CS207 #7, 7 Nov. 2014

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Hewlett 103

Sign in

Syllabus:

The order and coverage is flexible

1. Why should software be valued? Cost versus value.
2. Economic Flow. Market value of software companies.
3. Spending. Intellectual capital and property (IP).
4. Income from Sales and Service. Alternate Business models
5. Sales expectations and discounting of future income.
6. Principles of valuation.
7. Software growth.
8. Legal & forensics
9. The role of patents, copyrights, and trade secrets.
10. IP in a service company, protectable IP, fencing of customers'IP , know-how
11. Life and lag of software innovation.
12. How to grow a software company: organic or by acquisitions
13. Open source software; theory and reality. Freemium.
14. Separation of use rights from the property itself.
15. Setting licensing rates.
16. Role of Government
17. Risks when outsourcing and offshoring development.
18. Effects of using taxhavens to house IP. Abolish Corporate taxation?

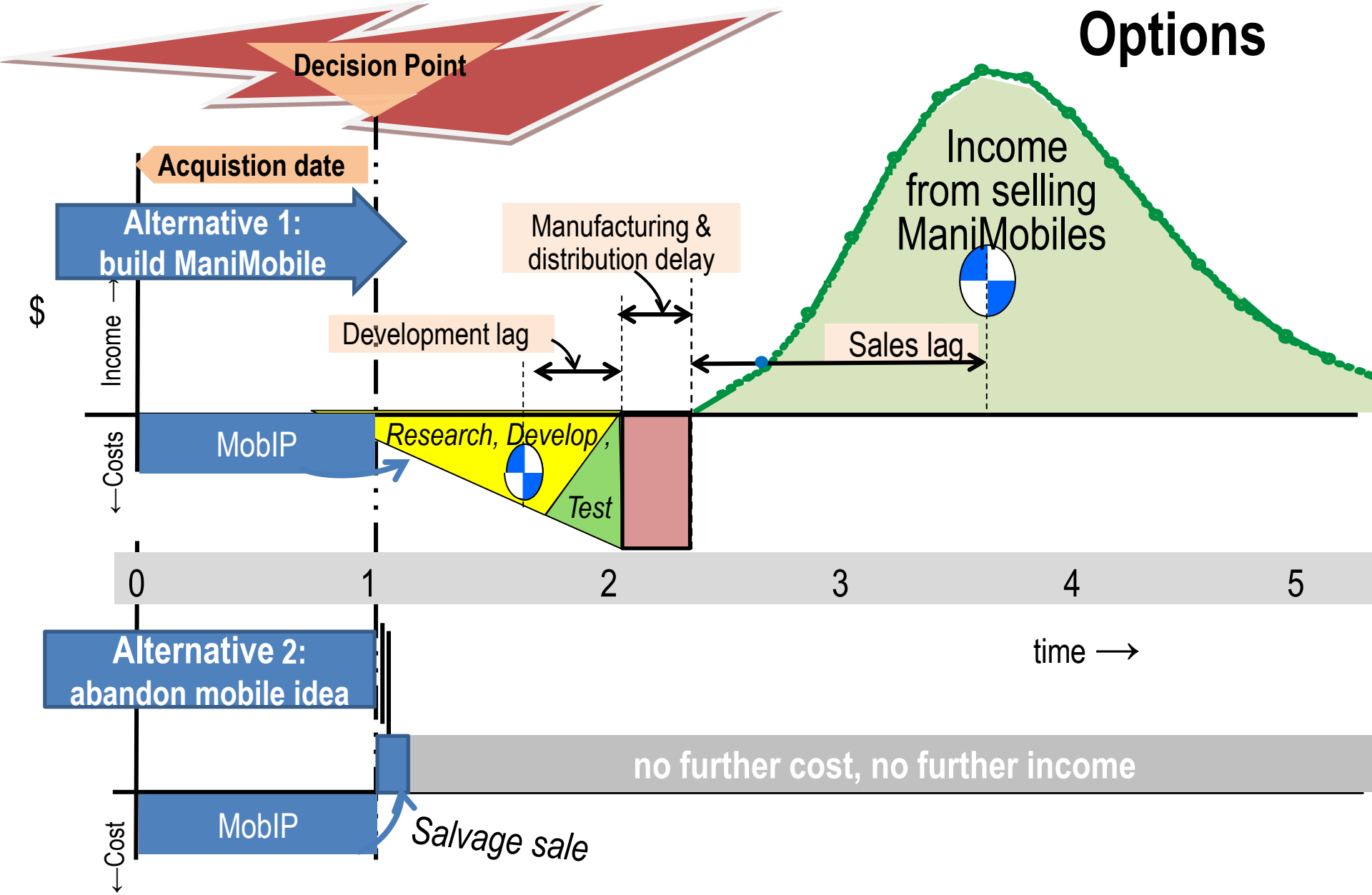
Guidance obtained earlier

Income determines value

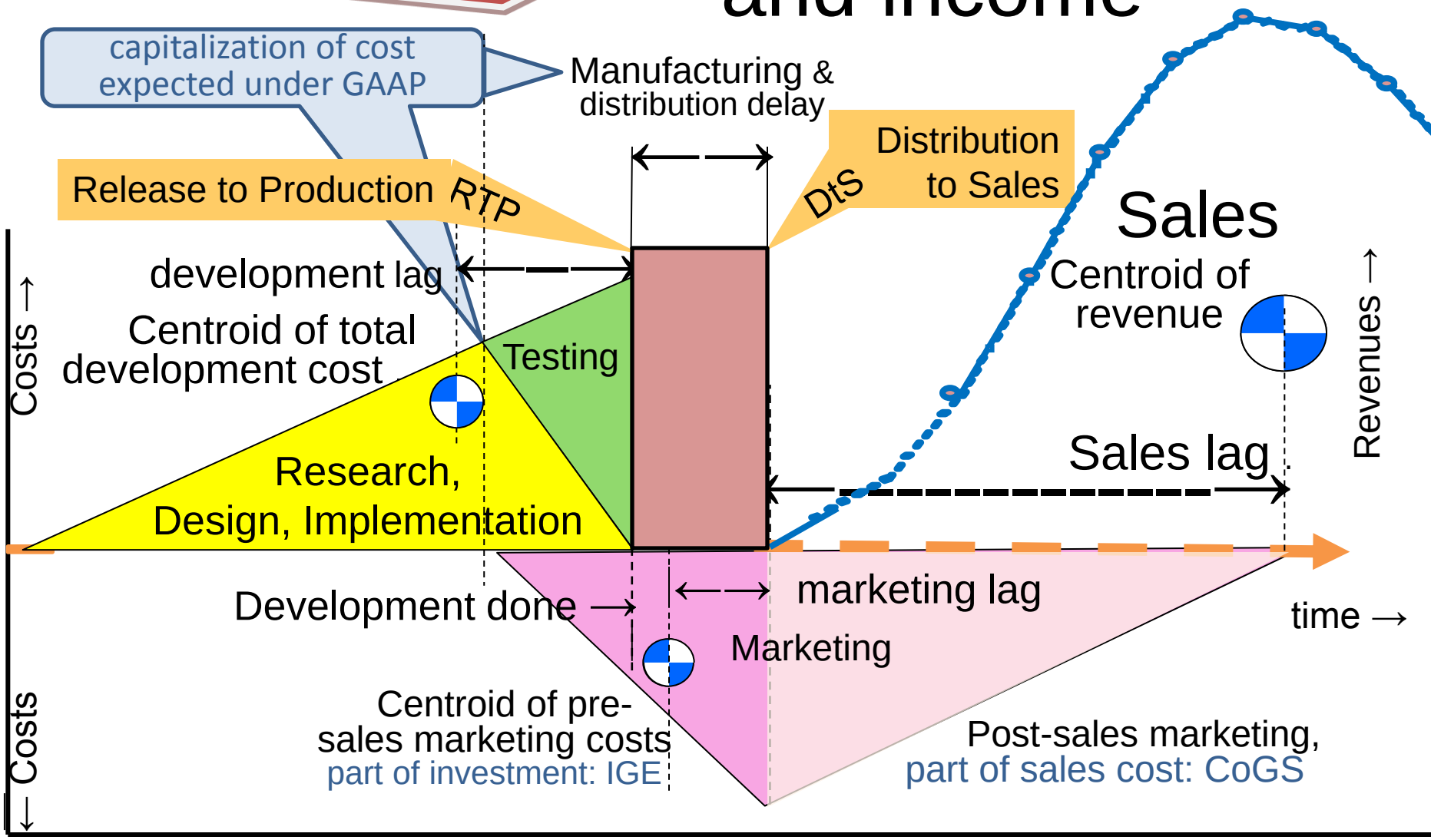
Income is due to sales

- We applied an overall Erlang sales curve
  1. New versions keep market going with added sales
  2. Customers replace earlier versions
  3. Maintenance is charged, more income, more work
- Now alternatives can be intelligently discussed
  1. keep development costs low
  2. design so that SW maintenance is low
  3. charge a higher price
  4. minimize sales cost, without reducing market size
  5. broaden the market
  6. Options →

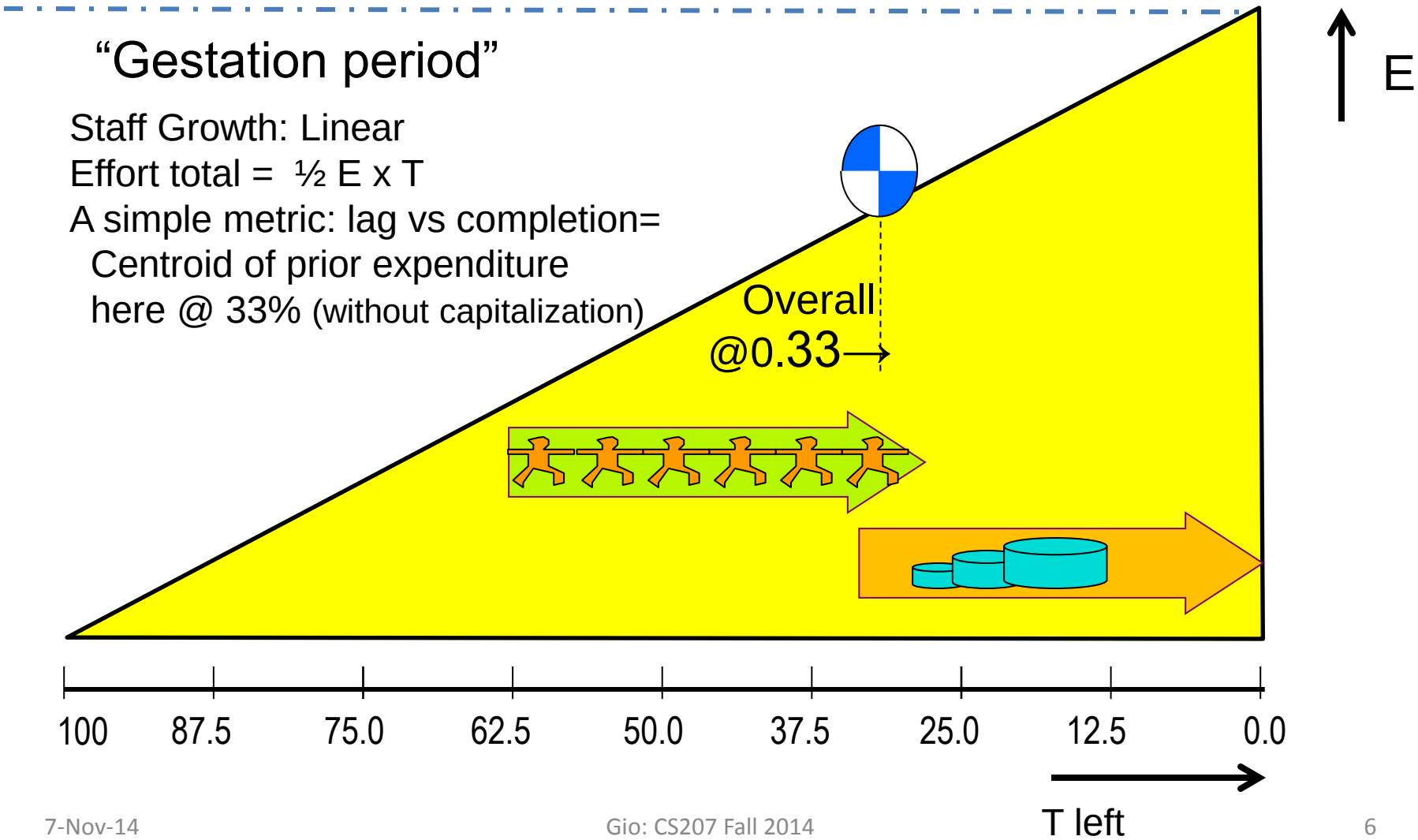
Options


Decision Point
Acquistion date
Alternative 1:
build ManiMobile
$
Income →
←Costs
Manufacturing &
distribution delay
Development lag
Income
from selling
ManiMobiles
Sales lag
MobIP
Research, Develop,
Test
0
1
2
3
4
5
time ⟶
Alternative 2:
abandon mobile idea
no further cost, no further income
MobIP
Salvage sale
←Cost

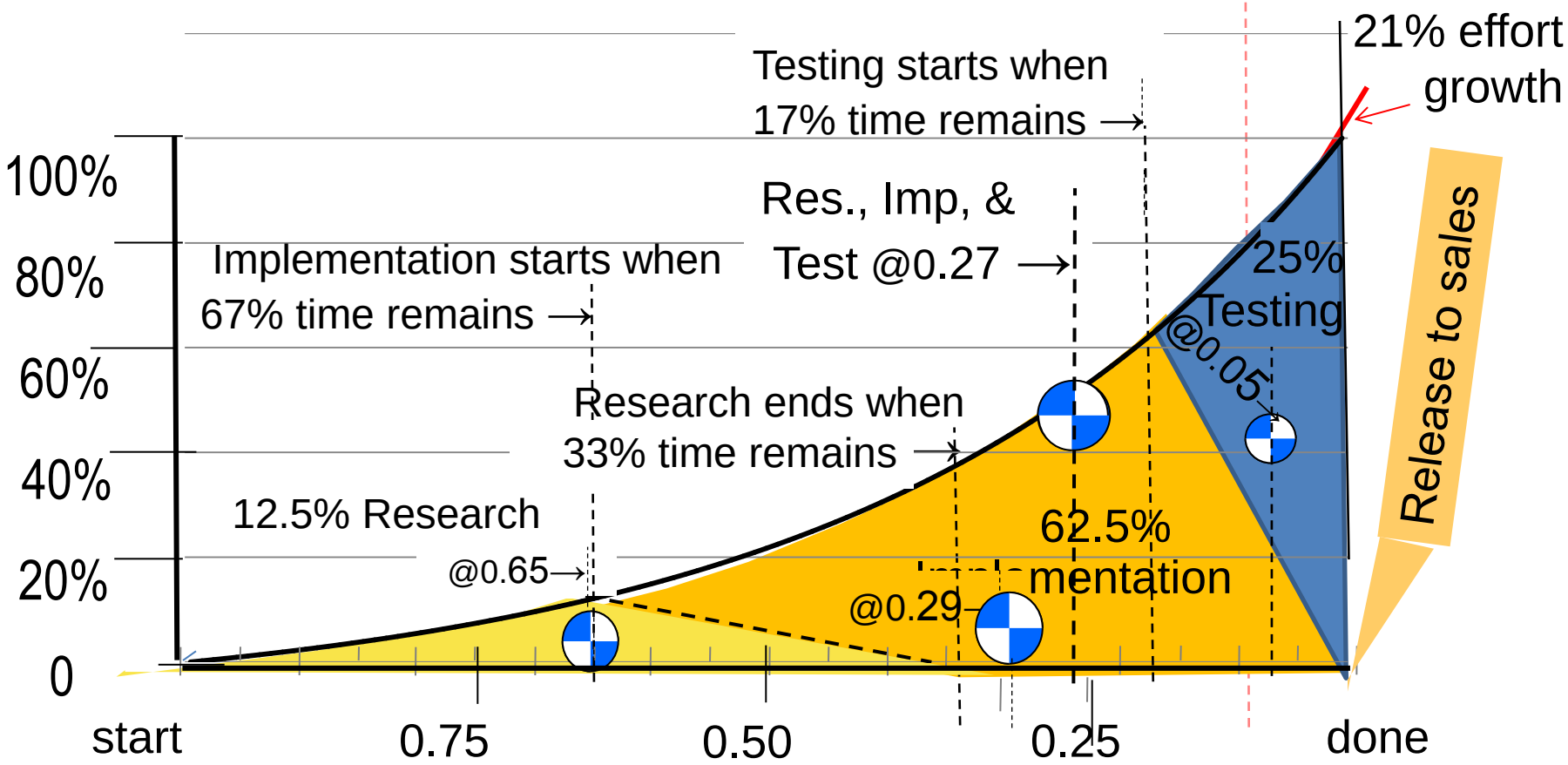
Timing of expense and income



Lag measures Prior effort



Lag in start-up development

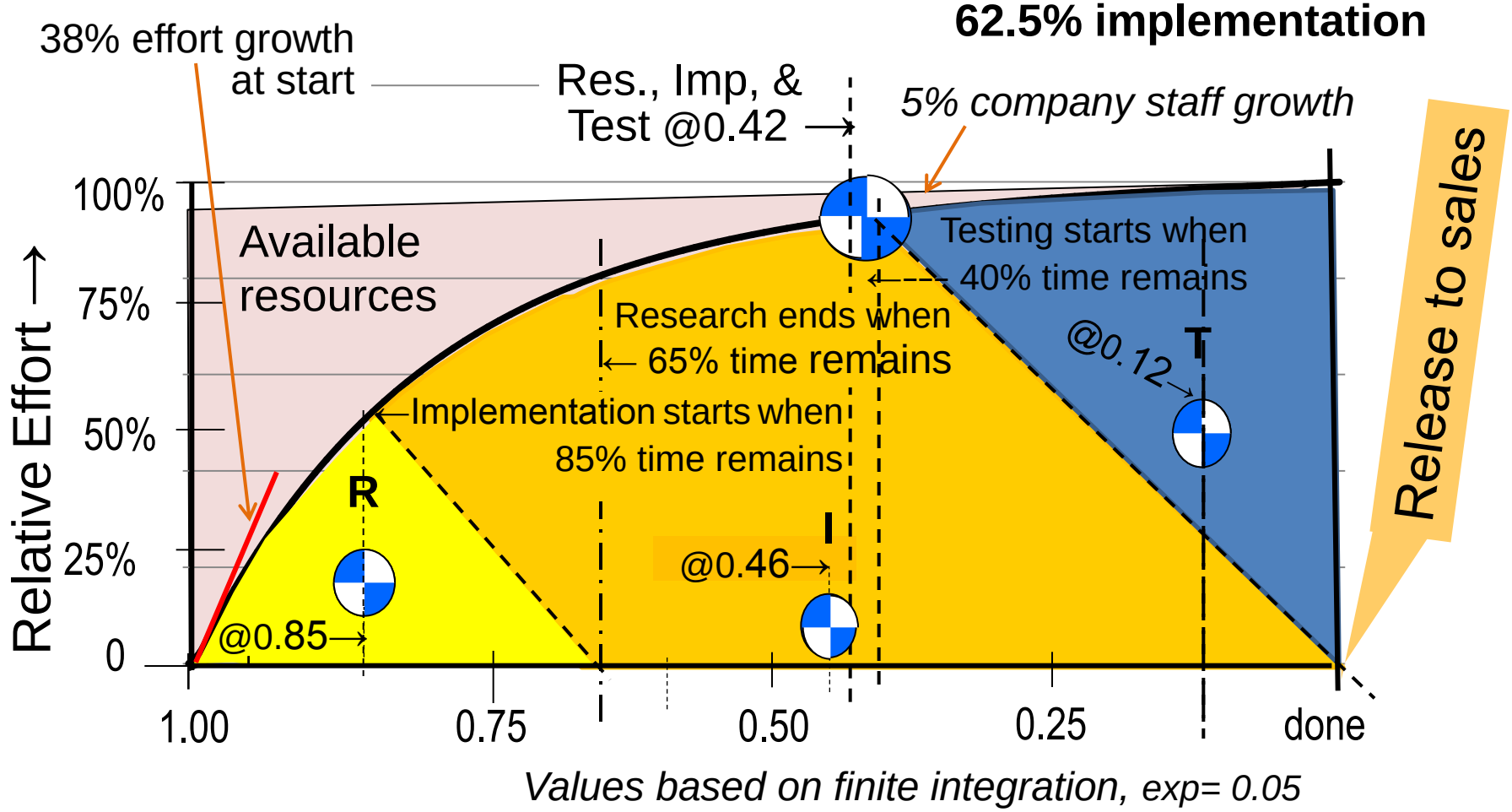


Development in mature company with

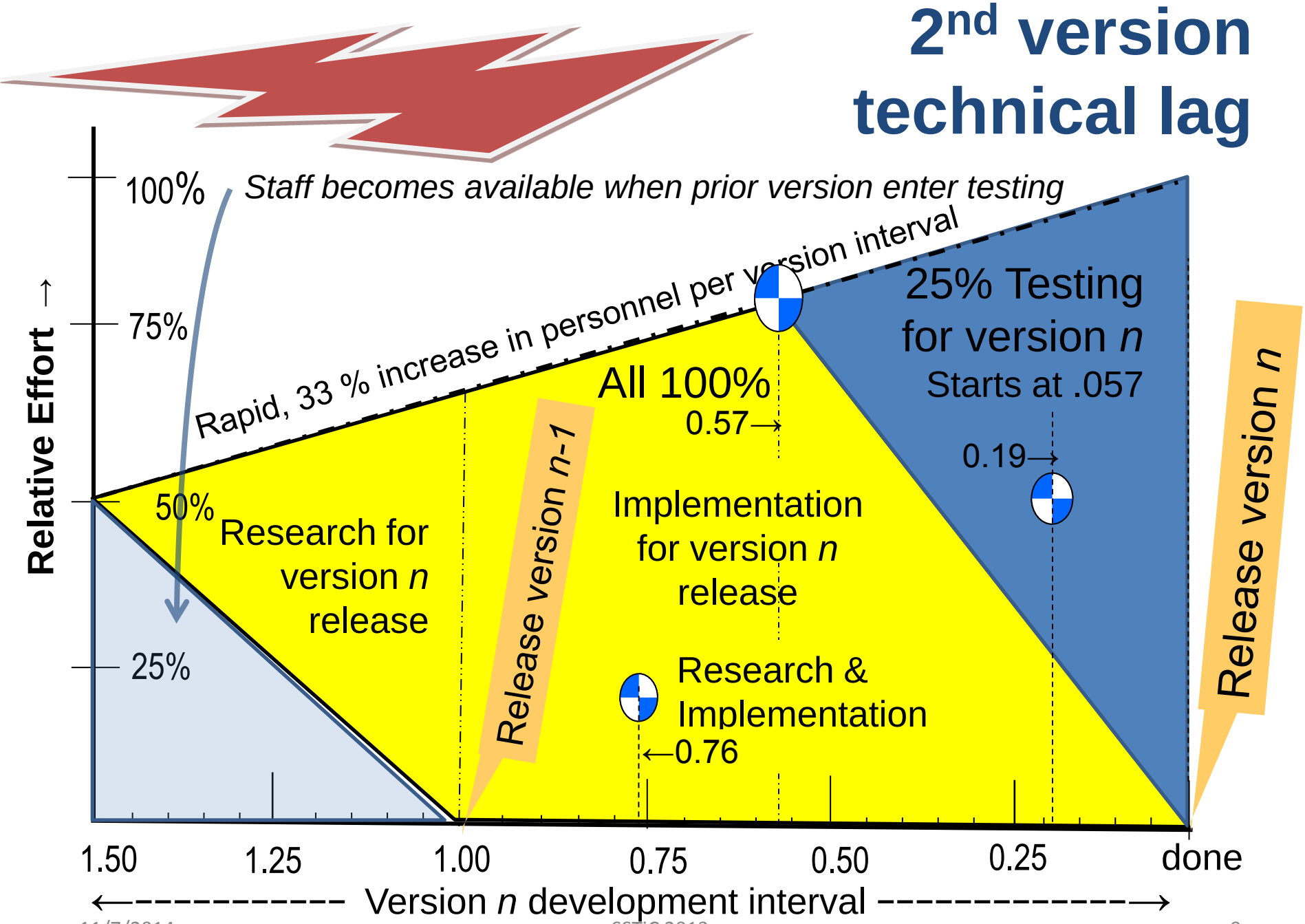
12.5% research and

25% testing effort,

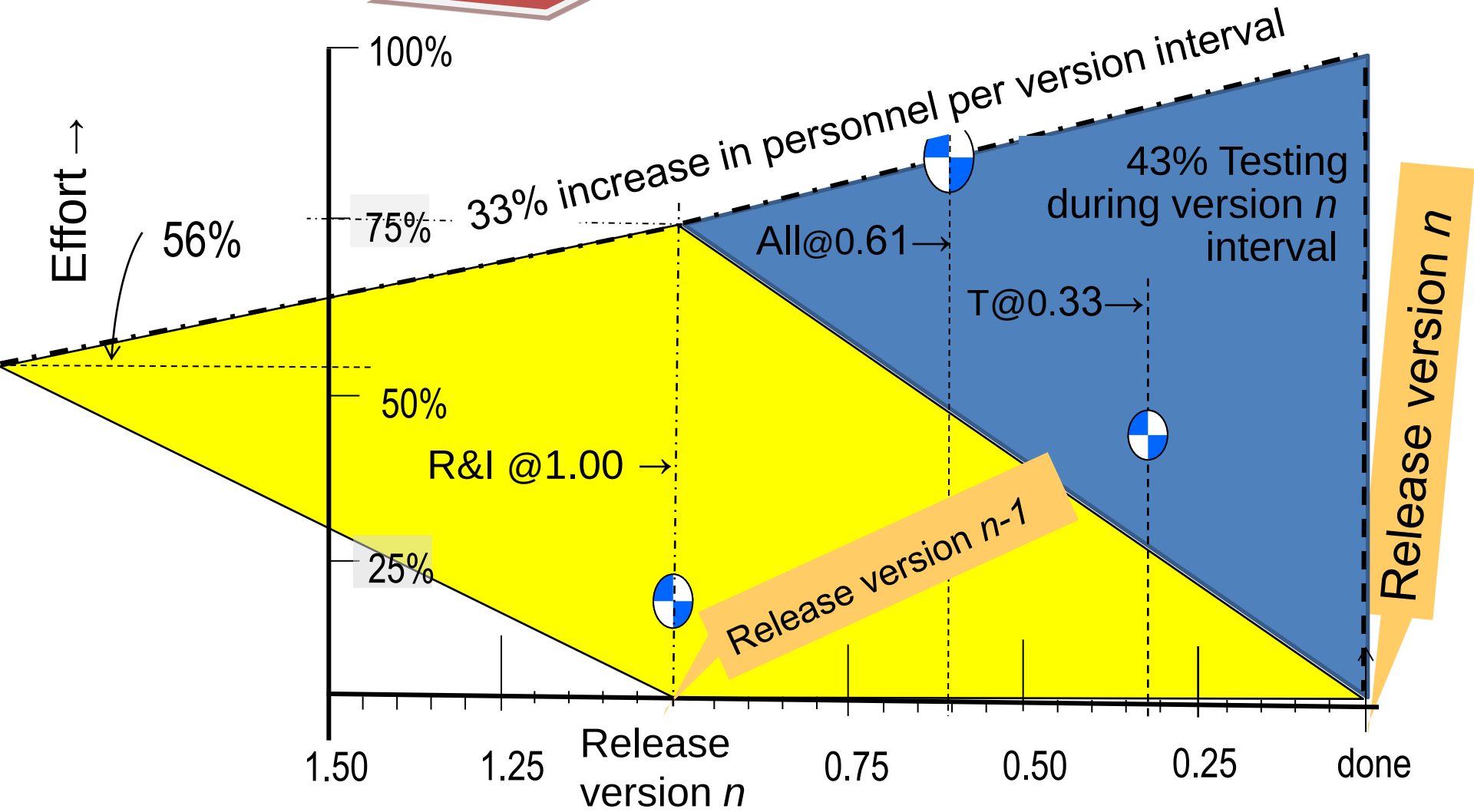
62.5% implementation



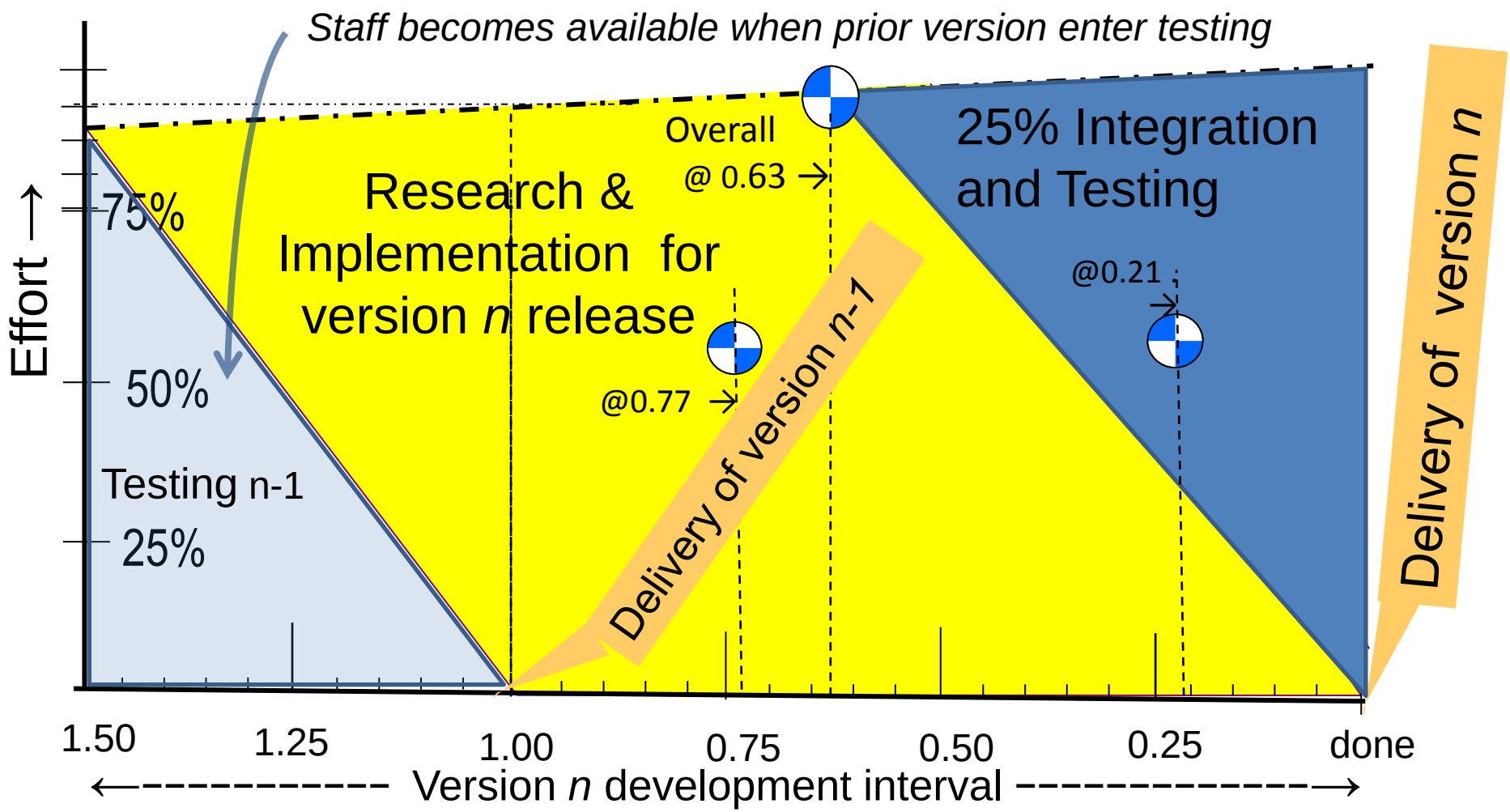
2nd version technical lag



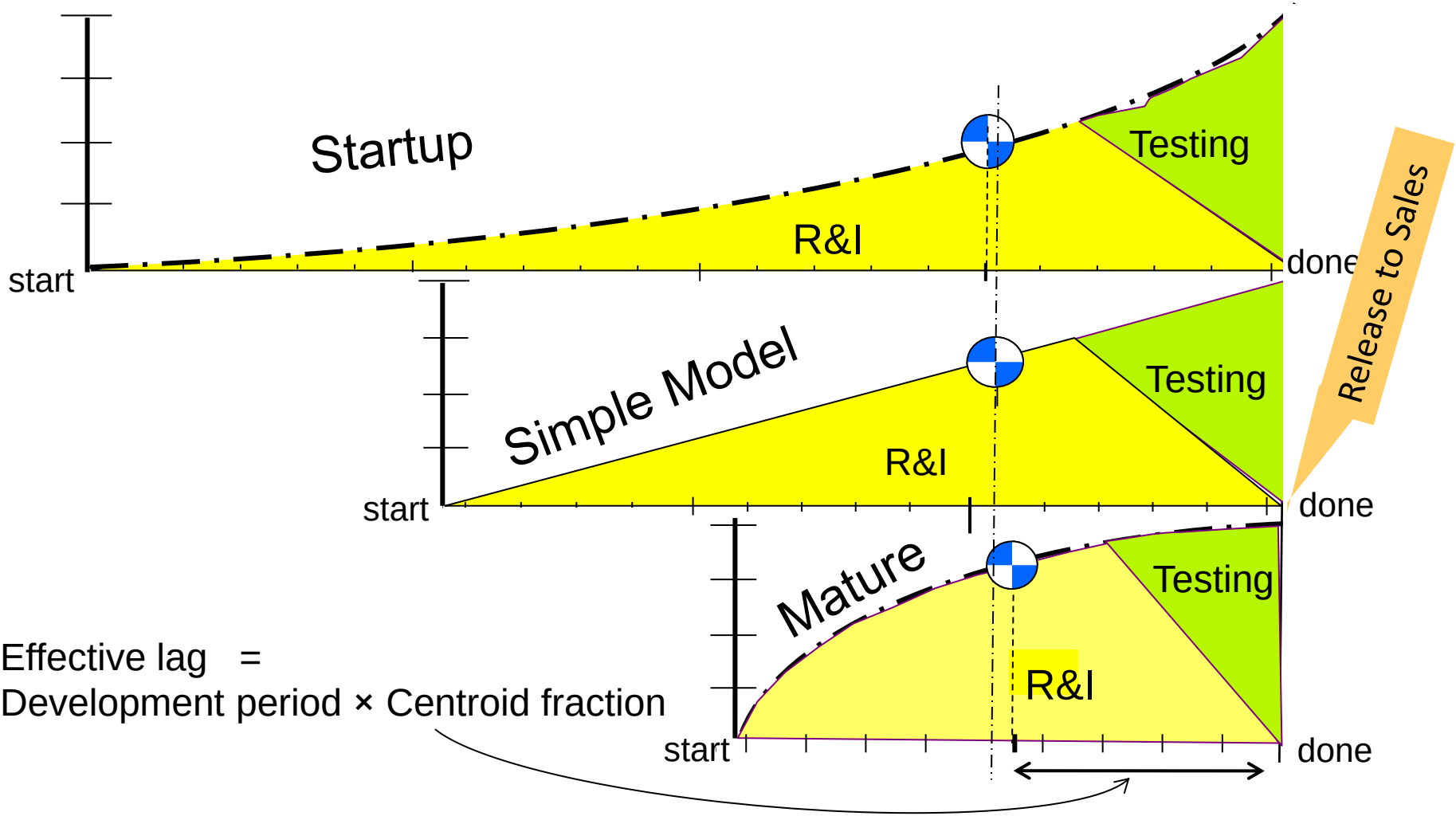
2nd Version substantial testing



Mature ongoing technical lag



Lag differs less than development period

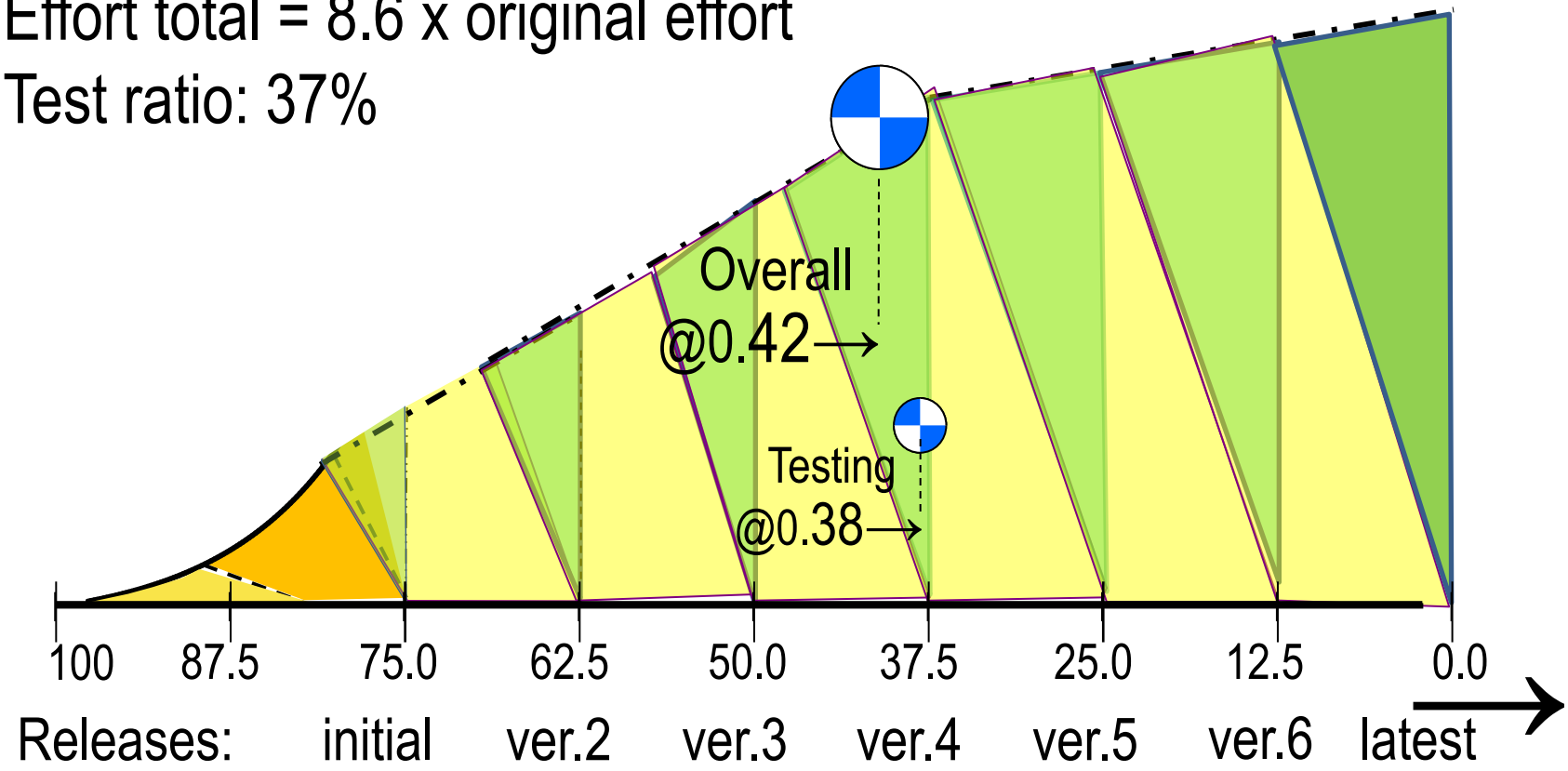


Effective lag =
Development period × Centroid fraction

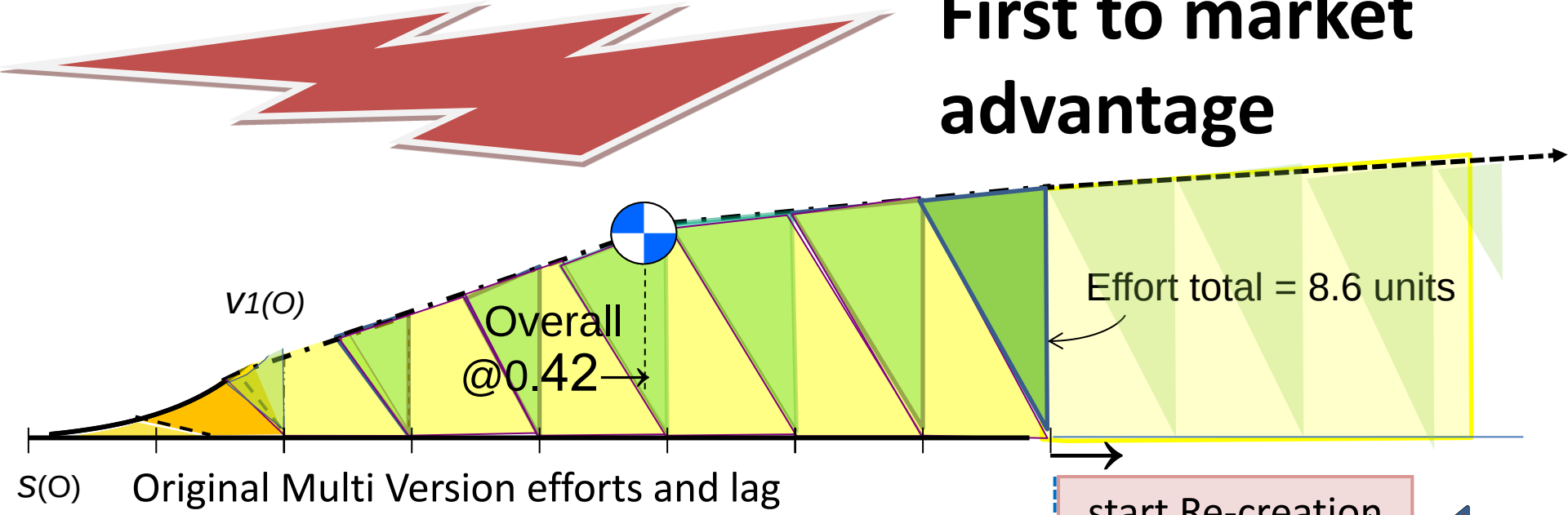
Multi Version product effort and lag

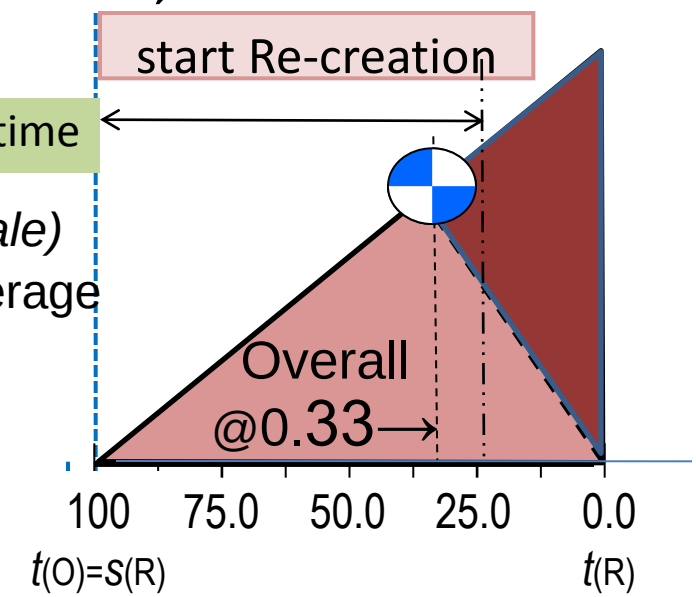
Effort total = 8.6 x original effort

Test ratio: 37%



First to market advantage





Competition *(drawn to scale)*
Growth Rate 20%/year average
Effort total = 5.4 units

Competition/ Original multi version source
Effort ratio R/O = 0.63
Time ratio (t(R)-s(R)/t(O)-s(O)) = 0.41
Effective Lag ratio = 0.23

But at that point the original is 3.5 versions ahead of the competition!

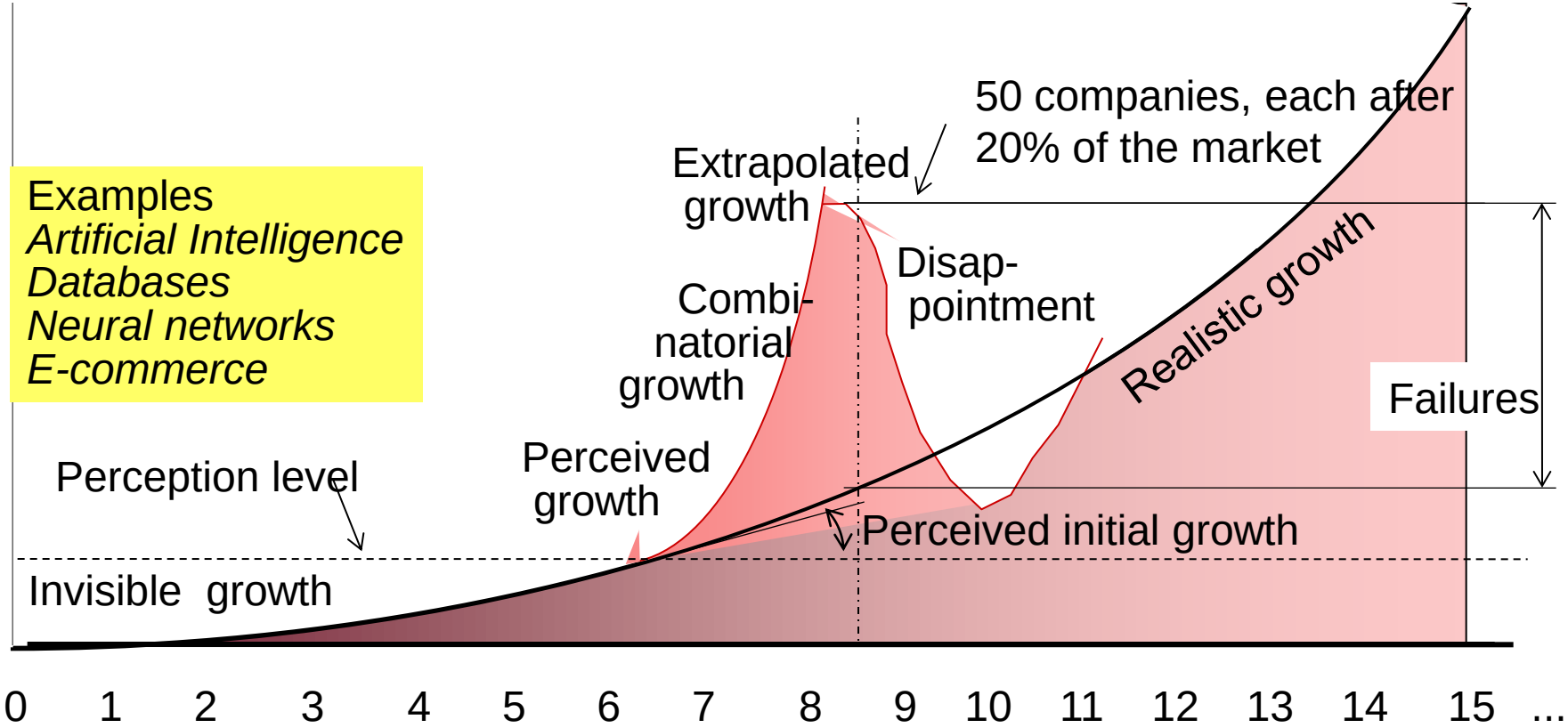
Predicting the market

1. Comparables (discussed earlier)
2. Size of total segment
   - Product for gas stations
     - number of gas stations in the US -- relatively stable
   - Cisco failure
     - Sales to many optimistic startups – > 90% will fail
     - never aggregated - Sales staff vs. Management
       - Cisco had to crush $2.1B of electronic inventory in 2002

Growth and Perception

E-commerce [this slide based on a 2001 CS99/73N class exercise]

- Gartner: 2000 prediction for 2004: 7.3 T$
- Revision:2001 prediction for 2004: 5.9 T$ *drastic loss?*

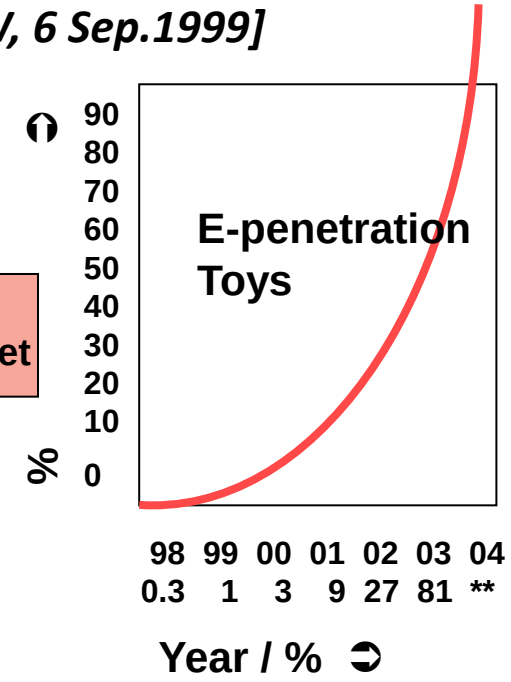


T r e n d s
1998 : 1999

- Users of the Internet 40% ⇒ 52% of U.S. population
- Growth of Net Sites (now 2.2M public sites with 288M pages)
- Expected growth in E-commerce by Internet users *[BW, 6 Sep.1999]*

segment	*1998*		*1999*
➢ books	7.2%	⇒	16.0%
➢ music & video	6.3%	⇒	16.4%
➢ *T o y s*	3.1%	⇒	10.3%
➢ travel	2.6%	⇒	4.0%
➢ tickets	1.4%	⇒	4.2%
➢ Overall	8.0%	⇒	33.0% = $9.5Billion

Centroid, in 1999
~1% of total market

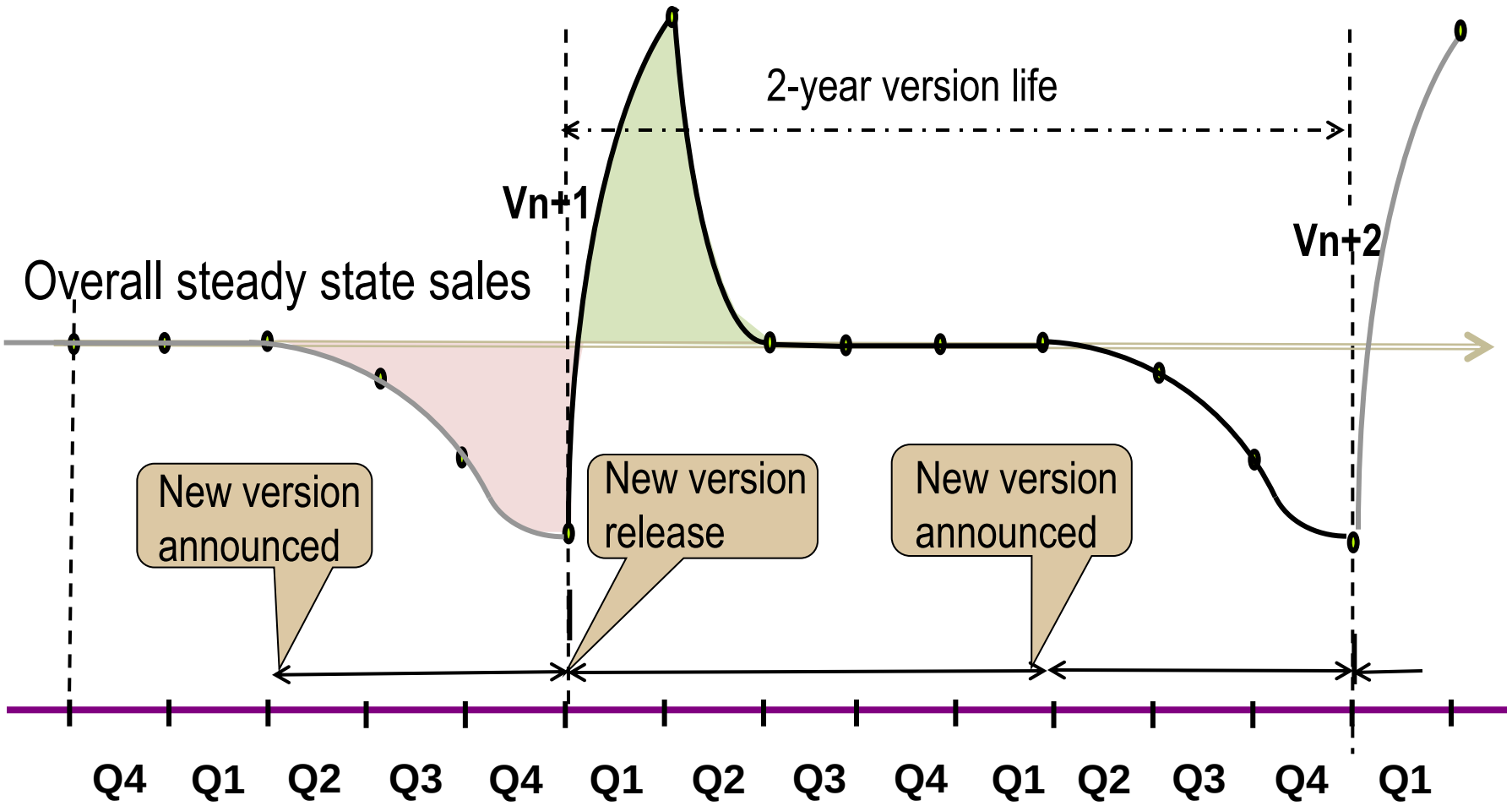


An unsustainable trend cannot be sustained [Herbert Stein, Council Econ. Adv, 1974]

⇒ *new services*

Transients due to versions

Customer behavior w.r.t. new versions, superimposed on basic sales curve



Vishal Sikka, CEO Infosys

Renovate or Reconstruct

Own versus Buy

Own vs. Rent:
The dynamics of sharing

Dr. Vishal Sikka
Member of the Executive Board | SAP AG
November 22, 2013

Recap from our last lecture

We are exploring fundamental tradeoff decisions that impact software development as well as areas beyond software

These tradeoffs are:

Renovating vs. Reconstruction ← *covered in last lecture*

Own vs. Rent

Build to Stock vs. Make to Order

Today we look at the economics and tradeoffs associated with owning vs. renting a resource

Fundamental question for our discussion today

At which point does it make sense to have a resource be dedicated vs. have it be shared and what are the fundamental principles at work here? A corollary to this is own vs. rent or the essential dynamics of the own-share spectrum.

The above question applies to software as well as physical goods and services

Increasing interest in rental model (1/2)

Transportation

zipcar wheels when you want them

- Since its founding in 2000, grown over 850,000 members
- ~11,000 vehicles across US, Canada, UK, Spain, Austria
- 2012 Revenue: $278.9M. Two tier structure – annual membership ($60/yr), hourly rental ($8-$10/hr)

Hospitality

airbnb Travel like a human.

- 10M nights booked since its founding in 2008—4M in just first half 2012
- Over 500,000 listings in 34,000 cities in 192 countries
- Over 32 languages supported, more than 1.5M app store downloads . Charges 9 – 12% on each booking

Infrastructure

amazon web services™

- Launched in 2006, customers in 190 countries, including Pinterest, Dropbox, as well as Netflix, Shell, Adobe, 300 govt. agencies worldwide
- Data centers in 9 regions, 25 availability zones and 38 edge locations for content distribution
- Revenues expected ~$1B in Q4 2013, over $3.2B in 2013^

Products & Apparel

RENTTHERUNWAY love. wear. return.

- Launched in 2009, Over 3 million members, present in 150 campuses
- Offers 25,000 dresses from over 150 designers
- Rental costs $75 to $200 per dress (2-4 days) plus $5 for insurance

- On 14 March 2013 Avis Budget Group purchased Zipcar for about US$500 million in cash

^ Estimated as Amazon does not split out the revenues for AWS but bundles it in the other category

Increasing interest in rental model (2/2)

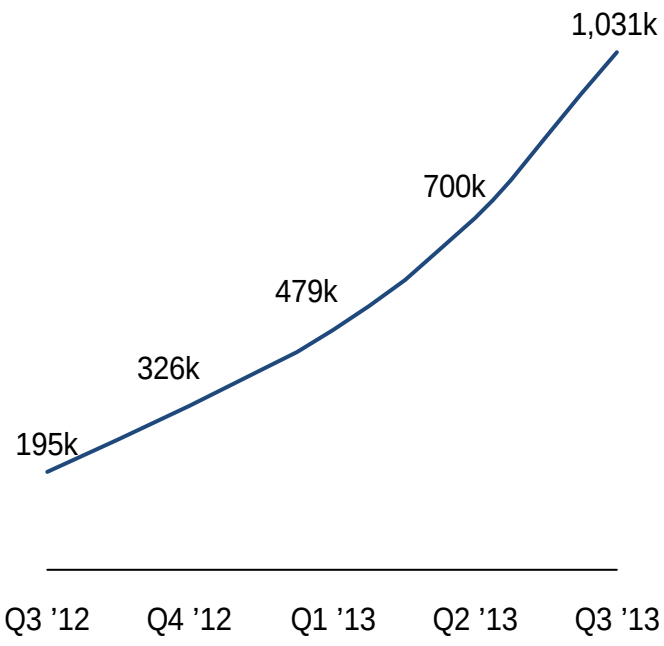
Decided to switch to pure SaaS model in 2004. In 3 years, moved to new model from its existing traditional license based business model, subscription revenues now match up to the original license revenues

In May 2012 announced Creative Cloud offering but still maintained its license model.
In May 2013 announced no current plans to release another perpetual release of the packaged software. Creative Cloud to be sole delivery option

Pursuing a dual strategy for its biggest revenue and profitable segment, MS Office. Mix of subscription based Office 365 offering and ownership based license model

An example of rental model adoption: Adobe creative subscription momentum

Creative cloud subscriptions



Business model transition significantly increases long-term revenue growth

Metric	Q3 FY12	Q4 FY 12	Q1 FY 13	Q2 FY 13	Q3 FY 13
Total paid subscriptions exiting the quarter	194K	326k	479k	700k	1,031k
% with annual commitment (vs. month-to-month)	88%	90%	92%	93%	95%
% full creative cloud (vs. point products)	79%	81%	81%	81%	81%
Creative annualized recurring revenue (Mn)	$90	$153	$233	$355	$546

Key takeaways:

- Increase/acceleration in creative cloud subscriptions
- Traditional perpetual license revenues declines (yoy basis). Expenses did not/not expected to decline with decline in revenues

→ Long-term: able to attract new users, keep our end user base current, and increases recurring revenues (ratably recognized)

http://wwwimages.adobe.com/www.adobe.com/content/dam/Adobe/en/investor-relations/PDFs/ADBE-Investor-Presentation-Sept-2013.pdf

Our objective in this work

- Identify the key market forces at work in making the decision to own vs. rent
- Key equations and concepts that can help us understand the underlying economics
- Understand the key tradeoffs and frameworks
- Recognize the non economic factors which are also in play and their importance

Accounting (financial) differences in owning vs. renting

	Owning (capital expense)	Renting (operating expense)
Purpose	To buy assets that have useful life beyond current year	Ongoing costs to run a business
How is it usually paid?	Upfront lump sum (or financed with extra finance charge)	Regular payment schedule e.g. monthly mortgage
When is it accounted?	Over 3 to 10 years as asset depreciates	In the current month or year
Where is it listed in financial statements?	Balance sheet - Property or equipment minus depreciation Statement of Cash Flows – listed under investing activities	Income statement – operating costs Statement of Cash Flows – listed under operating activities (i.e. working capital)
How is it treated for tax benefits?	Over time as asset depreciates	Deducted in current tax year

Own vs. Rent – Mathematical Representation

Ownership

$$P + \sum_{t=2}^{n} \frac{M_t}{(1+r)^{t-1}} + \frac{U_c}{(1+r)^f}$$

vs

Renting

$$\sum_{t=1}^{n} \frac{(R_t + V_t)}{(1+r)^{t-1}} + S$$

P = Year 1 cost of ownership (includes purchase price, initial set up and customization costs, other expenses like training etc.)

M_t = Annual maintenance payments

t = Expected life of asset or time period of ownership evaluation

r = Interest rate or cost of capital

U_C = Upgrade costs (e.g. SW and HW)

f = Upgrade frequency

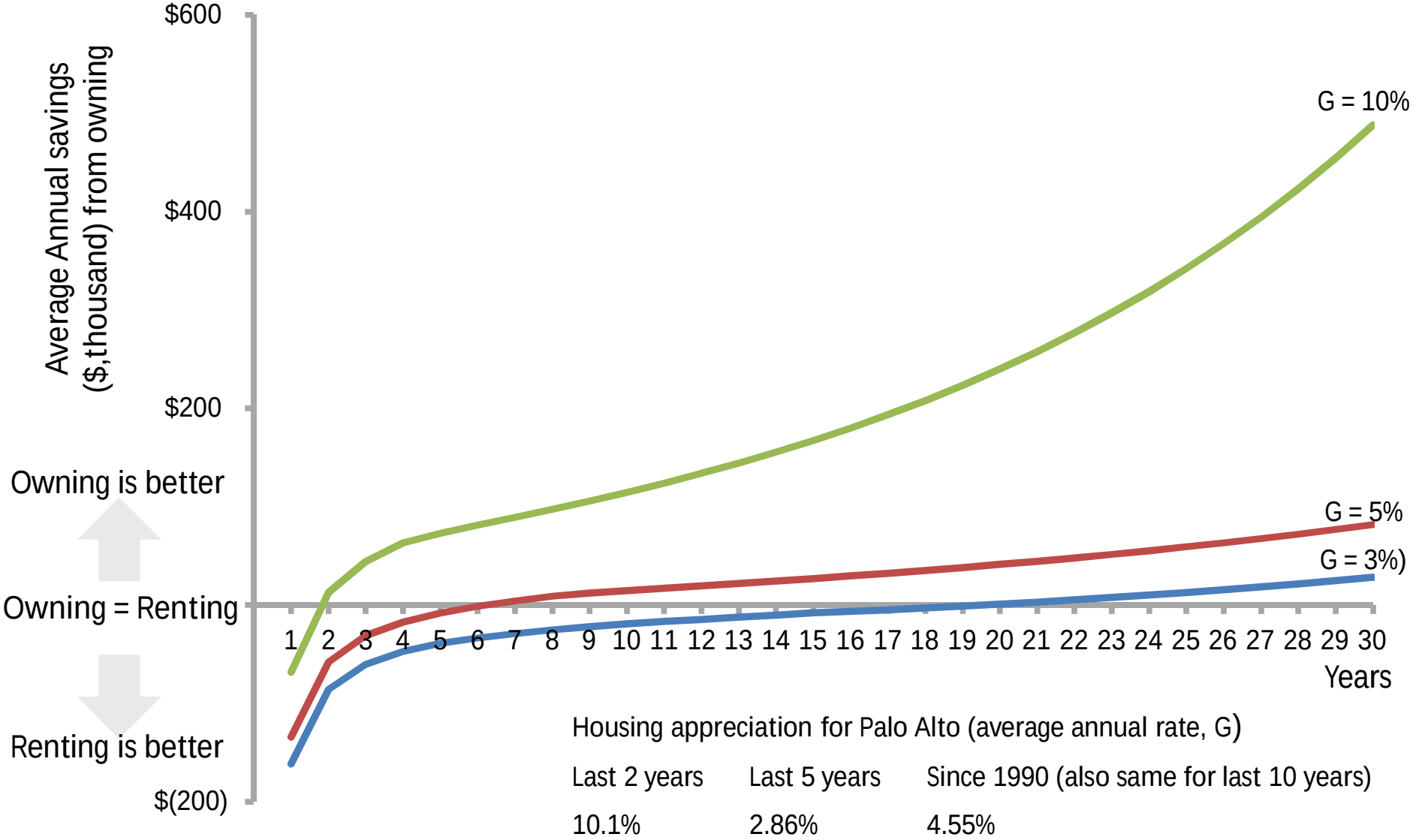
R_t = Annual rental or subscription includes any regular training and/or HW costs

V_t = Benefit or value from sharing model e.g. reduction in implementation or deployment etc.

S = Initial set up costs for rental/subscription service (includes initial HW needs, training and customization etc.)

Model application : renting vs. owning a house

E.g. for a $1.5M single family home in Palo Alto for different home appreciation rates (G)



Source: http://www.neighborhoodscout.com/ca/palo-alto/rates/ and http://www.nytimes.com/interactive/business/buy-rent-calculator.html?_r=1&

Model application for Zip Car – Owning vs. Leasing a car

Car ownership [1]

Expenses	Monthly	Annual
Vehicle depreciation/Lease	$270.00	$3,240.00
Insurance	$99.00	$1,188.00
Parking	$125.00	$1,500.00
Gas	$45.00	$540.00
Maintenance	$36.00	$432.00

Average replacement period for a car [3]	6 years	
Average annual increase in gas prices	3%	inflation rate
Average annual increase in insurance	3%	inflation rate

Zipcar model [2]

	One time	Annual	per hour
Membership Fee		$60.00	
Application Fee	$25.00		
Usage rate			$10.50
(usage rate includes gas, parking, insurance, maintenance)			
Late fee			$50

Assumed annual usage rate increase	5%

Assumed 5 instances per year when late fee is paid

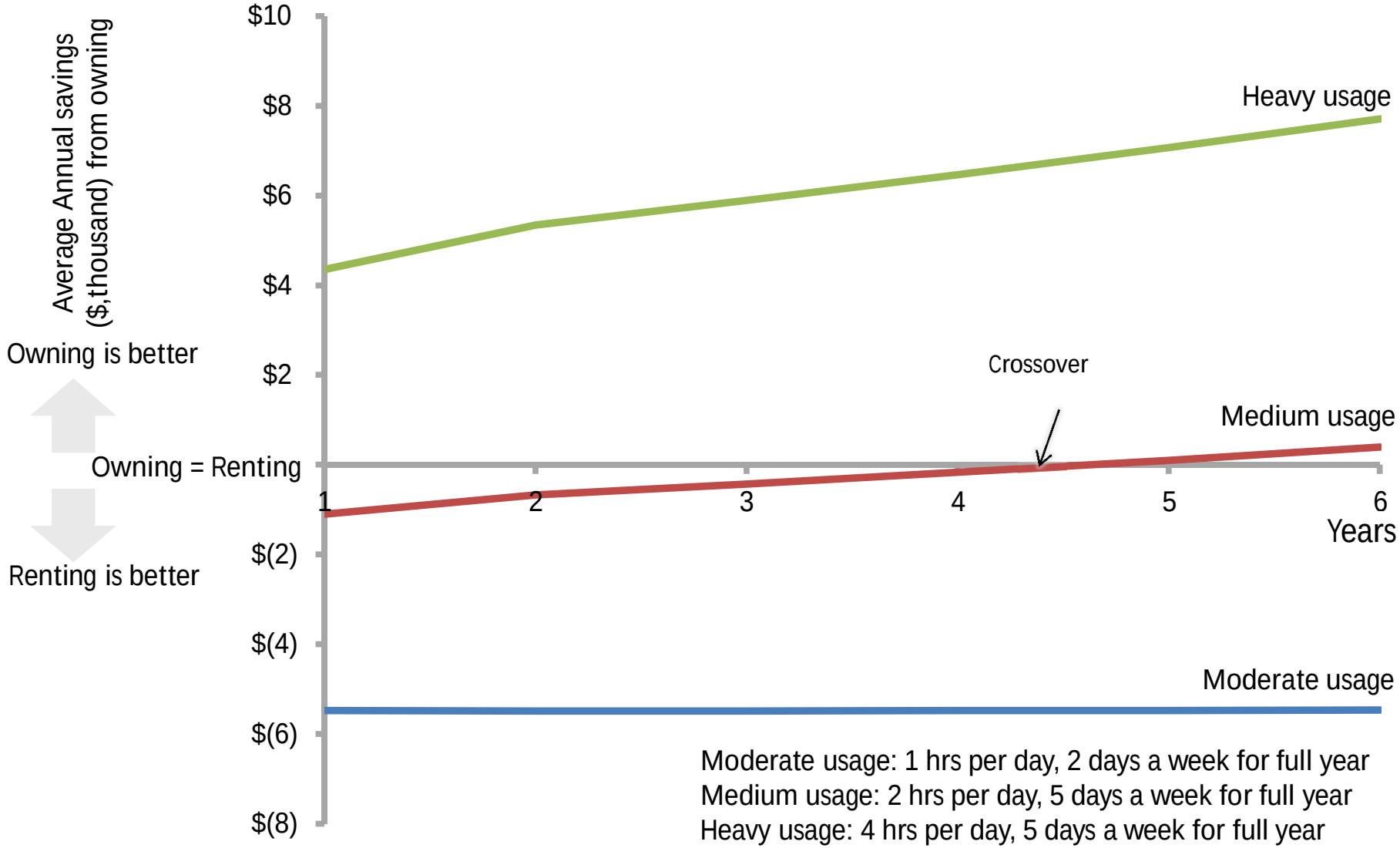
Usage profiles for Zipcar (annual hours)		
Moderate usage	104	1 hrs per day, 2 days a week for full year
Medium usage	520	2 hrs per day, 5 days a week for full year
Heavy usage	1040	4 hrs per day, 5 days per week for full year

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Ownership model	$6,900.00	$7,005.24	$7,060.23	$7,116.88	$7,175.23	$7,235.32
Cumulative spend in ownership model	$6,900.00	$13,905.24	$20,965.47	$28,082.35	$35,257.57	$42,492.89
Zipcar Model						
Annual spend @ moderate usage	$1,427.00	$1,513.93	$1,574.13	$1,637.33	$1,703.70	$1,773.38
Annual spend @ medium usage	$5,795.00	$6,329.65	$6,630.63	$6,946.66	$7,278.50	$7,626.92
Annual spend @ high usage	$11,255.00	$12,349.30	$12,951.27	$13,583.33	$14,246.99	$14,943.84
Cumulative spend @ moderate usage	$1,427.00	$2,940.93	$4,515.06	$6,152.39	$7,856.09	$9,629.47
Cumulative spend @ medium usage	$5,795.00	$12,124.65	$18,755.28	$25,701.95	$32,980.44	$40,607.37
Cumulative spend @ high usage	$11,255.00	$23,604.30	$36,555.57	$50,138.89	$64,385.89	$79,329.73

Source: 1: HBS Case Study: Zipcar Refining the Business Model; 2: www.ecommerce-digest.com/zipcar-case-study.html; 3: http://articles.latimes.com/2012/feb/21/business/la-fi-autos-new-cars-20120222

Model application : owning vs. renting a car (Zipcar Model)

Savings estimated for different usage patterns for rental service



Note: average replacement cycle for a car in US is 6 years

Model application for Adobe Photoshop (consumer SW) pricing – license vs. creative cloud subscription

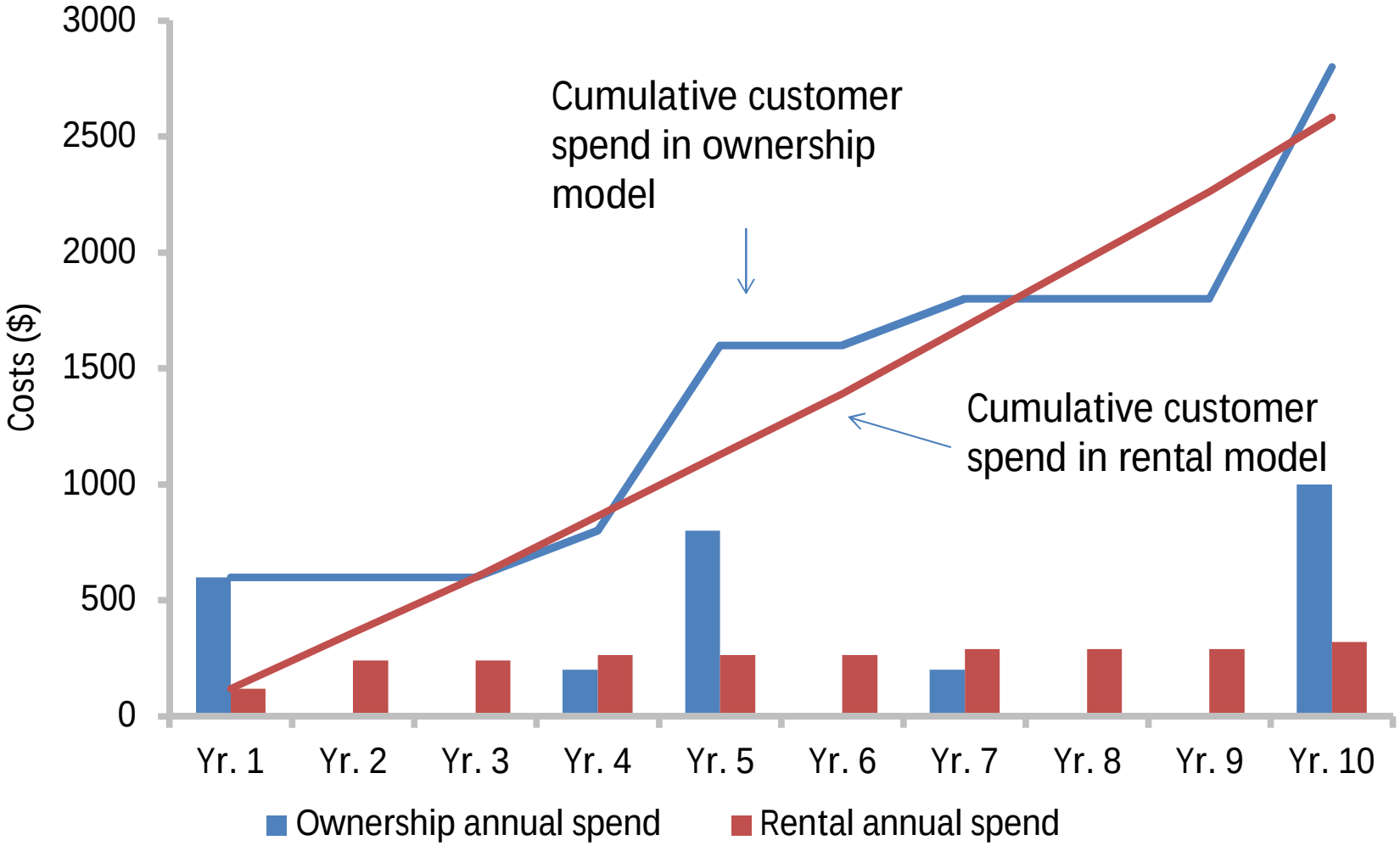
Ownership Model		
Photoshop License Cost	$600	
Upgrade cycle (license model)	36 months	assumption
Typical upgrade cost	$200	assumption
HW upgrade needed	$800	every 5 years, assumption
Subscription (Rental) Model		
First year (monthly price)	$10	discount first year
Regular monthly price	$20	
Increase in subscription price	10%	price increase every 3 years

Since the product offering remains unchanged from feature functionality perspective, there is no additional benefit to the consumer in subscription mode except maybe ease of access from anywhere

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Ownership model - annual spend	$600	$0	$0	$200	$800	$0	$200	$0	$0	$1,000
Comments				SW Upgrade	HW Upgrade		SW Upgrade			SW + HW upgrade
Rental model - annual spend	$120	$240	$240	$264	$264	$264	$290	$290	$290	$319
Comments	Promo pricing for 1st yr			Rental increase			Rental increase			Rental increase
Ownership - cumulative spend	$600	$600	$600	$800	$1,600	$1,600	$1,800	$1,800	$1,800	$2,800
Rental - cumulative spend	$120	$360	$600	$864	$1,128	$1,392	$1,682	$1,973	$2,263	$2,583

Source: Adobe website, http://news.cnet.com/8301-1001_3-57583370-92/how-greedy-is-adobes-creative-cloud-subscription-not-very/

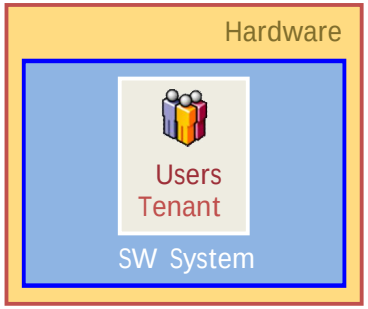
Model application : consumer software example



Note: example calculations for Adobe Photoshop license vs. rental model

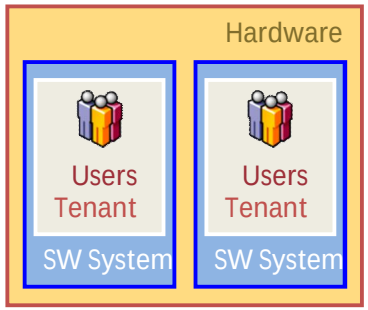
Sharing/Rental models used by SW providers

Single System



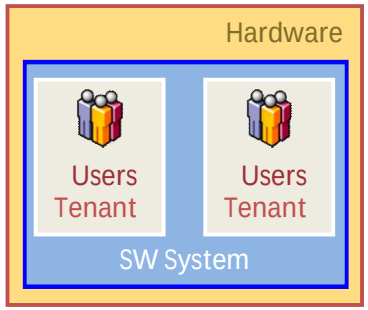
Each customer has his own system, hosted on a dedicated hardware

Multiple Systems



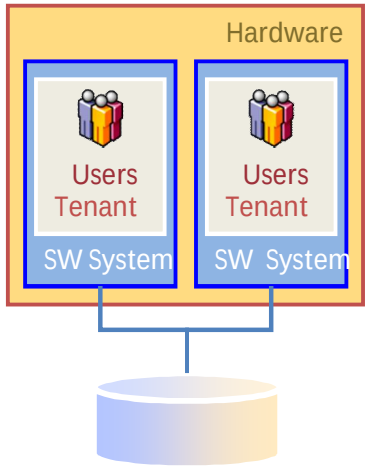
Multiple systems share a hardware using virtualization technology or multiple installations

Multi-Client



Customers share one system using multi-client

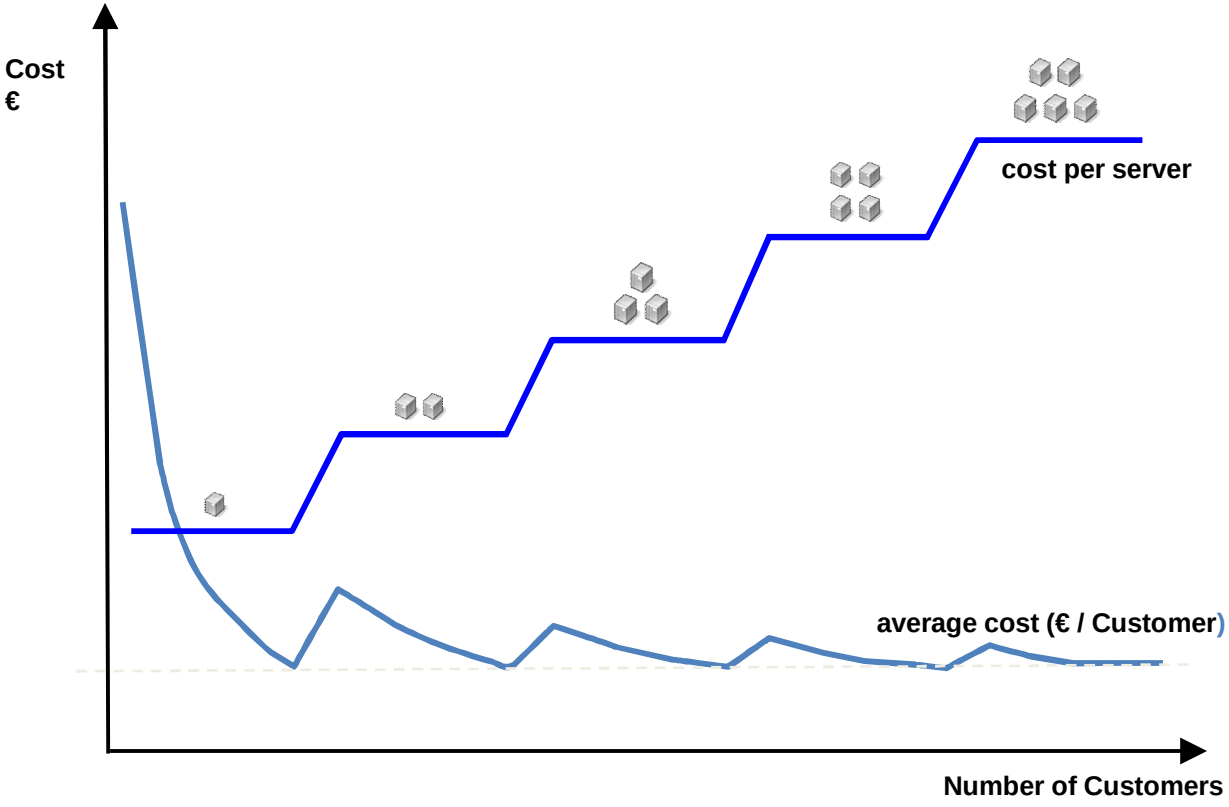
Shared Repository



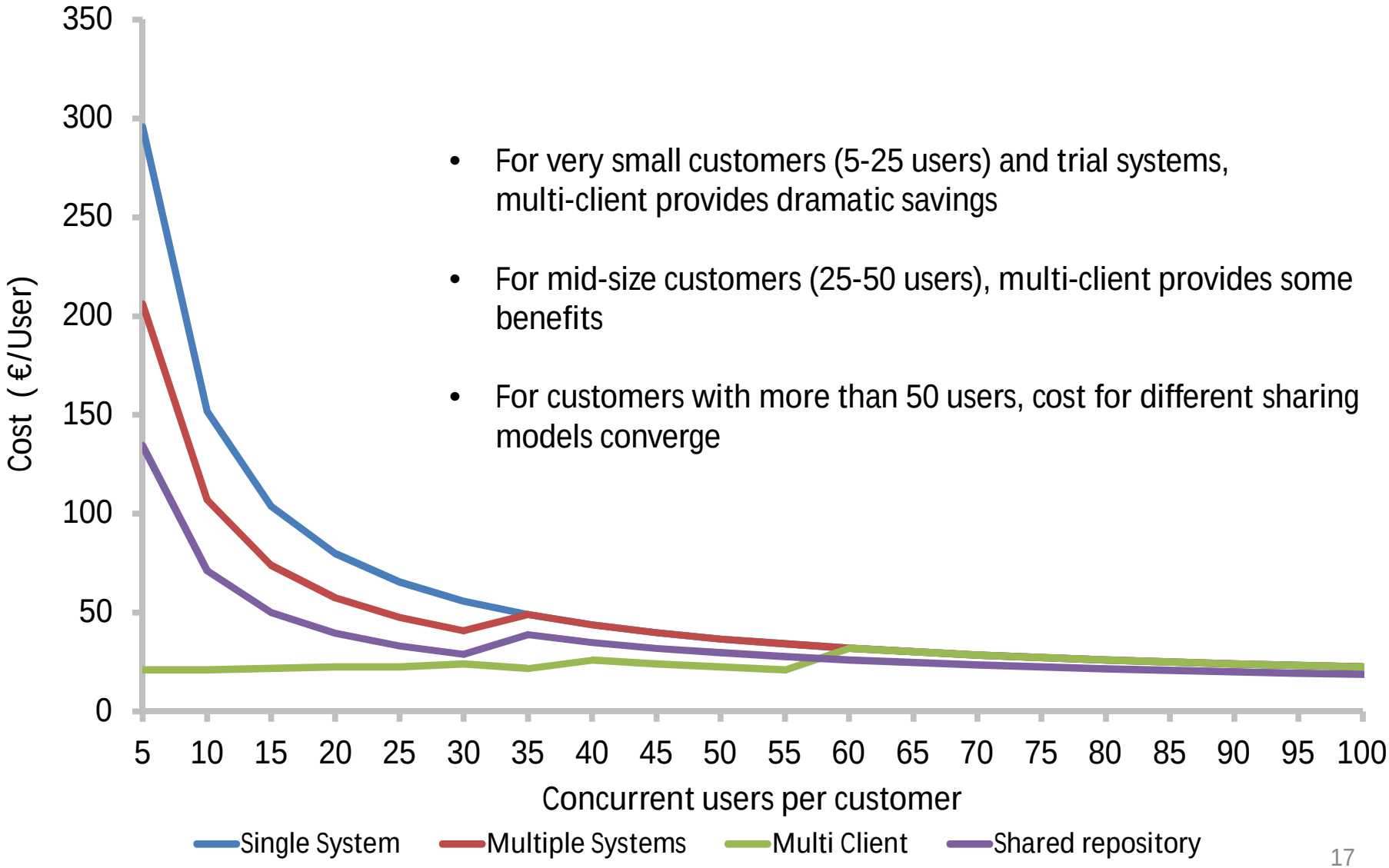
Customers have dedicated systems like in the multiple system case but the repository provides sharing of customer independent content

Discrete Scaling Out

The discrete unit of scale is a single server. The average cost per customer (over all servers) converges towards the average cost per customer for one fully utilized server



Total cost of ownership (TCO) for serving customers for different sharing models – SW provider perspective



- For very small customers (5-25 users) and trial systems, multi-client provides dramatic savings
- For mid-size customers (25-50 users), multi-client provides some benefits
- For customers with more than 50 users, cost for different sharing models converge

Model application : business software example Background

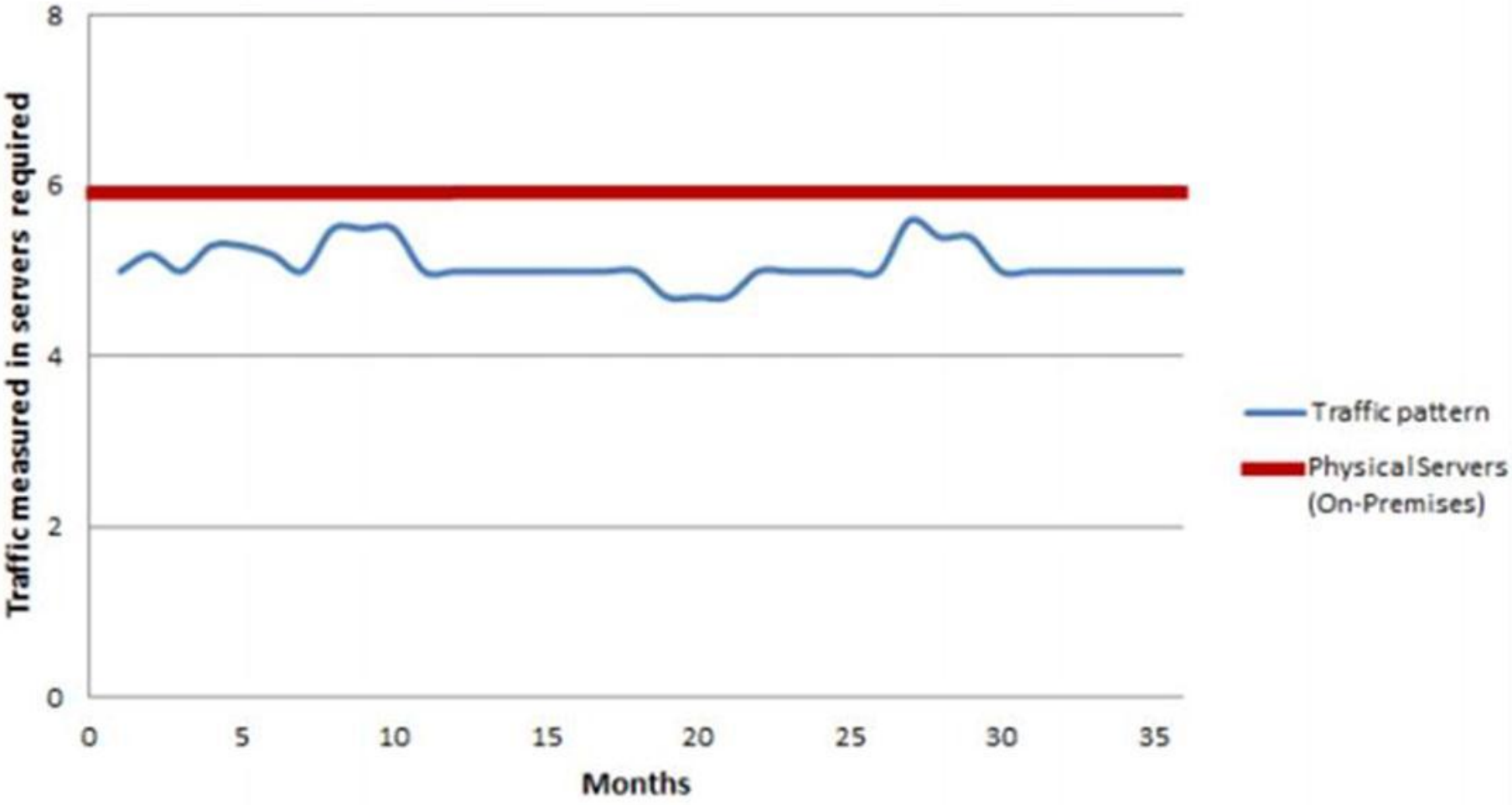
- We will model three web application scenarios, map each scenario to a usage pattern, and compare the costs of running these applications on-premises vs. the equivalent cloud environment on AWS (either in AWS EC2 reserved instances or AWS EC2 OD instances)

Scenario	Potential Use Case
Steady state usage demand pattern	Typical corporate website
Spikey but predictable demand pattern	Seasonal promotions e.g. holiday sales
Uncertain and unpredictable demand pattern	Launch of a new offering which is not tested before, adoption is not clear upfront

- We model the application using simple compute and database resources all based on Linux OS
- All calculations are based over 3 years

http://media.amazonwebservices.com/AWS_TCO_Web_Applications.pdf

Model application : business software example
Scenario 1: Steady state usage demand



http://media.amazonwebservices.com/AWS_TCO_Web_Applications.pdf

Model application : business software example
Scenario 1: Server needs and cost estimates

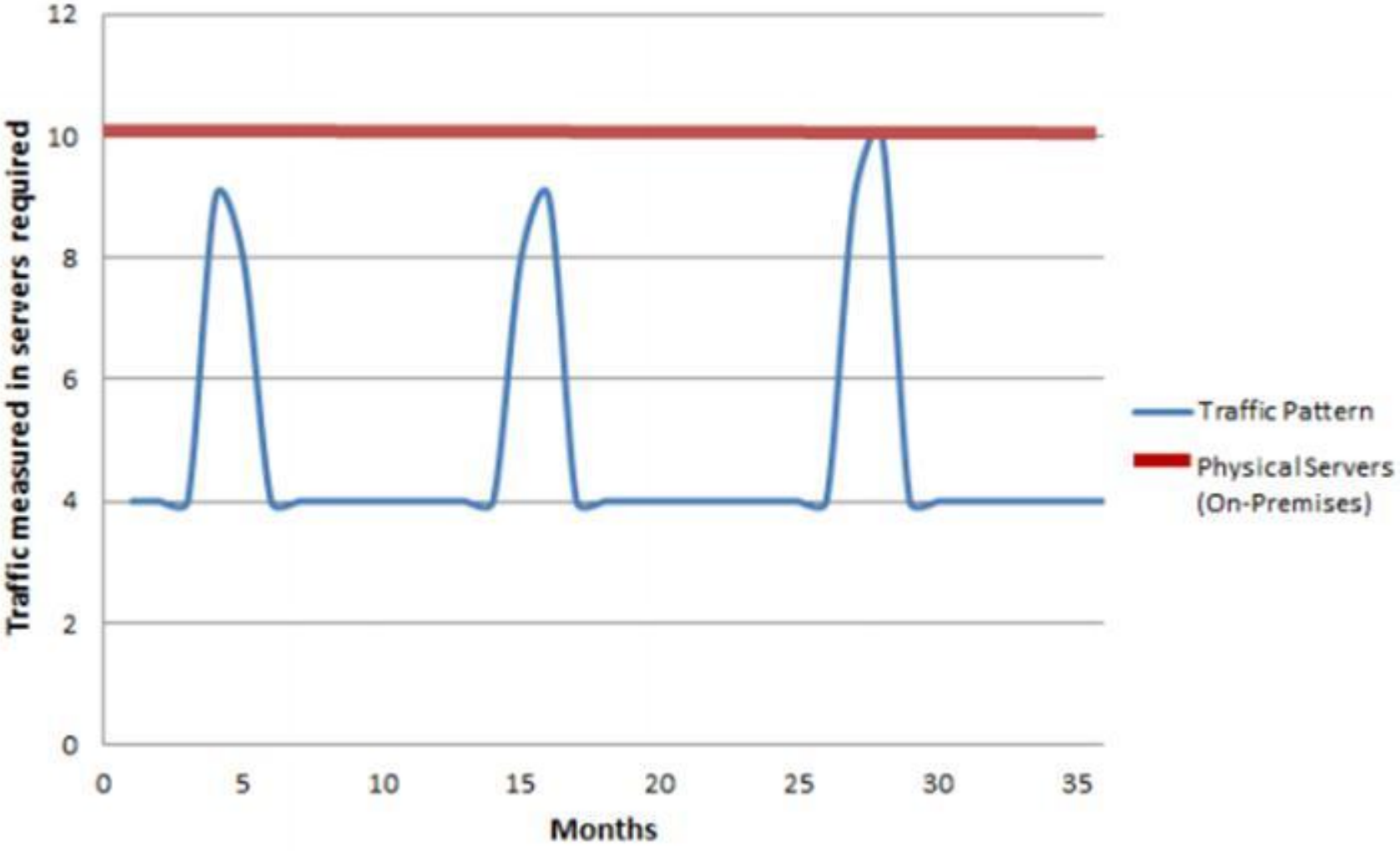
Server needs

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Web Servers	2	2 heavy utilization (3 yr term)	2 OD Instances
App Servers	2	2 heavy utilization (3 yr term)	2 OD Instances
DB Servers	2	2 heavy utilization (3 yr term)	2 OD Instances

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Server hardware	$306	-	-
Network hardware	$60	-	-
HW Maintenance	$48	-	-
Power and Cooling	$174	-	-
Data Center Space	$144	-	-
Personnel	$1,200	-	-
AWS Charges	-	$616	$2,131
Total Charges per month	$1,932	$616	$2,131
Total Over 3 years	$69,552	$22,176	$76,723
Savings vs. OP Option		68%	-10%

Recommended option

Model application : business software example
Scenario 2: Spikey but predictable demand



http://media.amazonwebservices.com/AWS_TCO_Web_Applications.pdf

Model application : business software example
Scenario 2: Server needs and cost estimates

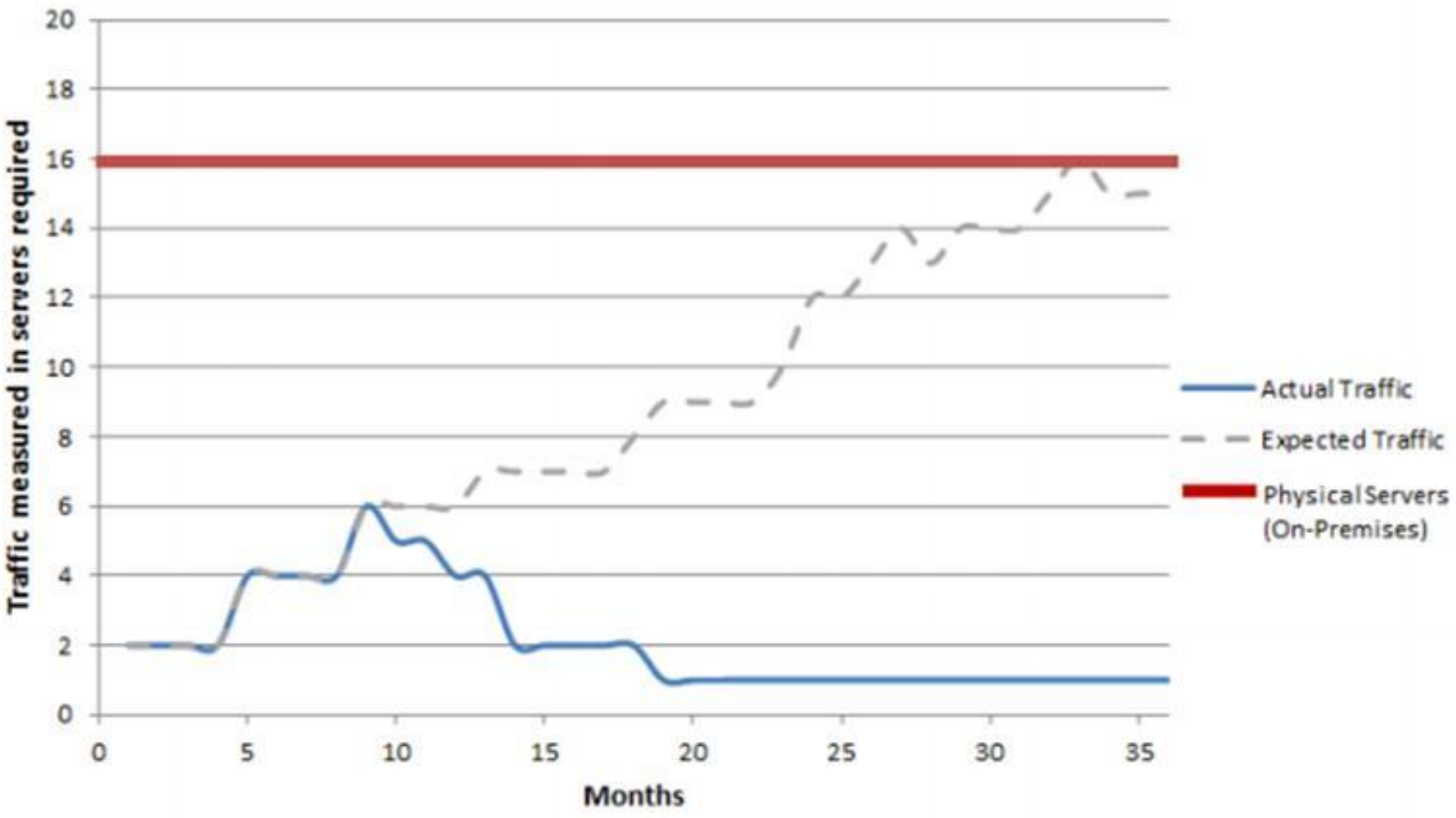
Server needs

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Web Servers	4	4 heavy utilization (3 yr term)	1 OD Instance base + as needed
App Servers	4	4 heavy utilization (3 yr term)	1 OD Instance base + as needed
DB Servers	2	2 heavy utilization (3 yr term)	2 OD Instances base

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Server hardware	$510	-	-
Network hardware	$100	-	-
HW Maintenance	$80	-	-
Power and Cooling	$290	-	-
Data Center Space	$240	-	-
Personnel	$2,000	-	-
AWS Charges	-	$988	$1,843
Total Charges per month	$3,220	$988	$1,843
Total Over 3 years	$115,920	$35,568	$66,348
Savings vs. OP Option		69%	43%

Recommended option

Model application : business software example
Scenario 3: Uncertain, unpredictable demand



http://media.amazonwebservices.com/AWS_TCO_Web_Applications.pdf

Model application : business software example
Scenario 3: Server needs and cost estimates

Server needs

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Web Servers	7	7 heavy utilization (3 yr term)	OD Instances as needed
App Servers	7	7 heavy utilization (3 yr term)	OD Instances as needed
DB Servers	2	2 heavy utilization (3 yr term)	OD Instances as needed

	On Premise	AWS - Option 1 All Reserved	AWS - Option 2 All On-Demand
Server hardware	$816	-	-
Network hardware	$160	-	-
HW Maintenance	$128	-	-
Power and Cooling	$464	-	-
Data Center Space	$384	-	-
Personnel	$3,200	-	-
AWS Charges	-	$1,546	$1,048
Total Charges per month	$5,152	$1,546	$1,048
Total Over 3 years	$185,472	$55,656	$37,714
Savings vs. OP Option		70%	80%

Recommended option

Key challenges in renting/sharing

Psychological factors impacting ownership decisions

- Security of tenure
- Pride of ownership

Trust and reliability in rental services

- Reliability and reputation of the parties in the transaction
- Service and business disruptions e.g. AWS outages

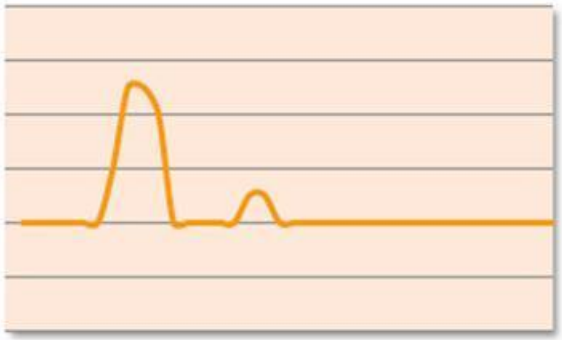
Evolving rules and regulations

- Tax rules around income from sharing of assets
- Data and privacy regulations

Additional details: framework for ownership – Understand the variability in asset usage

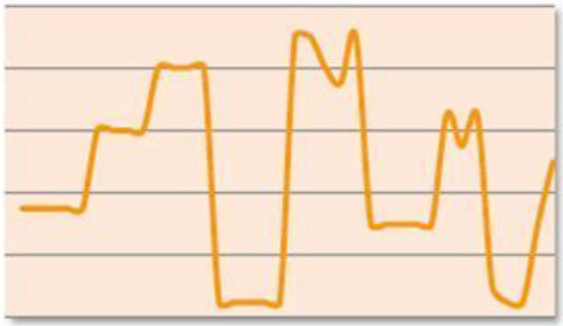
Steady state usage pattern

Often high utilization with known demand → ownership is often better in these cases



Spikey but predictable usage pattern

Often associated with seasonal promotions or events → mix of ownership and rental (for spikes) is preferred



Uncertain and unpredictable usage pattern

Often associated with applications or trends that suddenly go viral → rental is preferred to avoid large upfront expense of ownership

A framework for determining ownership vs. rent

Asset ownership = f (U, λ, S, V)

Where:

U = Current utilization of asset

λ = Variability in usage of asset

S = Scarcity or uniqueness of asset
i.e. how easy is it to obtain or create

V = Fraction of total value generated by the asset that is captured by its owner

Source: Competing on Resources, HBR and author analysis

Conclusions

- New models around collaborative consumptions are emerging largely due to the technology advancements

- These new sharing models have the potential to disrupt established industries ranging from transportation, software, to consumer goods like apparel

- However own or rent decisions need to include a long term perspective and consider many key aspects at play on both cost and benefits

- We believe that Own vs Share is an instance of a broader economic tradeoff that needs to be further investigated