produce an market analysis of 2 of the potential projects identifying:
  - the value proposition or unique selling point of the technology
  - the technical *features* or targets required by the users of the technology
  - a list of potential users/customers of the technology
  - a plausible business model for selling/delivering the technology to customers/users
  - an estimation of the potential sales of the technology
- To help with your decision making you have access to lecture material, academic papers, a book, and two short videos

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Hints…

- 'Your task, as a team, will be to produce an market analysis of 2 of the potential projects identifying:
  - the value proposition o… …nology
  - the technical *features* … …of the technology
  - a list of potential users…
  - a plausible business mode… …ing/delivering the technology to customers/users
  - an estimation of the potential sales of the technology'

JUSTIFY THESE NUMBERS!

- You should:
  - Do a library search using technical and commercial publications
  - Review on-line sources including Market Research Journals
  - Identify and review Trade Publications and Trade Associations
  - Ask the tutors for help
  - Pay very close attention to the points raised in the 'Chemistry Stock Market' game
- Your output should be two reports in consistent format so that the two projects can be readily compared

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The New Projects…

Here are the 5 projects MegaChem are interested in…..

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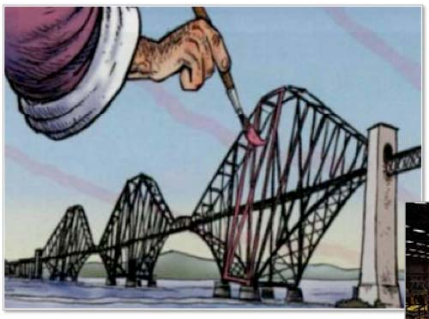
Project 1 Anti-corrosive pigment



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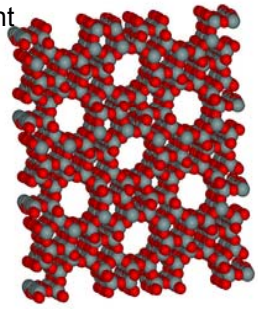
Project 1 – Anti-Corrosion Pigment

- We have discovered a better anti-corrosion pigment using zeolite to encage zinc chromate
- Corrosion costs $1trn in US alone!
- Zinc chromate is a well known effective anti-corrosive that is restricted in use because Cr^{VI} is toxic in the environment
- Because our pigment encages chromate anions, it provides the anti-corrosive benefits without the toxicity issues
- We recommend reviewing the opportunities for developing and commercialising this pigment



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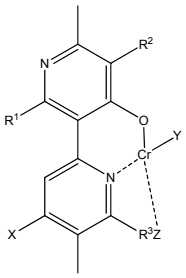
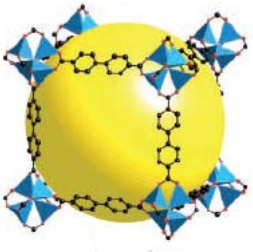
Project 2 Methane Oxidation Catalyst



Catalyst Facts:
Turn over Number:
15Million
Turn over Frequency:
1.5kat
Synthetic Cost:
18000$/kg



8.8x10^7 m^3 methane

1.2x10^5 T methanol

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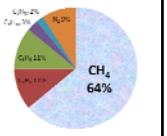
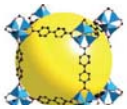
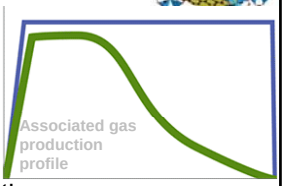
Project 2 – Methane Oxidation Catalyst

- We have a chromium catalyst that can convert methane t methanol at mild conditions
- Methane (natural gas) is difficult and expensive to transport over long distances, while methanol liquid is much cheaper and easier to move
- Commercial Opportunities could include
  - Major methane gas fields around the world
  - Potential to reduce flaring of associated gas
  - Exploit methane hydrates in arctic waters
- We need to assess and prioritise these opportunities







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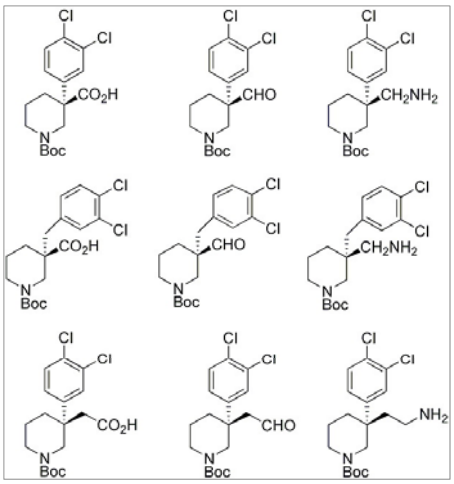
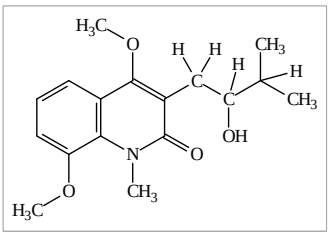
Project 3 New antibacterial synthesis





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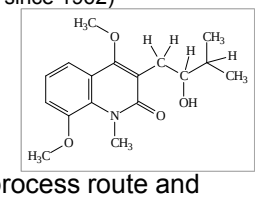
Project 3 New antibacterial synthesis

- We have a new route to synthesizing specific enantiomers of intermediates and drug candidate molecules
- Using specific enantiomers avoids some major potential side effects caused in drug trials by the presence of the opposite enantiomer
  - See ‘thalidomide’
- In particular, we have a route to an enantiomer of lunacridine, which has potential anti-bacterial activity
  - Lunacridine could be the precursor of a whole new family of antibiotics, the first major discovery since 2000 (which was the first since 1962)
  - Constant demand for new antibiotics
  - World market around $15bn pa



- We would like to determine the value of the process route and the new antibiotic candidate

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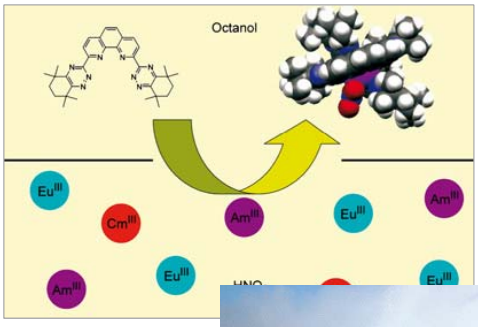
Project 4 New Separation Technique



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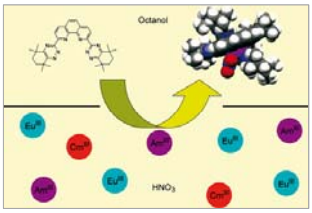
Project 4 New Separation Technique

- Lanthanides (‘rare earths’) and actinides are chemically similar and hard to separate
  - Lanthanide fission products are a problem in nuclear waste
  - Thorium is a contaminant in lanthanide mining
  - Lanthanides have interesting magnetic properties and important industrial uses



- We have discovered a new phenanthroline-derived ligand that can separate actinides (Th, Am, etc) from chemically similar lanthanides
- We plan to explore opportunities in both nuclear waste decontamination and clean-up of rare earth mines

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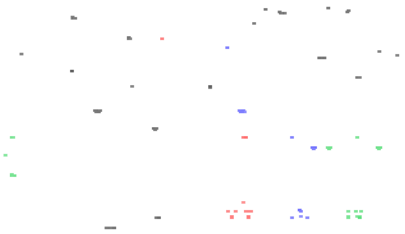
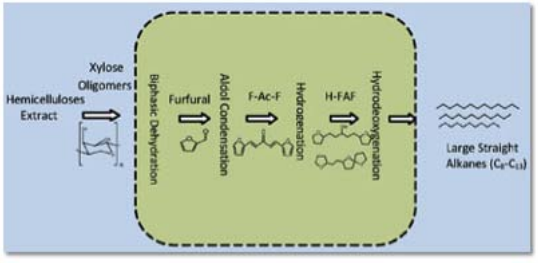
Project 5 Bio-diesel from Lignin





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Project 5 Bio-diesel from Lignin

- There are few current processes for making Jet Fuel from Biomass sources
  - Demand for Jet fuel around 5million barrels/day
- We have a multiple step process that converts lignin hemicellulose to C_8-C_{12} paraffins suitable for Jet Fuel
  - Lignins are major constituents in certain tropical and temperate plants
  - Other biomass process tend to make lighter paraffins not C_8-C_{12}
- We recommend further study of the economic and logistics of this process

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Markets and Researching them – Lecture Resources

- The following slides are from an approximately 2 hour workshop on Markets and Market Research given to chemistry students at a UK University in 2012
- You may read or use as much of this material as you like, working through the exercises if need be, to help you produce your assignments
- This lecture is available on video at http://www.youtube.com/embed/0J5jd6JE6zc?feature=player_detailpage

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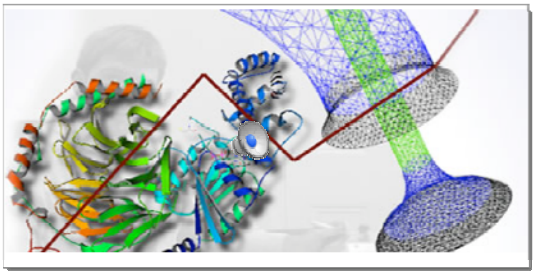
‘Finding out what people want’
Market Research Skills in Chemistry/Environmental Science



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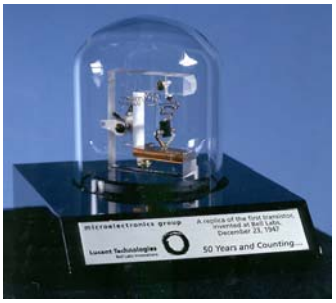
Chemistry in the 20th Century



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Benefits from Chemistry

The benefits from 20th century chemistry:

- The invention of the transistor radio
  - 'I can listen to the music I like where I like'
- Ammonia plant
  - 'we can feed the world so much more cheaply'

- Antibiotics
  - 'they can keep me healthy when I would have been sick for years'
- Mini cars and mini skirts, polymers and petroleum
  - 'it really makes me feel good to have/wear something so fashionable'

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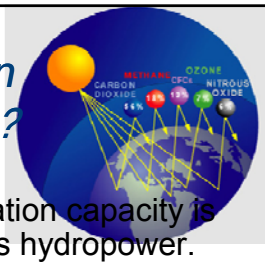
Potential Benefits – Green Issues?



- The world's current installed power generation capacity is around 4000GW, 22% renewables such as hydropower. What is the forecast demand for 2030?
- The UK's largest contribution to carbon emissions comes from one sector which produces 40% of the total emissions. What sector is that?
- What is the difference in energy efficiency between the best and worst office buildings?
- How much of all the food purchased in the UK is wasted?
- How much land is needed to grow enough biofuel to power a jumbo jet?
- Would we be better using that land to install photovoltaics or other forms of renewable energy?

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Potential Benefits – Chemistry and Medicine?

- What can beans and peas do, for free, at room temperature and pressure, that costs us a billion dollars a time?
- Why has contamination from rare earth mining been discussed in the Daily Mail?
- Why has the solution chemistry of the actinide elements become important over the last 30 years?
- What is so important about the gas-phase reaction between methane and hydroxyl radicals?
  - Can you do anything with natural gas (methane) except burn it?
- What portion of the patent life of a drug is used up before the drug gets to market?

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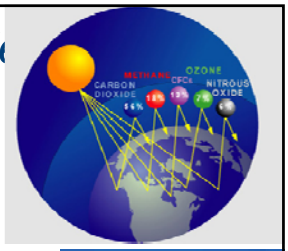
Chemistry Opportuniti



- Transport – fuel cells batteries (enough Li?), H_2 storage
- CH_4 emissions (& clean-up in atmosphere)
- Substitutes for rare earth magnets
- PV - efficiency, a-Si/µc-Si, CdTe
- CCS – CO_2 absorption, reservoir chemistry
- Power Transmission – spikes and troughs in supply, super-conductors
- Building insulation – 40% UK CO_2 from buildings, glass - Temperature control or energy gain?
- Nitrogen fixation
- Methane Methanol conversion
- Chemical description of AGW
- Cheaper ways to clean/distill water
- Nuclear waste

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Marketing Jargon

Market research
- Analyses opportunities to benefit people

Unique selling proposition
- Developing and articulating a benefit

Product Development/Management
- Delivering the benefit profitably

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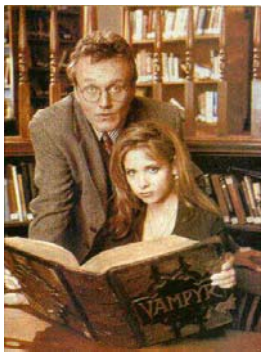
Types of Market Research

- Secondary – 'desk' research
  - internet, library work
  - 'Finding out what's already there'
  - Inexpensive, potential issues of quality
- There are many market research companies whose reports are available on-line or via libraries
  - Datamonitor
  - Keynote Reports
  - Mintel
  - Frost & Sullivan



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Types of Market Research

- Primary – actually talking to people!

- Qualitative: ‘finding out what they might want/need’
  - Small number interviews
- Quantitative: ‘finding out how much you will sell?’
  - 100+ interviews, big Research Companies (Neilson, MORI, etc) - V. expensive!

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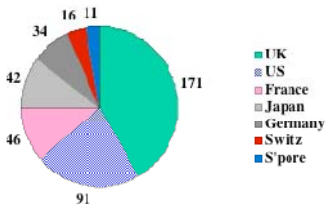
Desk Research (Scoping Studies)



- 'Potential or Total Market is £xm'
- Who is buying and who is selling
- Competitors
- Patents
- Sometimes price information
- Tells you if the project is a non-starter!

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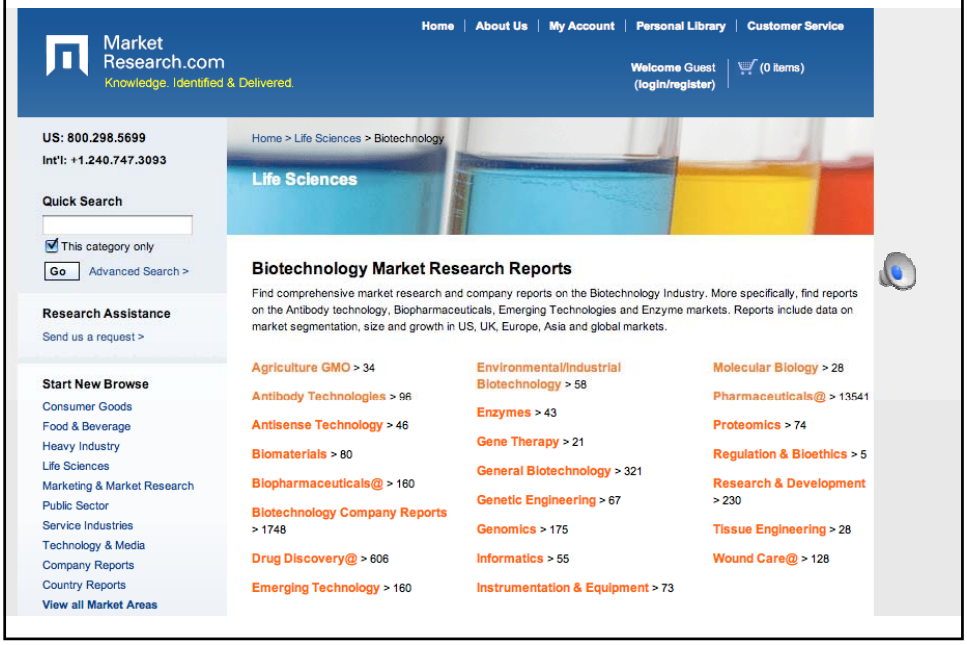
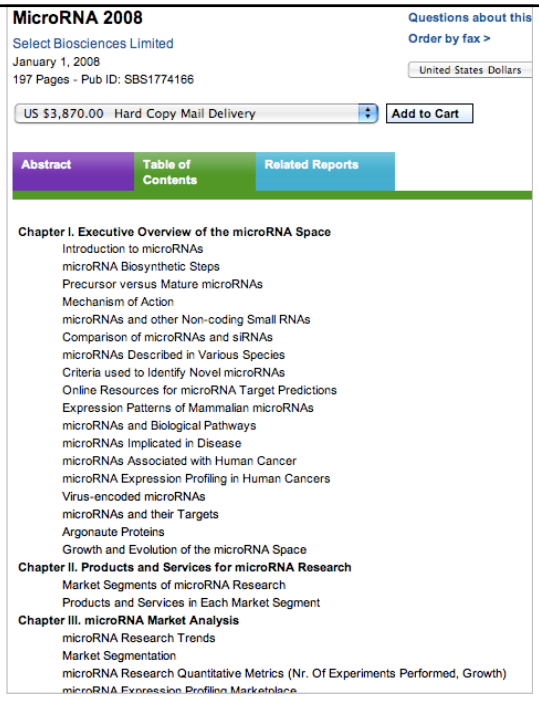
Finding Market Research Reports…



It might cost a lot…

- But you can get the contents page for free!
- Sometimes the absence of a chapter can tell you what you need to know!



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Desk Research - Market Potential

- We have a technology that could tell whether blood supplies (for transfusion) have been contaminated with v-CJD prions
- The UK blood transfusion service spends £70m pa on treating blood to remove prions
- The maximum market potential for technology in the UK is therefore £70m pa

- Around 2.5 million units of blood are collected pa
  - What does this imply for the per unit cost of a diagnostic test?

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Desk Research – Players and Competitors

- Some of these companies may have technologies that compete with us
- Some might want to buy from us!

Medical Equipment Manufacturers
www.themedweb.co.uk/manufacturers/
18 Jan 2011 – Comprehensive listing of **medical equipment manufacturers** in the **UK**.
M - NOP - QR - S

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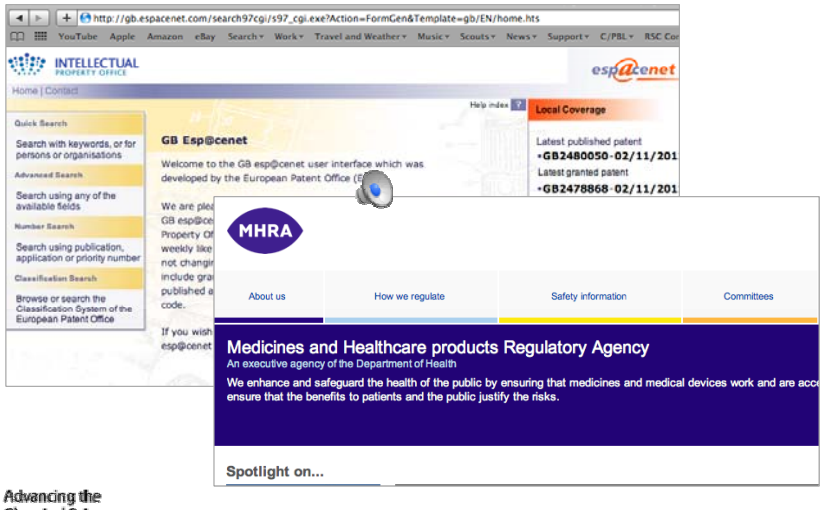
Desk Research – patents and regulation

- Esp@cenet, MDA



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Desk Research – reasons not to do the project!

- Legislation, competition

Sulfur Hexaflouride

Due to its extreme global warming potential, the California Air Resources Board (CARB) passed a regulation restricting Sulfur Hexafluoride (SF6) gas emissions, pursuant to the California Global Warming Solutions Act of 2006. *This rule places a ban on the sale, use, and release of SF6* for processes not specifically exempted in Title 17, section 95341 of the California Code of Regulations (17 CCR 95341).

Microsoft poised to enter virtual lab market: News in brief

Alex Barrett, News Director

Published: 26 Mar 2010

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Qualitative Market Research

- Identify concerns and potential benefits to users, formulate product offering & specification
- Value chain
- Potential Business Models
- Market segmentation
- User operability – 'chicken-gun test'
- Perhaps identify leads or launch customers

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Qualitative Market Research

- How to do it - process
- Structured interviews, open-ended questions
  - Don't read out the questions, but use the questions to guide a conversation
- 'Five phones calls trick' or six degrees of separation
- Talk to Trade Associations and Journals
  - e.g. Chemical Industries Association, Society Motor Manufacturers and Traders
  - Can find these during desk research
- Similar skills used in networking and job-seeking

Person	
Organisation	
ISSUE 1 - DEFINING THE NEED	
How common is tree root damage in this country?	
What kind of problems are caused by root damage – is it subsidence or other factors ?	
Does root damage cause expensive problems for councils?	
Are there 'on-costs' or secondary impacts (eg being unable to use an office or shop)?	
Could the costs be reduced by better information?	
Are there any things you'd	

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Things we can find out by asking

- How difficult is it to make chiral intermediates?
- What size tumours might we be asked to detect?
- Can we accept any false positives or false negatives?
- Would you prefer to buy or lease this piece of hardware?
- Would you pay more/less for a different spec product?
- Who actually makes the buying decision in your organisation?
- If your organisation was interested in our product or service what would be the validation/approval process and how long would it take?

Is there anyone else I should be talking to……?

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Segmentation in anticorrosive pigments...

Bridges, Cars, Airplanes, White Goods, Subsea, touch-up

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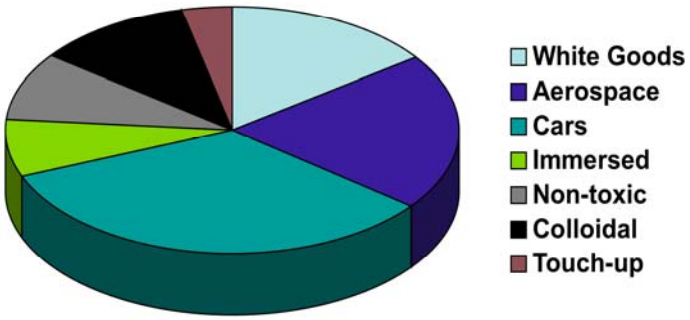
Segmentation...



Types of anti-corrosive pigment

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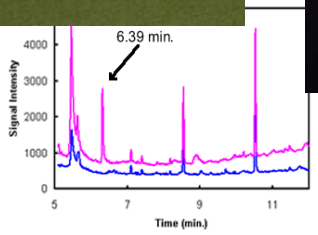
The Business Model



- Who will we send our first invoice to?
- What will it say we've done for our payment?
- Who approves the payment?

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The Drinks Industry

- Sells Product – 'Scottish Whiskey'
- Lets other people brew or blend – Fosters
- Sells raw materials for blending – Coke
- Licenses its intellectual property – trademarks
- Does testing, plant design, consultancy
- Different 'business models'

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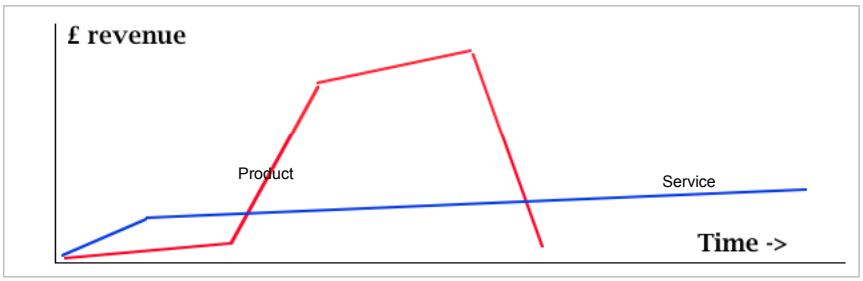
Selling Products or Services

- Products – selling physical 'stuff'
- Services – 'selling people' for testing, consulting, design
- New Products tend to have shorter life-cycle, services may have more durable cash-flow…



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Business Models for Chemical Companies

- **Sell products**
  - Fertilzers, plastics, polymers, pharmaceuticals and intermediates, raw materials, reagents
- **Sell services**
  - Contract research and development – synthetic routes
  - Chemical molecule design management
  - HSE management
- **Sell licence(s)**
  - Design a product and sell the right to make it to someone else
- **Sell the company**
  - Small molecule development company sells out to larger 'big pharma'

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Business Models For Cleantech

- **Sell products?**
  - Big money e.g. wind turbines
- **Sell services**
  - Testing, analysis (e.g. water quality)
  - Wind turbine quietening
- **Sell technology licence(s)** 
  - e.g. power generation, better processes
- **Sell to NGO's**
  - e.g. Gates Foundation
- **Sell to Government, HSE/EPA**
  - Standards, pollution control testing

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The Distribution or 'Value Chain'

- Manufacturer sells at: £0.75
- Importer, sells at: £1.20

- Wholesaler, sells at: £2.50
- Retailer, sells at: £6.00

User

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The Distribution or 'Value Chain'

- Manufacturer sells at: £0.75
- Importer, sells at: £1.20

- Wholesaler, sells at: £2.50 → Plumber
- Retailer, sells at: £6.00

£60!

User

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The Chicken-gun Test..

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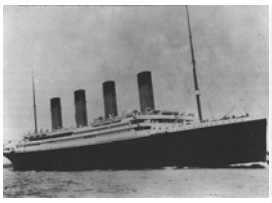
The Chicken-Gun Test



- Rolls-Royce went bankrupt in 1970 after the RB211 failed bird strike tests
- Test involves firing (dead) chickens from a special catapult into the engine - the 'chicken-gun' test
- THE ESSENTIAL PRACTICAL TEST FOR USER OPERABILITY
- All development projects feature a chicken-gun test
- Must be identified and addressed early in development
- Examples include
  - Operating in cold weather (Titanic, Space Shuttle)
  - Operating in bad weather (oil platforms military equipment)
  - Not being fragile (laptops, electronics, anywhere that vibrates)
  - Usability (dial size, handles, not smells, not dangerous etc)

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Classic Flaws in Current Projects

- E-commerce - delivery, payment
- Biotechnology - time for development and regulatory approval
- Environmental/renewables - who benefits and who pays
- Software - managing the development team
- Computer games - managing 'feature creep‘

also

- 'Time to sell' to big customers
- Not enough money/staff for sales
- 'One product companies’

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Please critique these statements!

- The market for paint pigment is $10bn! If we can get 1%, that’s $100m!
- Millions of people in Africa need a diabetes drug, there is a vast potential market for us…..
- No-one wants speech recognition software - sales in 2006 were only a few million dollars
- At IBM we only expect to sell a few mainframe computers per year

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Summary

- *A COMMERCIAL OPPORTUNITY EXISTS WHERE YOU CAN PROVIDE PROFITABLE BENEFITS TO ENOUGH PEOPLE WHO CAN AFFORD TO PAY FOR THEM*

Also

- Vast amount of information 'out there' - much is free
- Need qualitative and quantitative information
- Distinguish potential market from served market
- Never believe 'top-down' market analysis……
- Never homogenous - look for segmentation
- Usually there are formal and informal market requirements - look for the chicken-gun test
- Get the right business model

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Team Task…

- Reports should be:
  - A Powerpoint or similar presentation, perhaps with some added tables or text boxes
- More marks will be awarded for the quality of reasoning than the quantity of text produced!

We found these interesting facts!

Great, now explain what they mean for the project!

Developments and Issues	Impact on project - action required?
Tree Pathogen Detection Local authority tree officers are also interested in early detection of disease in specimen trees, and feel vulnerable to new diseases coming to the UK as a result of globalisation(imports and non-native species) and climate change.	Investigate as part of contacts with Scottish Tree Officers Group
A consultant who works with many tree officers, commented that while Phytophthora could be detected by observation and ELISA kits, it was difficult to distinguish between the different types/species of Phytophthora. A test that could do this would be very useful, as the different species required different treatments for the trees. Other difficult to characterise diseases were Armillaria and Meripilus.	Can we distinguish the different types of phytophthora, especially if all are present, and the tree has pythium or ustulina as well?
The Technical Officer at the Arboricultural Association was particularly interested in potential tests for Meripilus, Armillaria, and the Ustulina fungus, all of which are hard to detect, even by	The AA have a conference in Birmingham on May13 - could we send someone to talk to that

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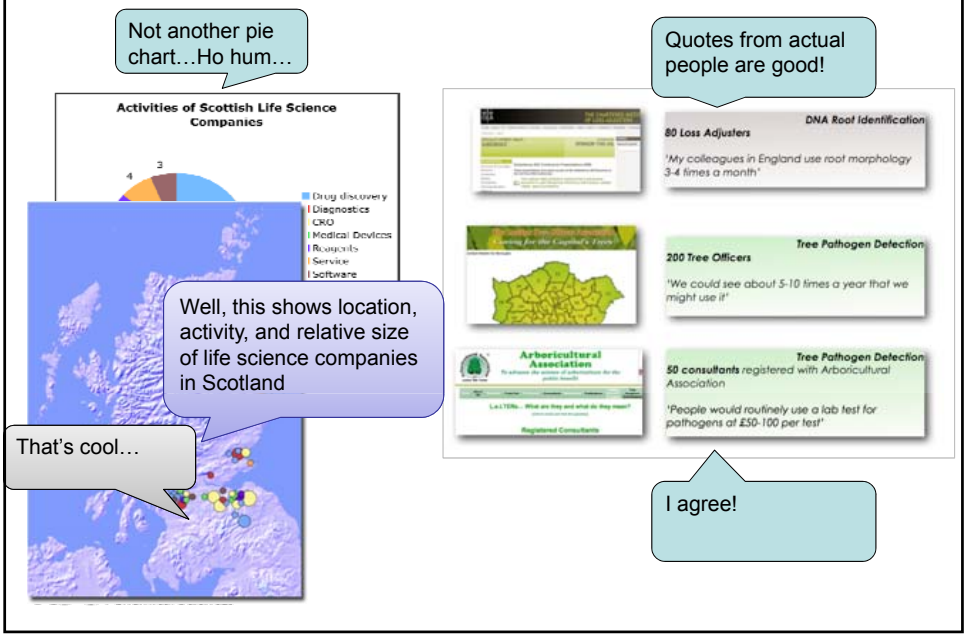
Present your information in Interesting Ways!



Market Research – Other Resources

- Video: *What Makes a Good Commercial Invention?*
  - http://www.youtube.com/watch?v=ArJvmjGfNVg
- Video: *The Difference Between Features and Benefits*
  - http://www.youtube.com/watch?v=stv3ePGNBcE

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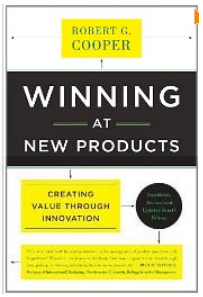
Market Research – Other Resources

- Paper: Great Mistakes in Technology Commercialisation
  - *Journal of Strategic Change, Volume 10, Number 7, pages 383-390, John Wiley & Sons, (November 2001)*
  - Download here:
    - http://www.rsc.org/learn-chemistry/content/filerepository/CMP/00/001/419/Great%20Mistakes.pdf

- Book: Winning at New Products, Robert G Cooper
  - Basic Books; 4th edition (28 July 2011)
  - ISBN-13: 978-0465025787
- Journal: Chemistry World, published by Royal Society of Chemistry, all/any editions from 2010 and 2011
- Chemical Stock Market Business Game – see next slide



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Selling the idea

- *Who do I need to do the project?*
- *Who else needs to know about it?*
- *Who shall I talk to?*

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Selling 'Big Ideas'...

- **Homework**
- **Network**
- **Spadework**

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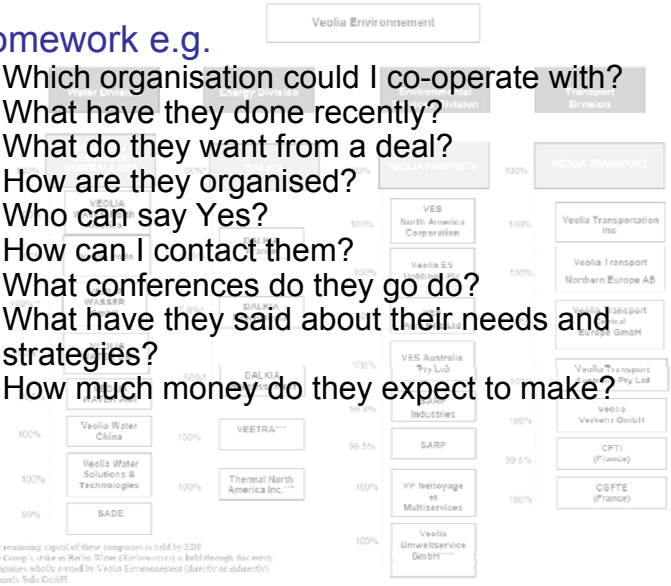
Selling 'Big Ideas'...

- Homework e.g.
  - Which organisation could I co-operate with?
  - What have they done recently?
  - What do they want from a deal?
  - How are they organised?
  - Who can say Yes?
  - How can I contact them?
  - What conferences do they go do?
  - What have they said about their needs and strategies?
  - How much money do they expect to make?



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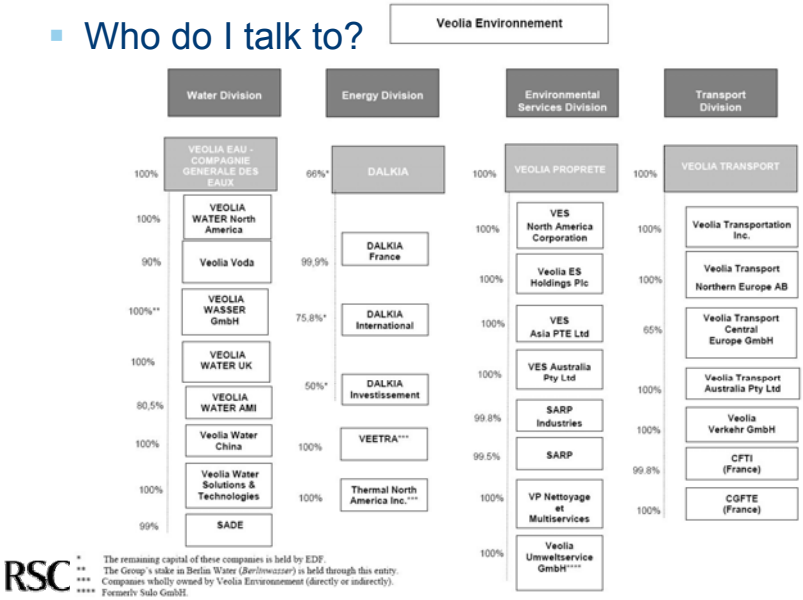
Selling 'Big Ticket' Items…..

- Who do I talk to?



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* The remaining capital of these companies is held by EDF.
** The Group's stake in Berlin Water (*Berlinwasser*) is held through this entity.
*** Companies wholly owned by Veolia Environnement (directly or indirectly).
**** Formerly Sulo GmbH.

Selling 'Big Ticket' Items…..

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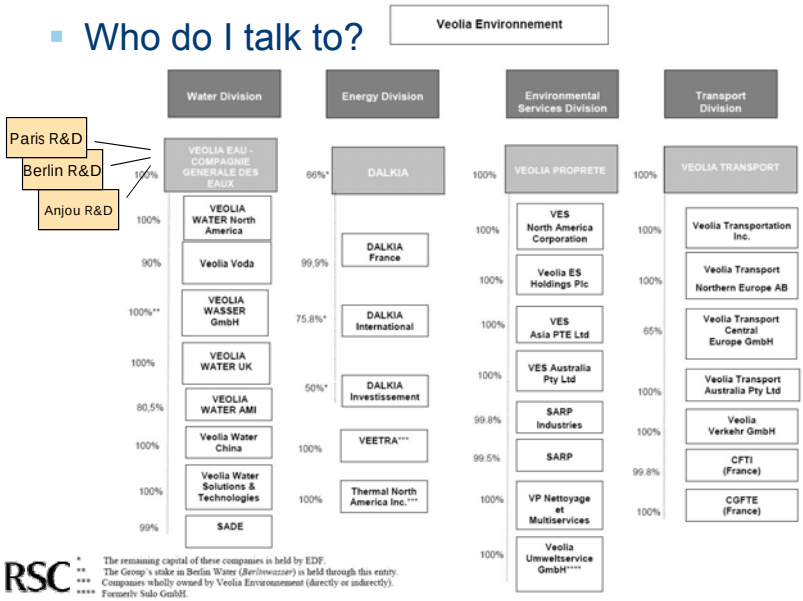

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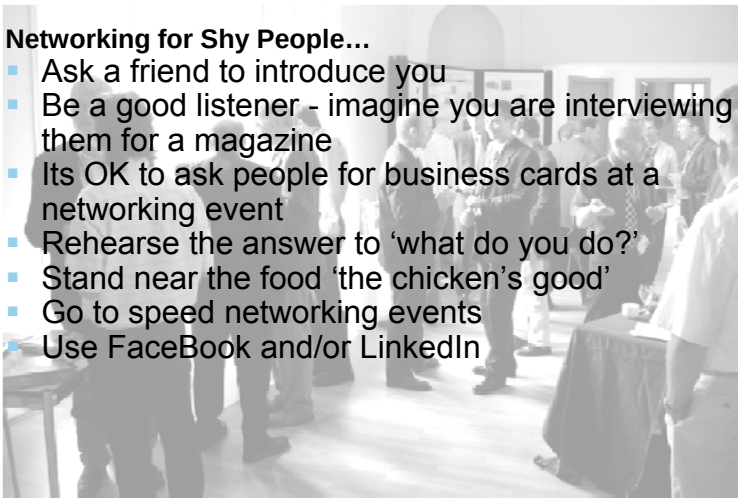
Selling Big Ideas…



Networking for Shy People…

- Ask a friend to introduce you
- Be a good listener - imagine you are interviewing them for a magazine
- Its OK to ask people for business cards at a networking event
- Rehearse the answer to 'what do you do?'
- Stand near the food 'the chicken's good'
- Go to speed networking events
- Use FaceBook and/or LinkedIn

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Selling Big Ideas…

Cold Calling…

- Ask to speak to the PA of the important person
- Be nice to the PA!
- Have an explanatory e-mail already prepared
- Call the PA back after an agreed time
- Be prepared to be scheduled at odd times!

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Selling Big Ideas…

The project pitch…(Spadework)

- Show you have done homework
  - 'we notice that you spend £3.5m a year on heating and we can reduce that'
- Focus the message
  - 'we are really good at reducing the carbon from old buildings…'
- Focus on benefits
  - 'we can deliver cost savings and greatly simplify your compliance process'
- Address potential worries or issues
  - 'in the event of overrun our fees are capped'
- Be prepared to do it over and over again
  - (17 times….)
- Identify your desired outcome
  - 'we'd like you to authorise a feasibility study into this project'

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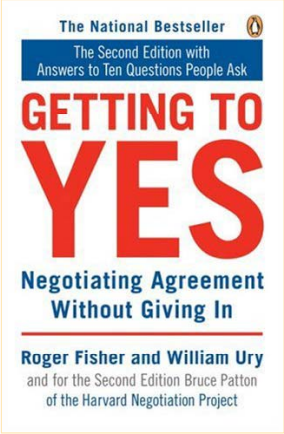
Selling Big Ideas…

The Negotiations…(Spadework)

- Get this Book!



- Be prepared to do it over and over again
  - (17 times….)

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It's the law…..

- A contract is in place once the two parties have agreed in writing to do business
- A offers something for sale, B says yes please
  - This is a contract
- Contracts don't have to be explicit
- 'Last T&C' applies

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Marketing Case Study - Shiny Teeth Ltd

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Graphics permission of Shiny Teeth Ltd

Shiny Teeth Ltd

- Two inventors have devised a novel way of making all-ceramic replacement teeth
- Most replacement teeth have metal cores; all-ceramic ones are expensive and time consuming to make and not approved by the NHS
- Ceramic cores have several advantages over metal cores, including durability, colour and non-toxicity
- The inventors have combined automated furnaces, CAD/CAM, and materials science into an 'instrument set' that transforms the making of teeth from a craft into a potentially large scale process
- We have been asked to estimate the market for their instrument set and advise on their business model

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The Market

- 3000 dental laboratories
- produce 2m teeth in the UK every year for 25000 dentists

- 30% (600k) of teeth are produced for private patients and are usually ceramic
- Each 'Shiny Teeth' instrument set can make 30,000 teeth per year
- So, the inventors believe that the potential market for their machine in the UK is 600k/30k = 20 sets. Are they correct?

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Distribution of Customer Size

- There are 2000+ small labs making 50-200 teeth pa
- Dental labs sell teeth to dentists for about £50 each
- There are around 600 big labs making over 1000 ceramic teeth pa

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Facts and Figures

- 1 skilled dental technician can make 200 teeth per year by current methods
- 1 dental technician can make 5-6000 teeth per year with 'Shiny Teeth' instrument set
- 1 technician's salary is £15,000 to £25,000
- Shiny Teeth Instrument set costs £15,000
- Instrument set needs annual servicing, consumes highly pure raw materials (silica)
- It takes an accountant about 2 hours (at about £100/hour) to prepare, check, print, post, and record an invoice

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Questions for Shiny Teeth

- Do we set up our own dental lab?
- Or do we sell instruments to dental labs?
- Or are there other ways of 'doing business'?
- *The way to start this problem is to consider how many customers (dental labs) would benefit from buying a 'ShinyTeeth' instrument set?*

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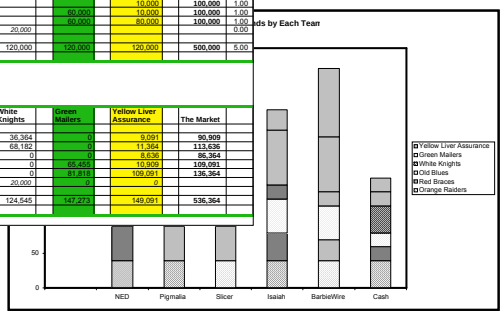
Stock Market Game

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	PERIOD 1 - GREEN ROUND: ORDERS																
2	Stocks	Shares in Circulation	Current Price	Orange Raiders		Red Braces		Old Blues		White Knights		Green Mailers		Yellow Liver Assurance		The Market	
3																	
4	NED	220,000	1	20,000		30,000		0		40,000				10,000		100,000	1.00
5	Pigmalia	220,000	1	20,000		30,000		30,000		60,000				10,000		100,000	1.00
6	Slicer	220,000	1	20,000		30,000		30,000						10,000		100,000	1.00
7	Isaiah	220,000	1	20,000		20,000		30,000				60,000		10,000		100,000	1.00
8	BarbieWire	220,000	1	20,000		10,000		30,000				60,000		80,000		100,000	1.00
9	Cash			20,000						20,000							0.00
10																	
11	Total (Checksum)			120,000		120,000		120,000		120,000		120,000		120,000		500,000	5.00
12	ZIT ANSWERS																
13																	
14	PERIOD 1 - GREEN ROUND: RESULTS																
15	Stocks	Shares in Circulation	New Price	Orange Raiders		Red Braces		Old Blues		White Knights		Green Mailers		Yellow Liver Assurance		The Market	
16																	
17	NED	220,000	0.91	18,182		27,273		0		36,364		0		9,091		90,909	
18	Pigmalia	220,000	1.14	22,727		34,091		34,091		68,182		0		11,364		113,636	
19	Slicer	220,000	0.86	17,273		25,909		25,909		0		0		8,636		86,364	
20	Isaiah	220,000	1.09	21,818		21,818		32,727		0		65,455		10,909		106,091	
21	BarbieWire	220,000	1.36	27,273		13,636		40,909		0		81,818		109,091		135,364	
22	Cash	40,000		20,000		0		0		20,000		0		0			
23																	
24	Total (Checksum)			127,273		122,727		133,636		124,545		147,273		149,091		536,364	
25																	
26																	



MegaChem has just discovered that 5 small start-up companies, involved in remarkably similar projects to the ones above, have launched on the 'Northland' Stock Market – how will they get on?

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