Internet Service Option on Trains: An Application in Belgium Railway

Jan Van Ooteghem
Ghent University — IBBT

12th Annual International Conference on Real Options: Theory meets Practice
Potential coverage problems

<table>
<thead>
<tr>
<th>Networks</th>
<th>URBAN</th>
<th>TUNNELS</th>
<th>RURAL</th>
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<td>Mobile network</td>
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<td>Wireless data network</td>
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<td>Satellite network</td>
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Outline

- Internet on trains
- Business model
- Real options

Flowchart business model

- Forecasting
- Technology assignment
- Cost-benefit model
- Evaluation

Forecasting

Delayed adoption model

- Adoption ratio 2006
- Adoption ratio 2007
- Adoption ratio 2011
- Adoption ratio 2015

Technology assignment

None - UMTS - HSOPA - WiMAX

Technology mapping

2006 - 2009 - 2012 - 2013

2008 - 2009 - 2012 - 2013
Flexible rollout scheme

Decision variables to adapt the rollout scheme
- Evaluation parameters (NPV, area cash flow, payback time)
- Uncertain input parameters (take rate, investment costs)
- E.g.

Rollout scheme possibilities

Real option results

5 year analysis
10 year analysis

Option value $1,350,796

Real option results

5 year analysis
10 year analysis

Option value $958,275

Conclusions & future work

- Internet on the train
  - New trials and commercial rollouts show feasibility
  - Research necessary for higher bandwidths and services
  - Combination of technologies required

- Real options analysis
  - NPV analysis: combination of UMTS+WIMAX networks
  - Sensitivity analysis: bandwidth and adoption must be decisive
  - Real options analysis
    - By introducing flexibility, NPV increased (uncertainty reduced)
    - Best results obtained for full UMTS and full WIMAX scenarios

- Future work
  - New simulations with better parameter values
  - Influence of business models on the overall costs

Thank you for your attention

Questions?

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12th ANNUAL INTERNATIONAL CONFERENCE
ON REAL OPTIONS:
THEORY MEETS PRACTICE

Rio de Janeiro, Brazil, July 9-12, 2008

DAY 1
Wednesday July 9, 2008
ENERGY/NATURAL RESOURCES, REAL ESTATE & INFRASTRUCTURE

8:00 Registration

8:20 Welcome/Orientation

ENERGY & NATURAL RESOURCES

8:25 WORKSHOP/PLENARY SESSION I
Real Options Applications in Natural Resources/Energy
Marco A.G. Dias, Petrobras, Brazil

9:00 Valuing, Optimizing and Understanding Managerial Flexibility:
An Application in Oil Expansion
Charles Dumont and Gregory Vainberg, McKinsey & Co, Canada

9:30 The Ethanol-Gas Flex Fuel Car: The Option Value of Choosing your Own Fuel
Carlos B. Pinto, Luiz Brandao and Mariana Alves, PUC-Rio, Brazil

10:00 Valuing the Option to Delay a Petrochemical Project in Brazil
Alberto M. Marques, Marco A. G. Dias, Petrobras, and Roberto M. da Silva Montezano,
IBMEC, Brazil

10:30 Morning Coffee Break

11:00 Option Value in Nuclear Energy Projects
Ulrike Lauferts and L. Van Den Dufpel, NRG, Netherlands

11:30 Valuation of Flexible Power Plants: An Application in the Brazilian Power Market
Alexandre Aronne, Haroldo G. Brasil, Fundacao Pedro Leopoldo, and Ivan Aronne,
CDTN, Brazil

12:00 ROUNDTABLE DISCUSSIONS BY INDUSTRY
A. Natural Resources/Energy/Real Estate Roundtable (G. Sick & L. Brandao)
B. Innovation/Manufacturing/Technology Roundtable (D. Paxson & S. Matthews)
C. Corporate Strategy & Portfolio Management (J. Kensinger & M. Pergler)

12:45 Luncheon

REAL ESTATE & INFRASTRUCTURE APPLICATIONS

2:20 WORKSHOP/PLENARY SESSION II
Real Options Applications in Real Estate/Infrastructure
Gordon Sick, University of Calgary, Canada

3:00 Optionality in Presale of Real Estate Development
Luiz Brandao, PUC-Rio, Brazil

3:30 Viability Study of a New Real Estate Venture in Brazil
Sergio M. Dos Reis, FNPP, Brazil

4:00 Afternoon Coffee Break

4:30 Optionality and the Role of Municipalities in Regional Development Projects in Finland
Mikael Collan, IAMSR, Ebo Akademi University, Finland

5:00 Internet Service Option on Trains: An Application in Belgium Railway
Jan Van Ooteghem, Ghent University – IBBT, Belgium

5:30 Flexibility in Fiber Deployment Network Planning: An Application to Belgian Network
Sofie Verbruggge, Gent University – IBBT, IBCN, Belgium

6:00 Closing Remarks

DAY 2
Thursday July 10, 2008
PORTFOLIO APPLICATIONS, MANUFACTURING/CONTRACT DESIGN AND STRATEGY

8:30 – 8:45 Welcome

8:45 PRESIDENT’S ADDRESS
On Multinationality Options and Performance
Lenos Trigeorgis, University of Cyprus and President, Real Options Group

PORTFOLIO APPLICATIONS

9:30 WORKSHOP/PLENARY SESSION III
Private Equity Acquisitions as Real Options Portfolios
John Kensinger, University of North Texas, USA

9:55 The Value of Land as Portfolio of Planting Flexible vs. Inflexible Crops
Nelson Ferreira, McKinsey & Co. Brazil

10:20 Morning Coffee Break

11:00 Valuing a Real Options Portfolio in the Petroleum Industry
Oscar M. Bravo, Luis Alfredo Mogollon and Jose Dario Parra, Ecopetrol S.A., Columbia
11:25 Performance Assessment of a Real Options Portfolio
Javier G. Castro, Tara N. Baidya and Fernando A. L. Aiube, DEI PUC-Rio, Brazil

12:00 Luncheon Keynote Address by Tom E. Copeland (MIT)
Financial and Real Options: My Complements and Your Substitutes

MANUFACTURING/CONTRACT DESIGN AND STRATEGY

1:50 WORKSHOP/PLENARY SESSION IV
Innovation, Manufacturing & Technology Investments
Dean Paxson, Manchester Business School, United Kingdom

2:15 License Contracts with Embedded Options to Expand and Withdraw:
The Case of Disc Flex Filter in Japan
Haruyoshi Ito, Keio University, Kenji Yamada, Coteau Vert Co. Ltd, and Akane Iwasaki,
Waseda University, Japan

2:35 Expansion Flexibility in Flexible Manufacturing Systems
Roberta Pellegrino, Politecnico di Bari, Italy

3:00 Flexible Processing Plant: Producing Vegetable Oil or Biodiesel in Brazil
Murilo Berne, FEA Minas, Jose A. de Sousa Neto, and Haroldo G. Brasil, Strategor,
Brazil

3:25 Afternoon Coffee Break

3:50 Auto ID (RFID) Deployment Configuration Design: An Application in
Aerospace Logistics
Victor Prodonoff Jr. and Tarik Driouchi, University of Cambridge, United Kingdom

4:15 Intuitive Real Options Implementation: Manufacturing Design at Boeing
Scott Mathews, The Boeing Company, USA

4:40 Entering a New Market in the Airline Business: Real Options and Games
Sergio Ramos, Kaiser Associates, and Ricardo Rochman, FGV-EAESP, Brazil

5:00 Risk and Flexibility in Global Manufacturing Strategy Design Decisions
Martin Pergler, McKinsey & Co, USA

5:25 – 6:15 Panel Discussion
Innovation/Technology, Corporate Strategy & Contracting:
Current Status and Future Prospects
Moderator: Dean Paxson (Manchester Business School, UK)

Panelists Include:
Francesco Baldi (ENEL, Italy)
Luiz Brandao (PUC-Rio, Brazil)
Tom Copeland (MIT)
Marco A.G. Dias (Petrobras, Brazil)
John Kensinger (U. N. Texas, USA)
Scott Mathews (The Boeing Company, USA)
Martin Pergler (McKinsey & Co, USA)
Sergio Ramos (Kaiser Associates, Brazil)

6:20 - 7:30 Networking Reception
Sponsored by ROG, Petrobras and McKinsey & Company