#### **Technology Choice when Delay is Costly**

"If later is better than never, is sooner better than later?"

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#### **Outline**

5 "a ed ► The issue: Should you wait to deploy a better/cheaper technology later?

► An asymmetric model

- ► A symmetric model
- ► An example with sensitivity analysis
- ► Conclusions

#### **Moore's Law**

D al 60 In 1965 Gordon Moore (Intel cofounder) noticed that microchip capacity doubled each year!

The pace of change has slowed down a bit over the past few years: doubling occurs "only" every 18 months.

#### **A Common Situation**

- ∧ A current technology exists and can be deployed now
- ▲ A new (better/cheaper) technology is on the near horizon
- ► The new technology may or may not become commercially deployable
- ► If you deploy the current technology now, then there is a cost to switch to the new technology later
- ► If you wait for the new technology, then your competitive position may be threatened, and you miss revenue from deploying the current technology
- K You have opportunities in several markets
- ► Examples: digital video on cable, cable telephony, high speed internet access over cable, ...

#### **Option to Wait for New Technology** 2 markets



#### **Representation Difficulties and Resolution**

► Asymmetric tree

Cumbersome to generate tree with more markets and/or time periods, e.g., 4 markets => 16 branches at first decision node

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- allow for choice of any technology whenever it is available
- impose a switching cost if an earlier technology choice is superceded
- tree becomes symmetric, and is generated automatically by software

# **Symmetric Representation**



Incur switching cost only if Smalltown used current technology in period 0

Similarly for Bigtown

# Influence Diagram



- K Customer attrition occurs if you do not deploy current technology immediately
- New technology will not succeed unless at least one town waits for it
- K Benefit is per person
- ∧ Annuity multiple is for payoffs in period 1



Deploy current technology if it fails  $\mathbf{\nabla}$ 

# **High Benefit from New Technology**



Deploy new technology in both markets if new technology succeeds

### Low Benefit from New Technology



# **Key Factors in Technology Choice**

- 尽 Size of the benefit of the new technology
- Chance that the new technology will become deployable
- K Cost of delay: lost revenue, lost customers
- Switching cost: from current to new technology
- ► Influence of the deployment decision on
  - K the development of new technology
  - technology choices of other firms (scale economies for vendors)

#### **Conclusions**

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► Technology choice involves a trade-off between ► benefits of a better technology later ⊾ benefits of an immediate market presence

- ► A deployment decision can influence the development of new technology
- ► Can simplify modeling by allowing for switching between technologies, even though it may not be optimal to switch
- べ "The wireless music box has no imaginable" commercial value. Who would pay for a message sent to nobody in particular?" David Sarnoff's associates in response to his urgings for investment in radio in the 1920s.

# **Appendix - Model Parameters**

- **\checkmark** Population: smalltown = 30, bigtown = 90
- Current benefit \$/sub = 5
- New benefit \$/sub: base case \$8, high \$12, low \$5
- New technology success probability:
  60% if at least 1 market waits
  0% if neither market waits
- Attrition = 10% (reduction in period 1 subs due to waiting)
- Annuity multiple = 10 (multiple for period 1 payoffs)
- **Switching cost** = \$2000