Module 36, Architectural Reasoning Business and Life Cycle

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Abstract

This module provides methods and techniques to analyze the business and lifecycle context.

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Simplistic Financial Computations for System Architects.

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Abstract

This document explains how simple financial estimates can be made by system architects. These simplistic estimates are useful for an architect to perform sanity checks on proposals and to obtain understanding of the financial impact of proposals. Note that architects will never have full fledged financial controller know how and skills. These estimates are zero order models, but real business decisions will have to be founded on more substantial financial proposals.

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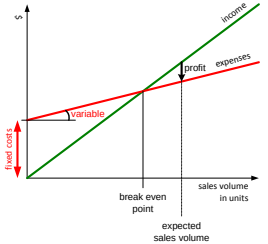
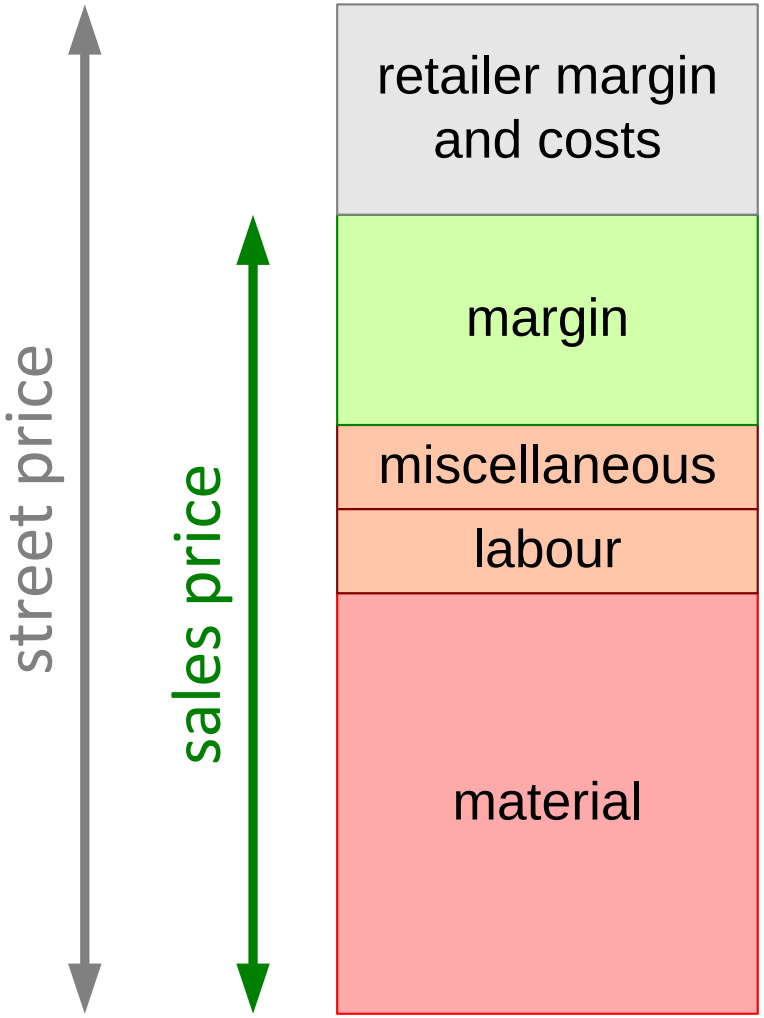


Product Margin = Sales Price - Cost



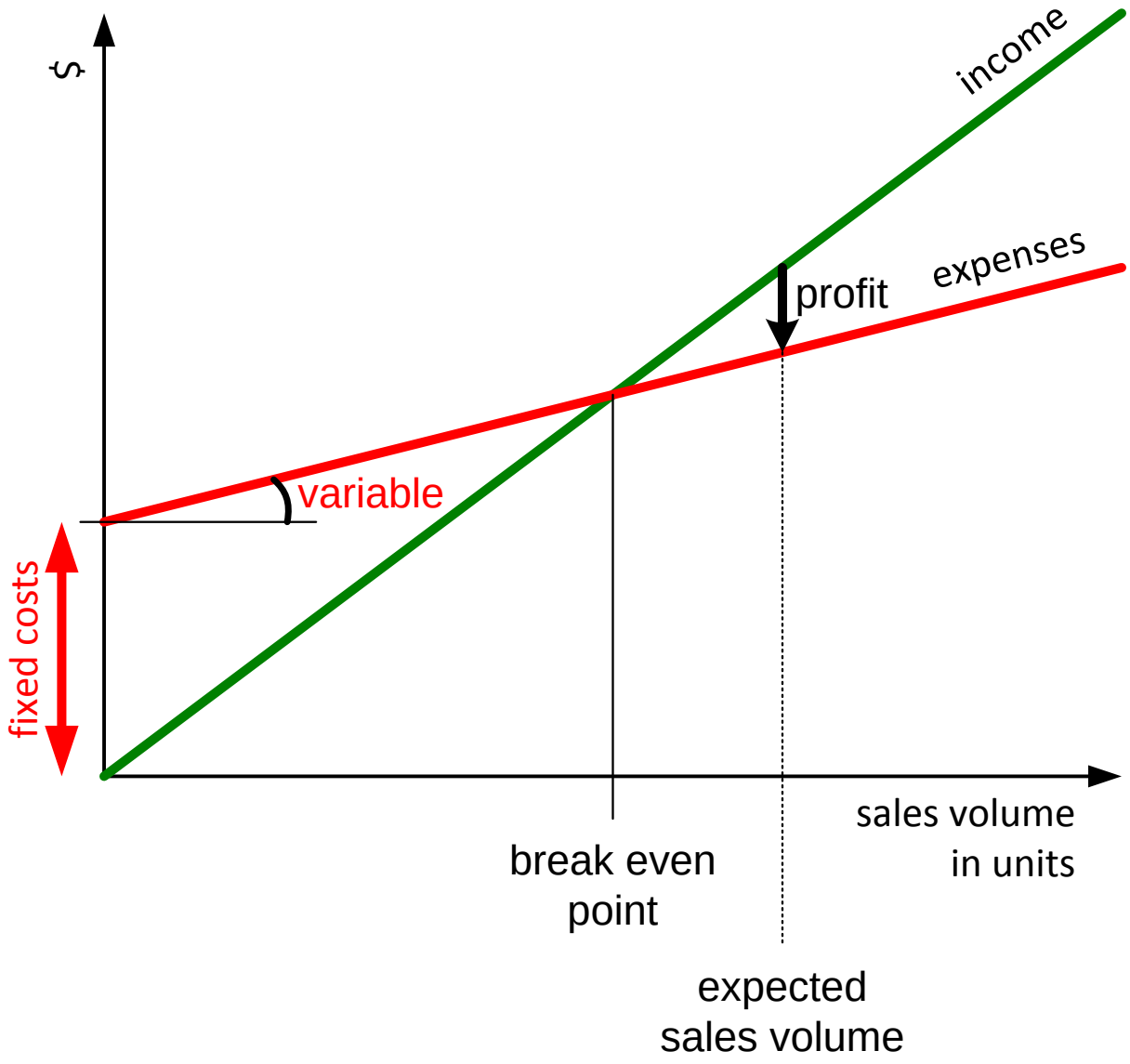
Margin per product.
The margin over the sales volume,
must cover the fixed costs, and generate profit

transportation, insurance,
royalties per product, ...

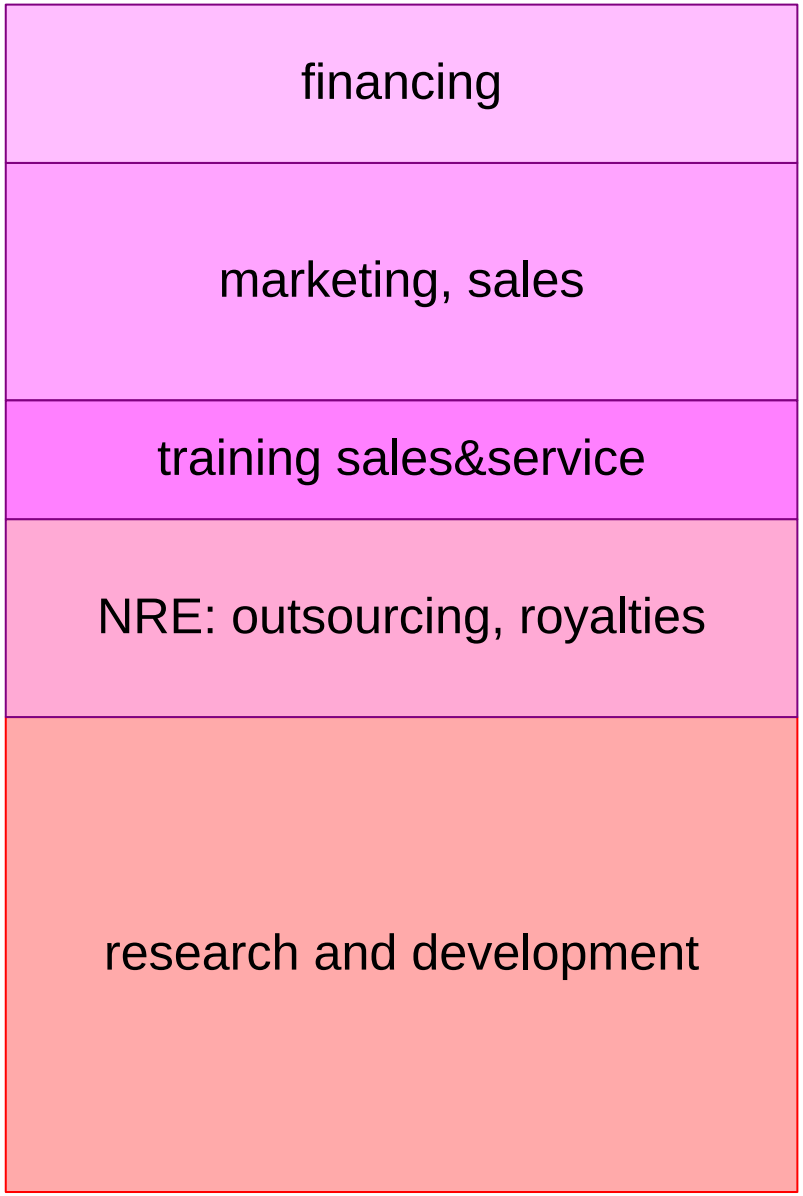
Cost per product,
excluding fixed costs

purchase price of components may cover
development cost of supplier

Profit as function of sales volume



Investments, more than R&D



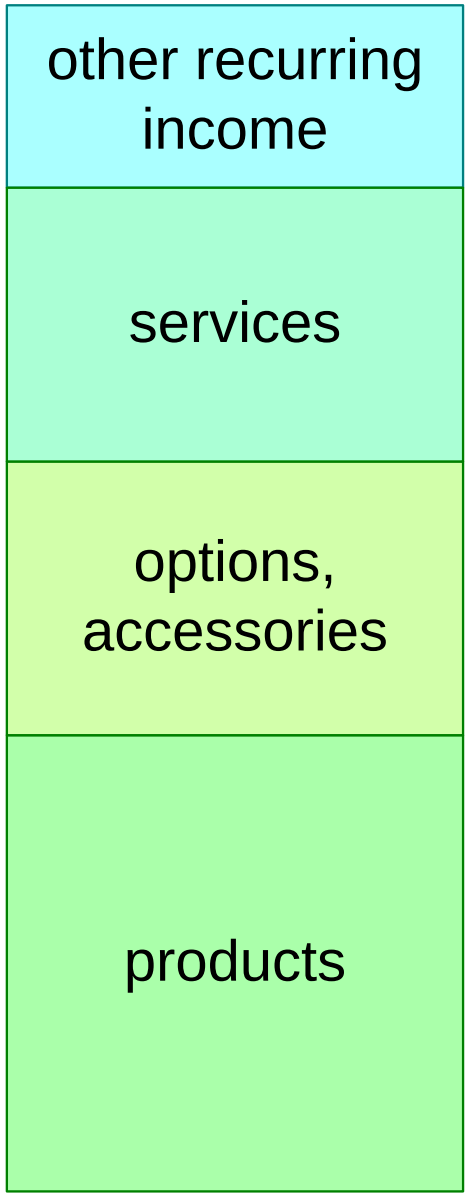
business dependent:
pharmaceutics industry
sales cost >> R&D cost

strategic choice:
NRE or per product

including:
- staff, training, tools, housing
- materials, prototypes
- overhead
- certification

often a standard staffing rate is used
that covers most costs above:
R&D investment = Effort * rate

Income, more than product sales only



$$\sum_{\text{services}} \text{income}_{\text{service}}$$

$$\sum_{\text{options}} \text{sales price}_{\text{option}} * \text{volume}_{\text{option}}$$

$$\text{sales price}_{\text{product}} * \text{volume}_{\text{product}}$$

license fees
pay per movie

content, portal
updates
maintenance

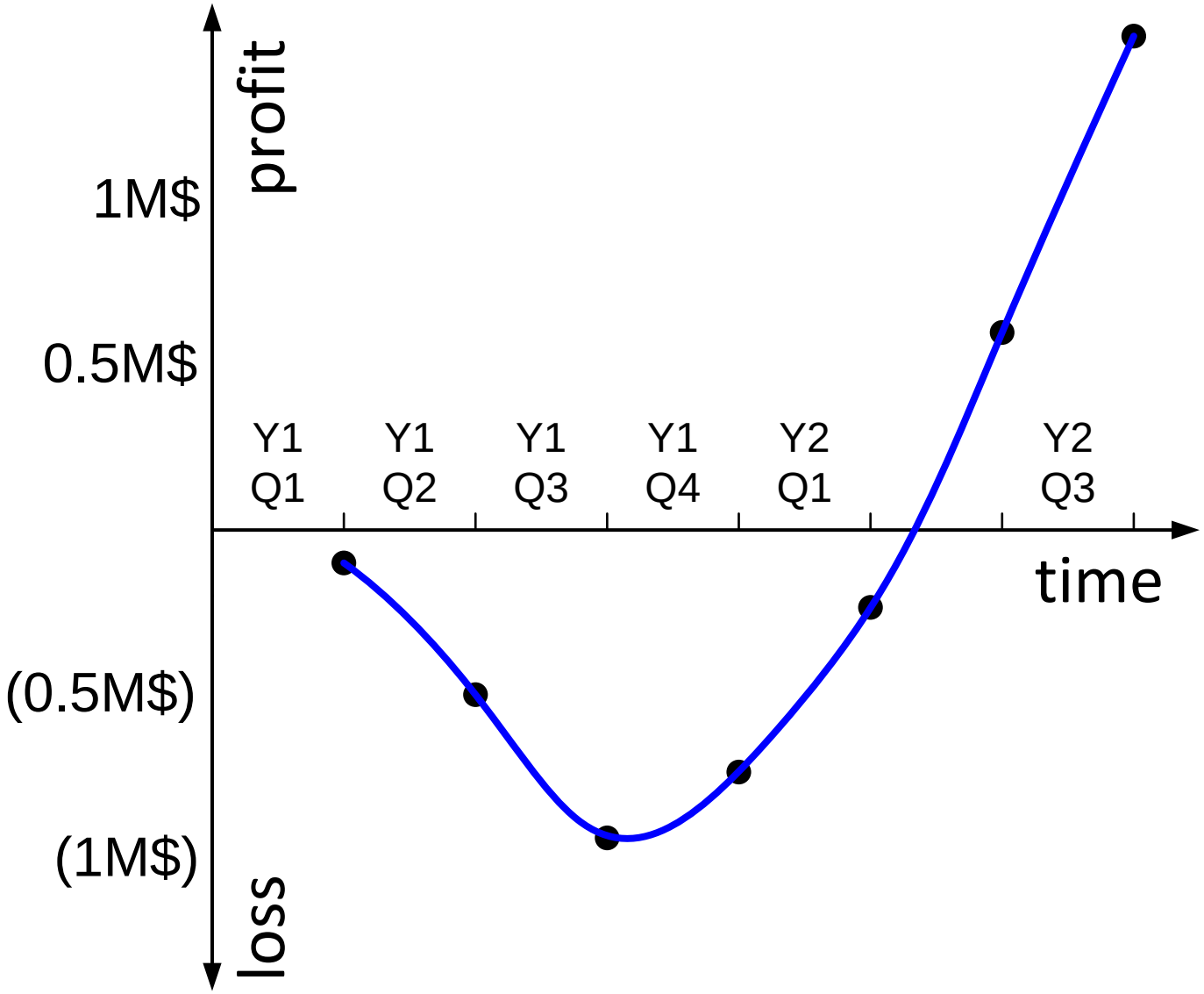
The Time Dimension

	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3
investments	100k$	400k$	500k$	100k$	100k$	60k$	20k$
sales volume (units)	-	-	2	10	20	30	30
material & labour costs	-	-	40k$	200k$	400k$	600k$	600k$
income	-	-	100k$	500k$	1000k$	1500k$	1500k$
quarter profit (loss)	(100k$)	(400k$)	(440k$)	200k$	500k$	840k$	880k$
cumulative profit	(100k$)	(500k$)	(940k$)	(740k$)	(240k$)	600k$	1480k$

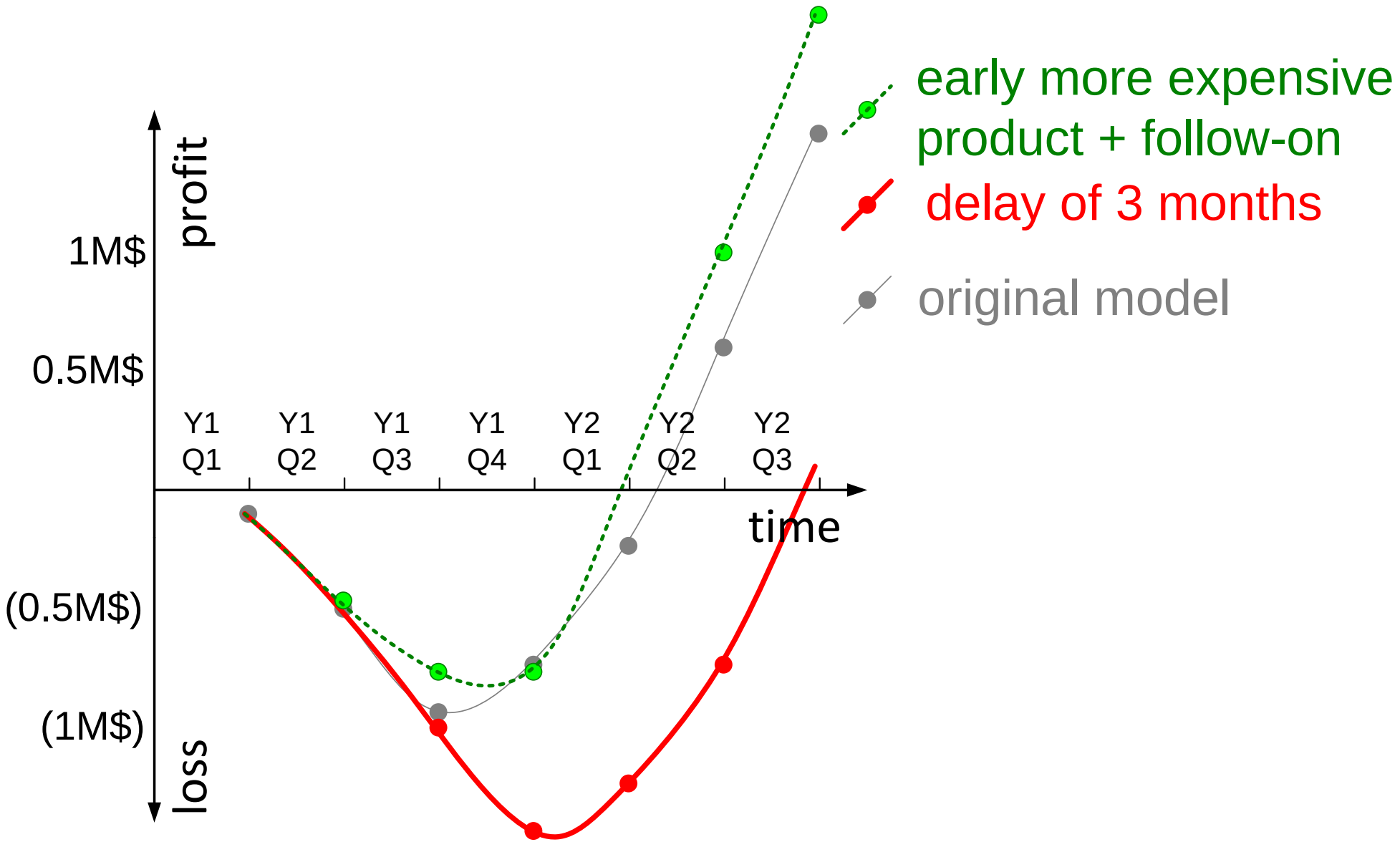
cost price / unit = 20k$
sales price / unit = 50k$

variable cost = sales volume * cost price / unit
income = sales volume * sales price / unit
quarter profit = income - (investments + variable costs)

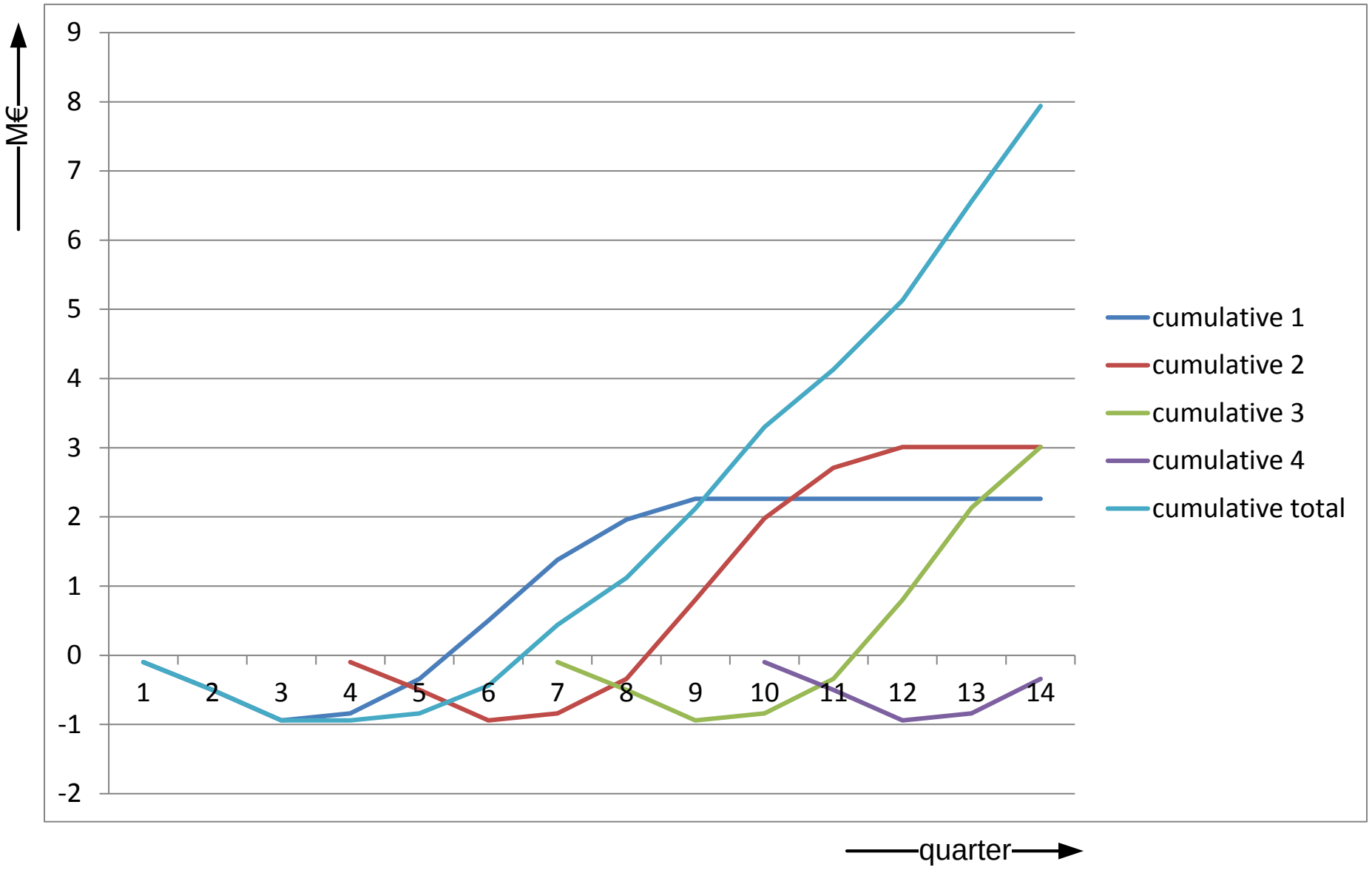
The “Hockey” Stick



What if ...?


profit
1M$
0.5M$
(0.5M$)
(1M$)
loss
Y1 Q1
Y1 Q2
Y1 Q3
Y1 Q4
Y2 Q1
Y2 Q2
Y2 Q3
time
early more expensive product + follow-on
delay of 3 months
original model

Stacking Multiple Developments



Fashionable financial yardsticks

Return On Investments (ROI)

Net Present Value

Return On Net Assets (RONA) leasing reduces assets, improves RONA

turnover / fte outsourcing reduces headcount, improves this ratio

market ranking (share, growth) "only numbers 1, 2 and 3 will be profitable"

R&D investment / sales in high tech segments 10% or more

cash-flow fast growing companies combine profits with negative cash-flow, risk of bankruptcy

Exercise Business Plan

Make a **business plan** for the mid to long-term future.

- determine business model
- determine investments, sales volume, sales price, and costs
- estimate the cash flow and accumulated profit
- include at least 3 releases or generations of systems

Modeling and Analysis: Life Cycle Models

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Abstract

Products and enterprises evolve over time. This presentation explores the impact of these changes on the system and on the business by making (small and simple) models of life cycle aspects.

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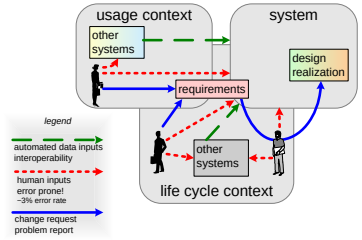
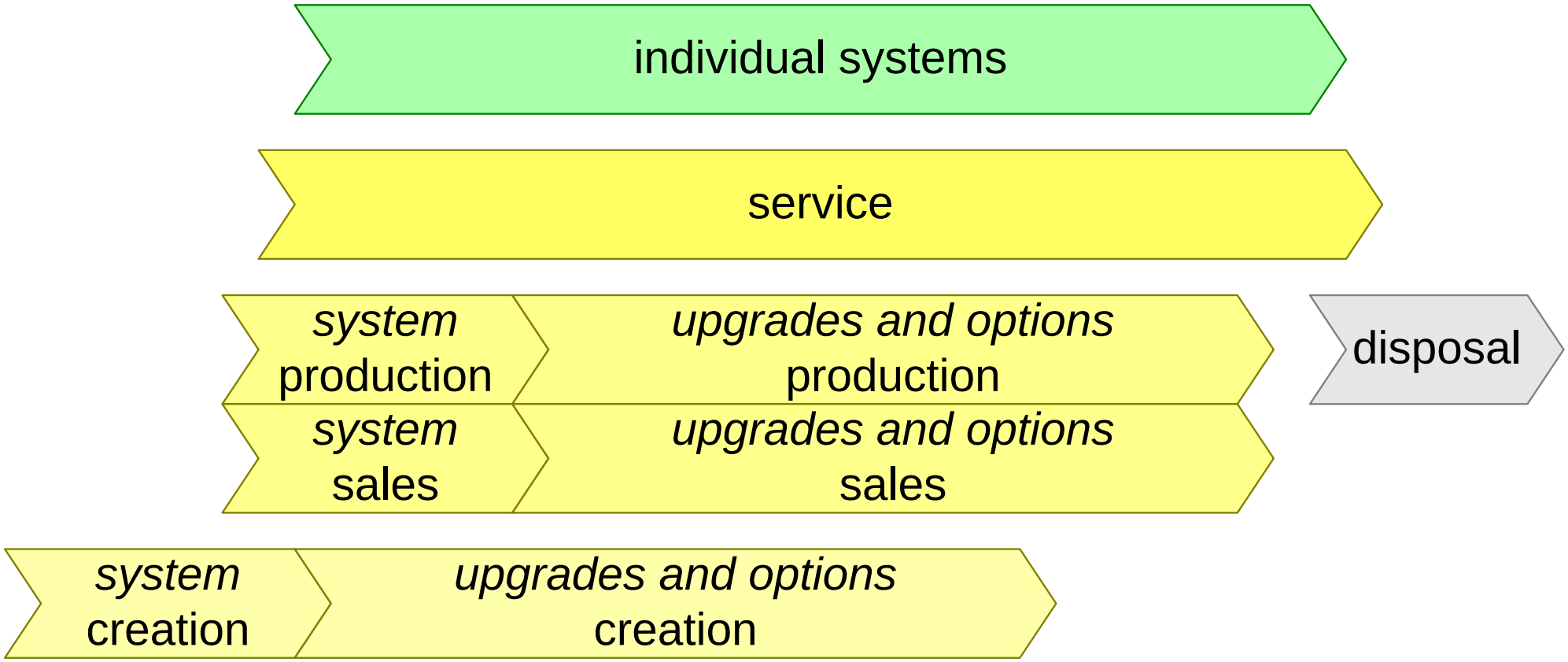
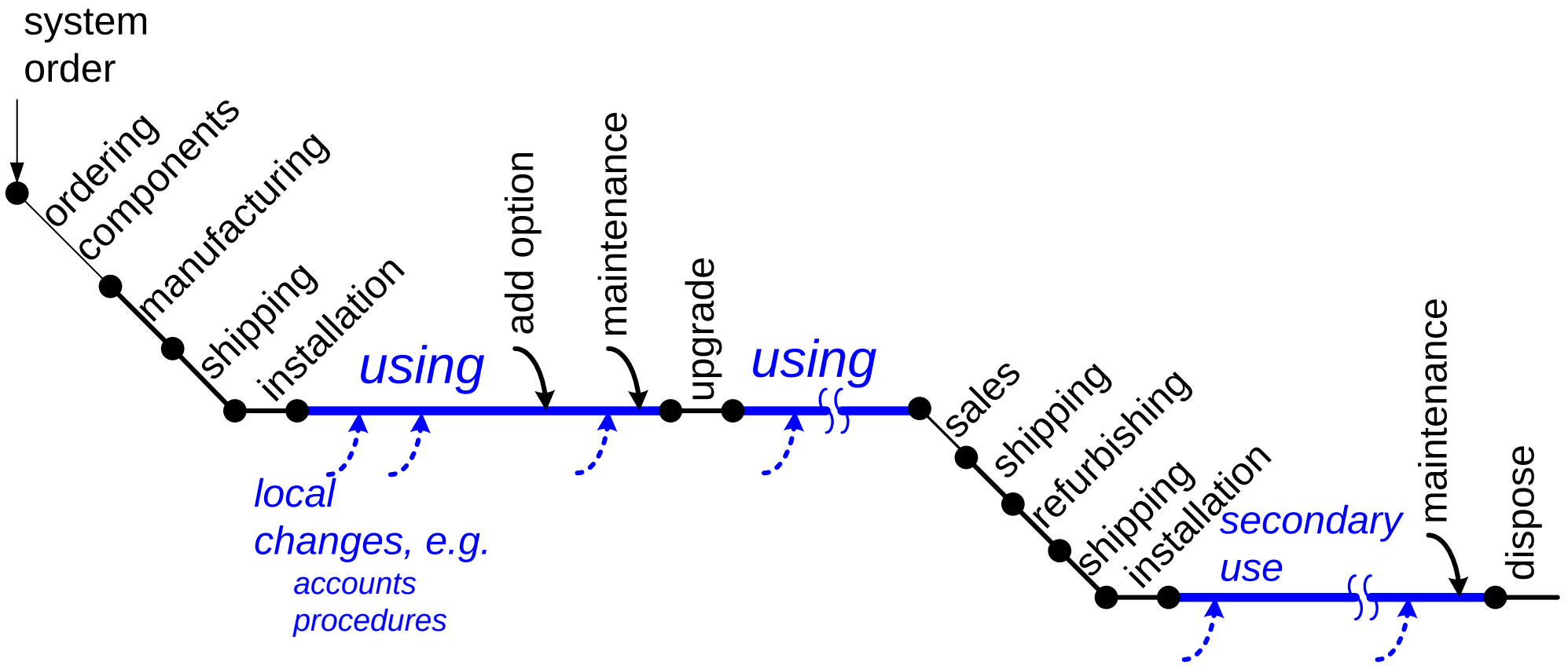


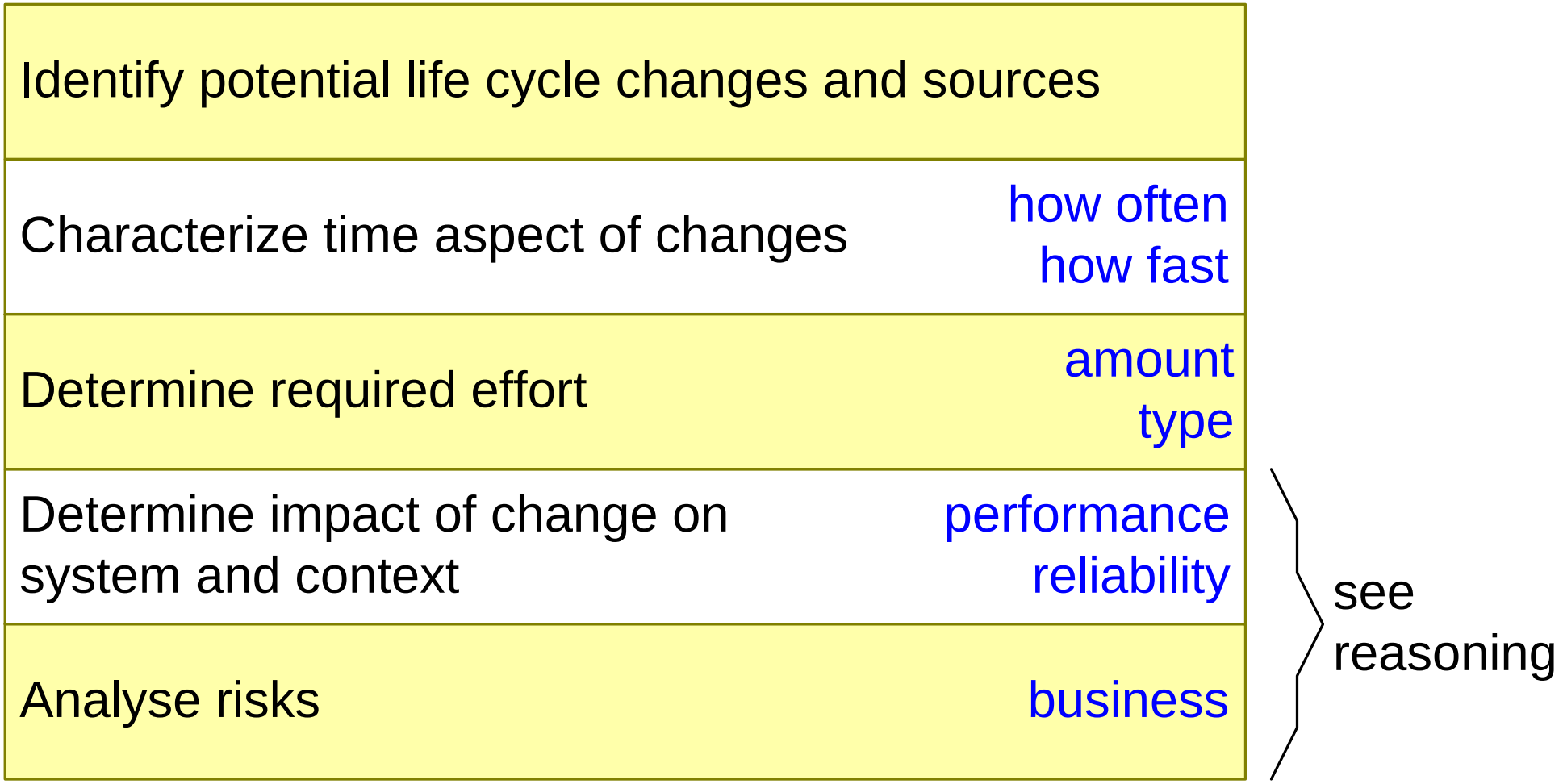
Product Related Life Cycles



System Life Cycle



Approach to Life Cycle Modeling



What May Change During the Life Cycle?

business volume

product mix

product portfolio

product attributes (e.g. price)

customers

personnel

suppliers

application, business processes

et cetera

www.homes4sale.com

www.apple.com/itunes/

www.amazon.com

www.ebay.com

www.shell.com

www.stevens.edu

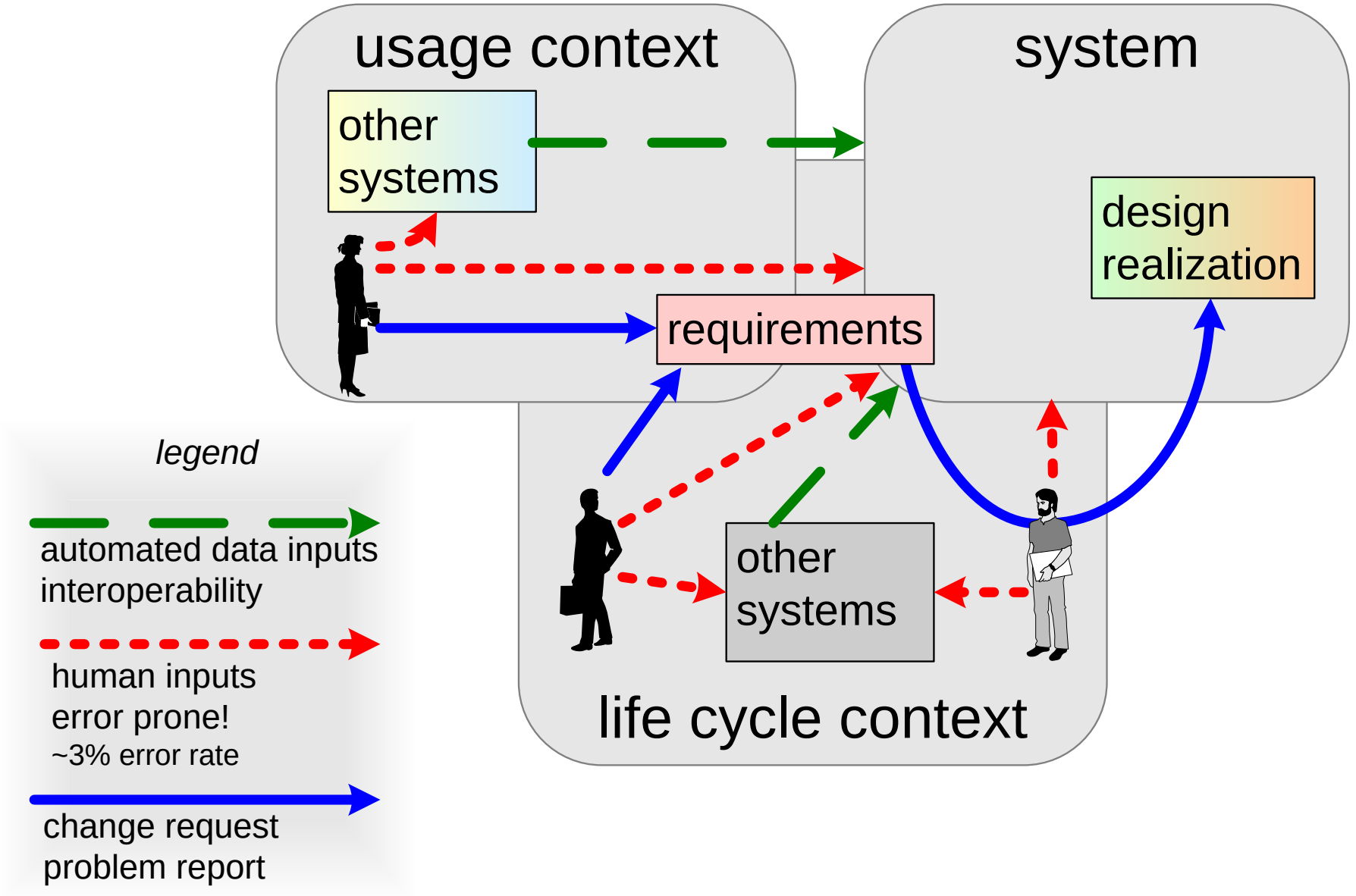
www.nokia.com

stock market

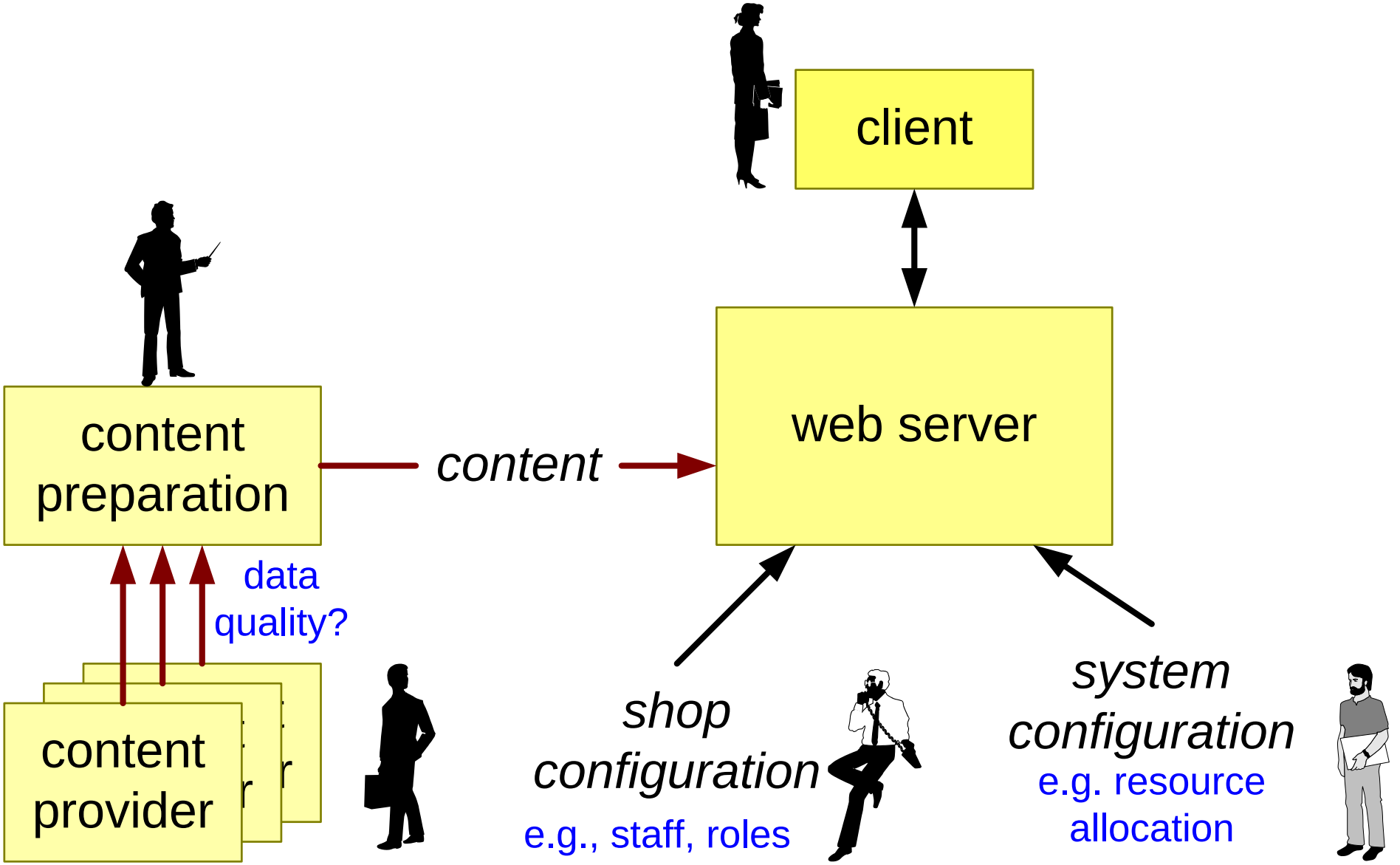
insurance company

local Dutch cheese shop

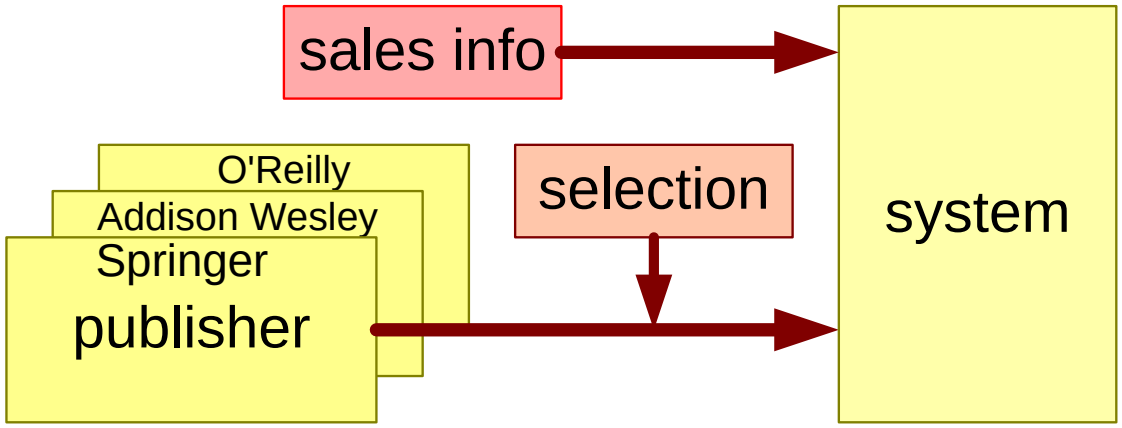
Simple Model of Data Sources of Changes



Data Sources of Web Server



Example Product Portfolio Change Books



product portfolio characteristics

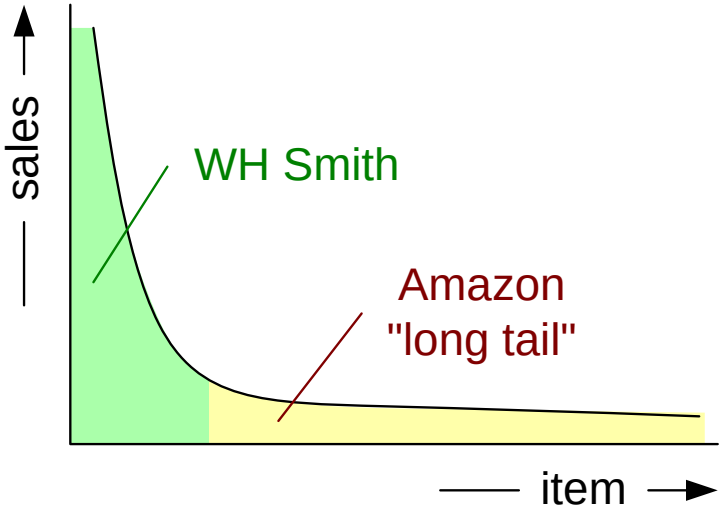
selection depends on business

life cycle changes determined by business characteristics

source: http://en.wikipedia.org/wiki/Long_tail

new books per year

UK (1)	206k (2005)	107k (1996)
USA(2)	172k (2005)	68k (1996)
China(3)		101k (1994)
India(21)		12k (1996)



source: http://en.wikipedia.org/wiki/Books_published_per_country_per_year

Example Customer Change

internet: broadband penetration

	Q1 '04	Q2 '04	growth in Q2 '04
Asia Pacific total	48M	54M	12.8%
China	15M	19M	26.1%
India	87k	189k	116.8%

http://www.apira.org/download/world_broadband_statistics_q2_2004.pdf

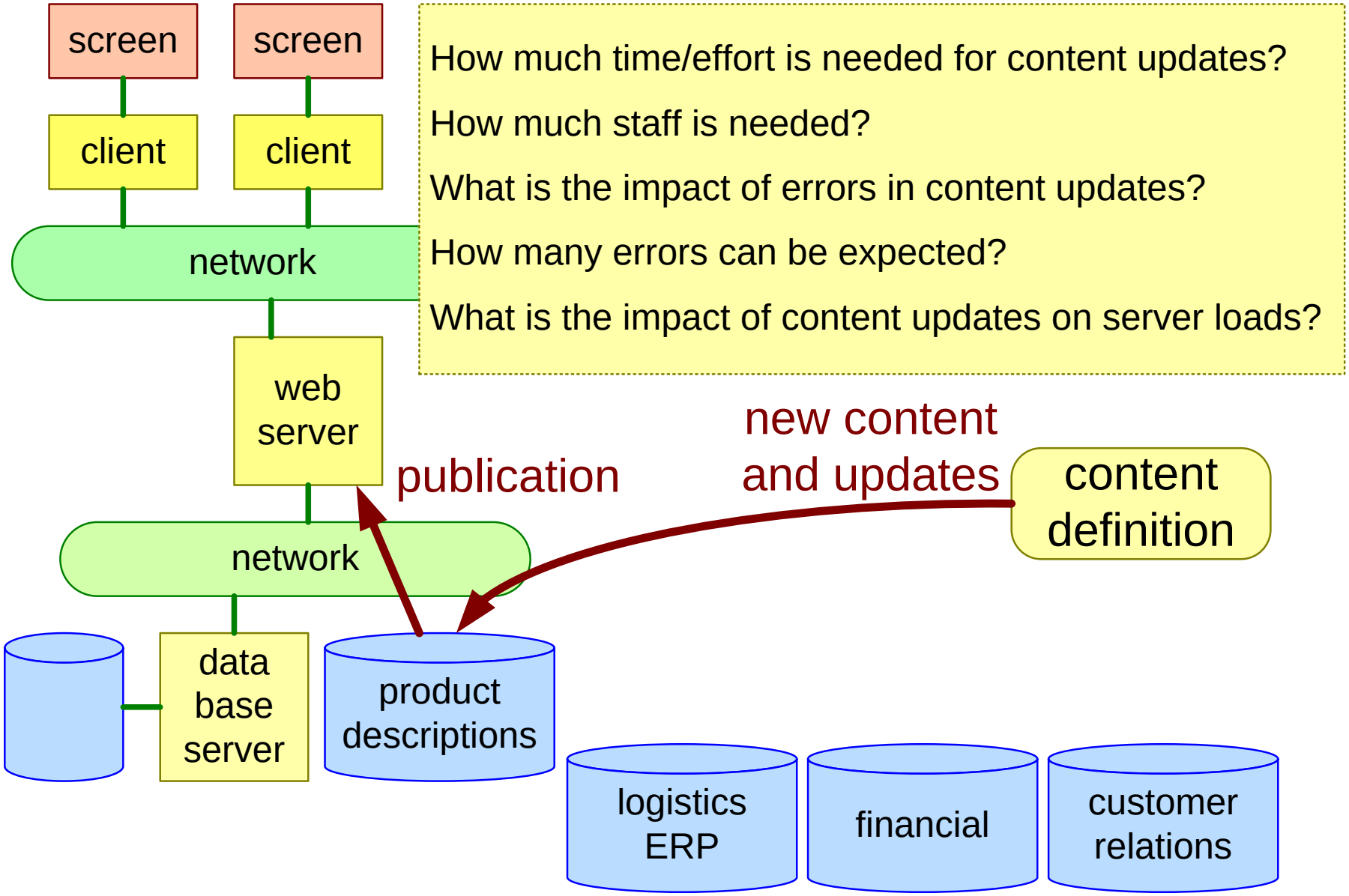
What is the expected growth of # customers?

What is the impact on system and infrastructure?

What is the impact on CRM (Customer Relation Management)?

What is the impact on customer, sales support staff?

Web Shop Content Update



Web Shop Content Change Effort

prepare change 1	prepare change 2		prepare change n

review input
select info
layout&cosmetics
check-in

verify change 1		verify change n

inspect source
inspect result

commit changes

$$effort_{changes} = n_{changes}*(t_{prepare} + t_{verify})+t_{commit}$$

$$\#fte = effort_{changes} / hours\ per\ day$$

$n_{changes}$ per day	10	100	1000
$effort_{changes}$	1 uur	10 uur	100 uur
#fte	0.1	1	12

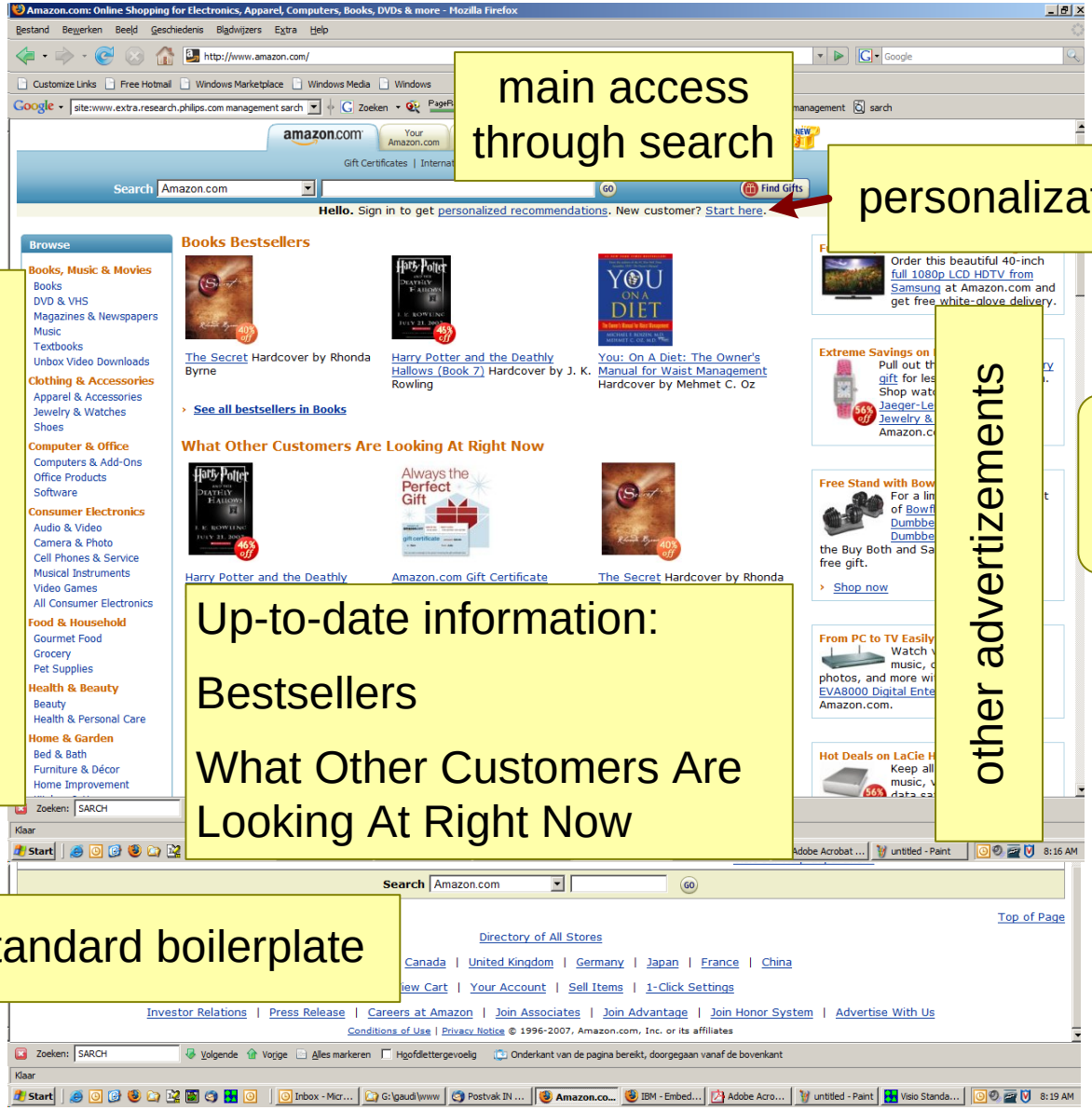
with $t_{prepare}$ = 4 min

t_{verify} = 2 min

t_{commit} = 1 min

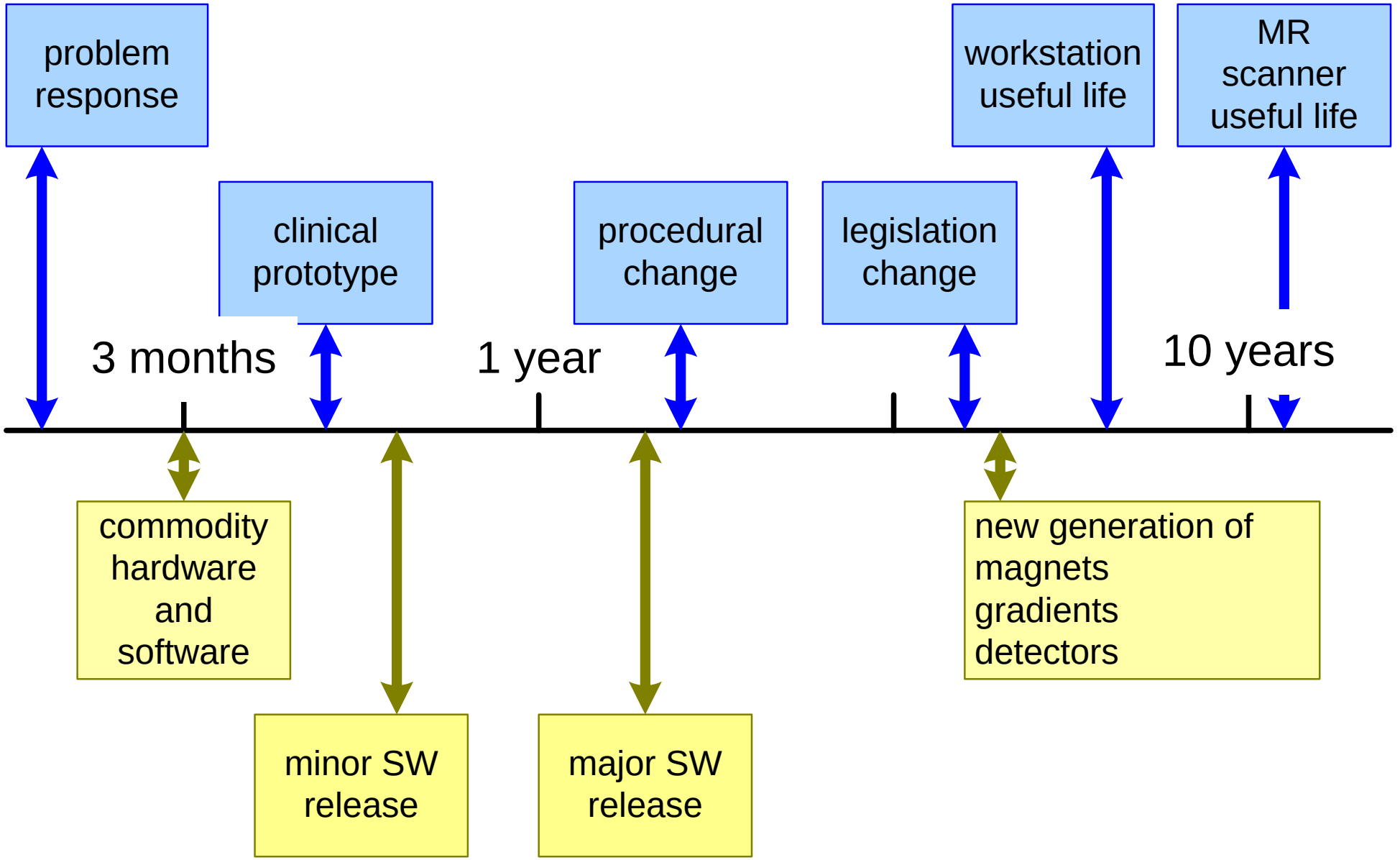
hours per day = 8 hours

Example of Client Level Changes

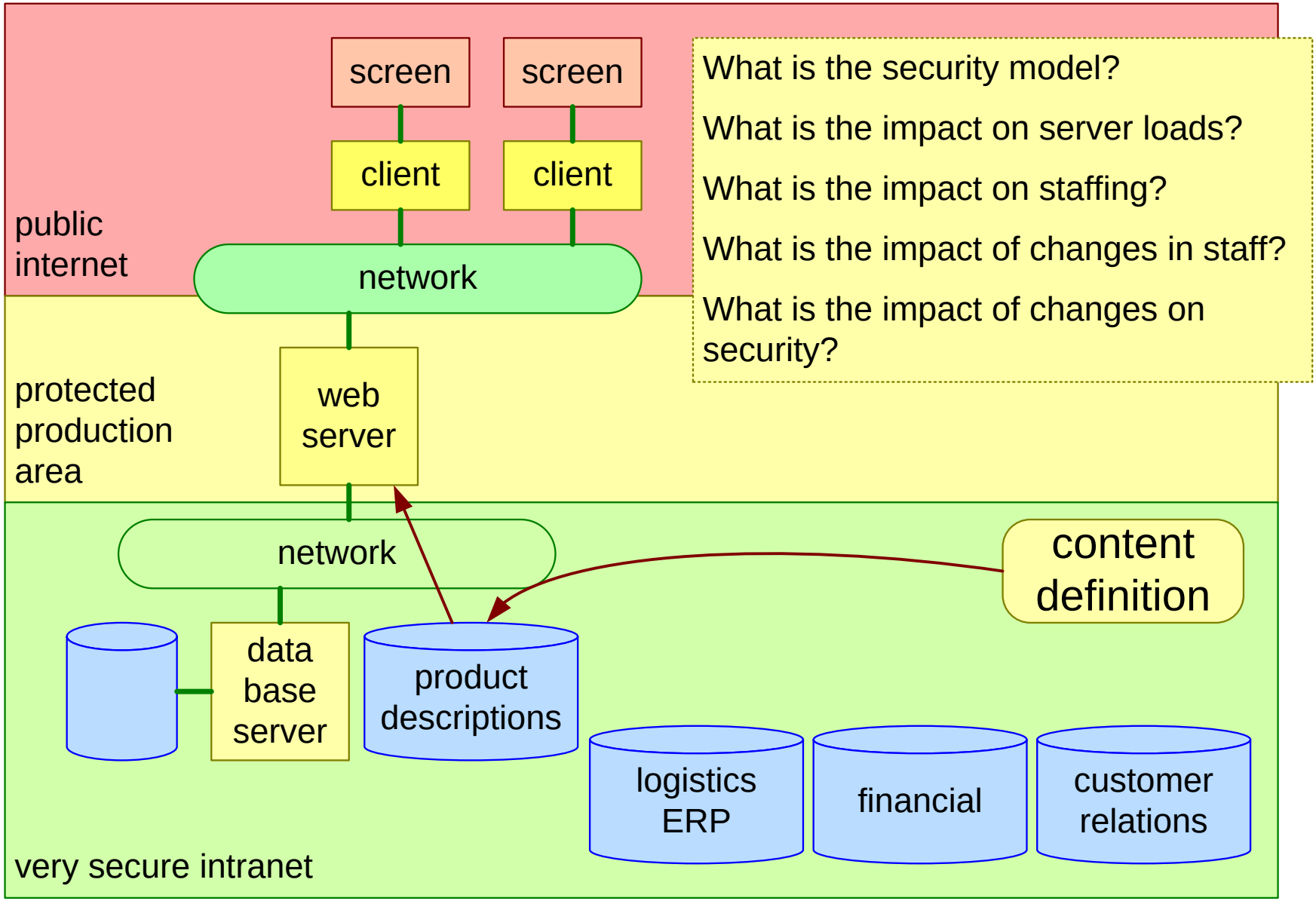


snapshot of www.amazon.com

Example of Time Scale Model for Changes



Web Shop Security and Changes



Web Shop Reliability and Changes

new faults = average fault density * #changes

$$\#errors = \sum_{faults} f(\text{severity}, \text{hit probability}, \text{detection probability})$$

	severity	hit probability	detection probability
Jansen iso *Janssen*	low	high	low
operator iso *sales repr*	high	high	medium

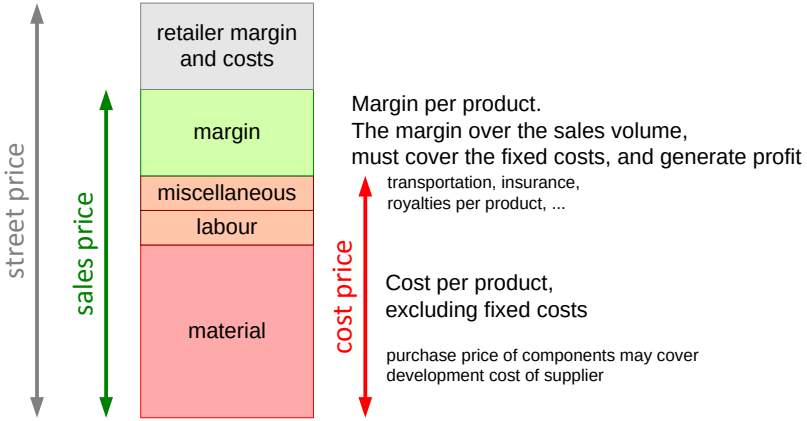
Exercise Life Cycle

Analyze the **evolution** during the **lifecycle**.

- identify sources of change in customer context, life cycle context, and technology
- make a list of changes
- determine per change the expected rate of change and the required response time to the change
- optional: determine effort, impact, and risks per change

Simplistic Financial Computations

Product Margin = Sales Price - Cost



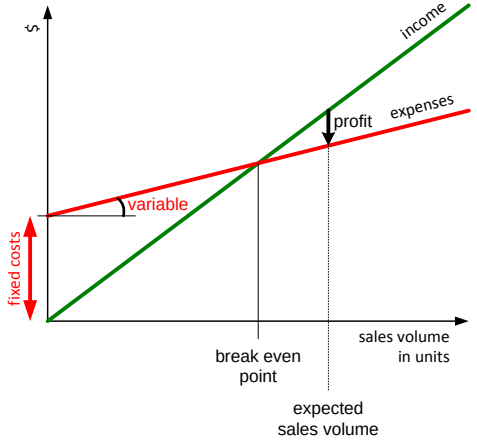
Margin per product.
The margin over the sales volume, must cover the fixed costs, and generate profit

transportation, insurance, royalties per product, ...

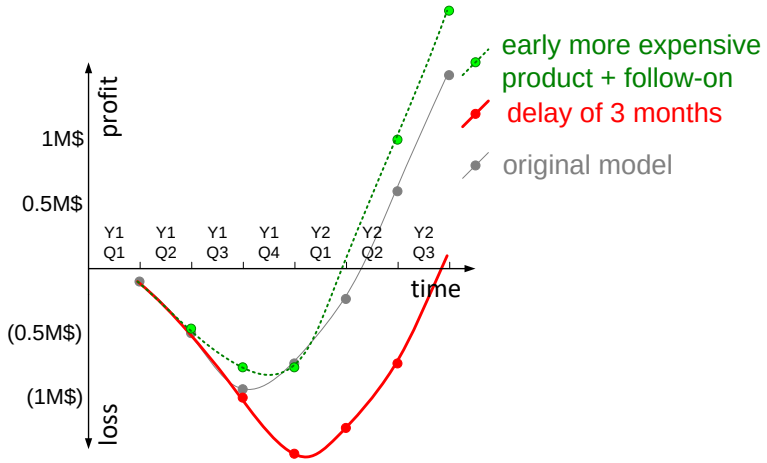
Cost per product, excluding fixed costs

purchase price of components may cover development cost of supplier

Profit as function of sales volume



Hockey stick and scenarios



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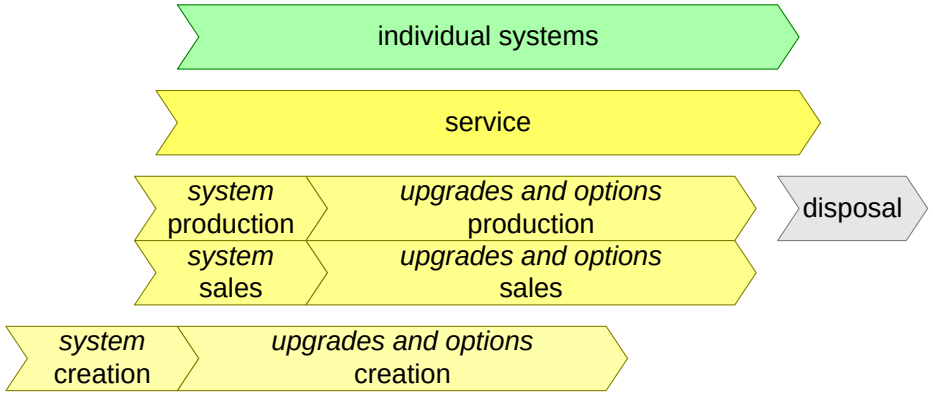
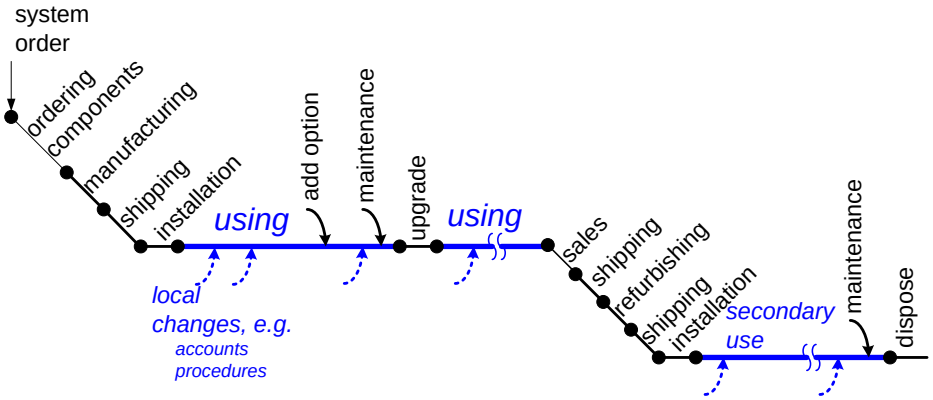
Life Cycle

Multiple Life Cycles



System Life Cycle



Analyze Frequency, Response Need, and Impact

Identify potential life cycle changes and sources	
Characterize time aspect of changes	how often how fast
Determine required effort	amount type
Determine impact of change on system and context	performance reliability
Analyse risks	business

see reasoning

Logarithmic Axis of Change Frequency