Recommendations for smartphone project success

Understand what's different about smartphones

Warnings from smartphone project failures

David Wood
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Preamble:
Why smartphones are interesting

The smartphone opportunity

And what is a smartphone?

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Global installed base at end of 2006

Mobile phones: 2.7B

TVs: 1.5B

Credit cards: 1.4B

Fixed telephones: 1.3B

Internet: 1.1B

Misc. CE: 870m

PCs: 850m

Cars: 800m

0   1000   2000   3000

million units
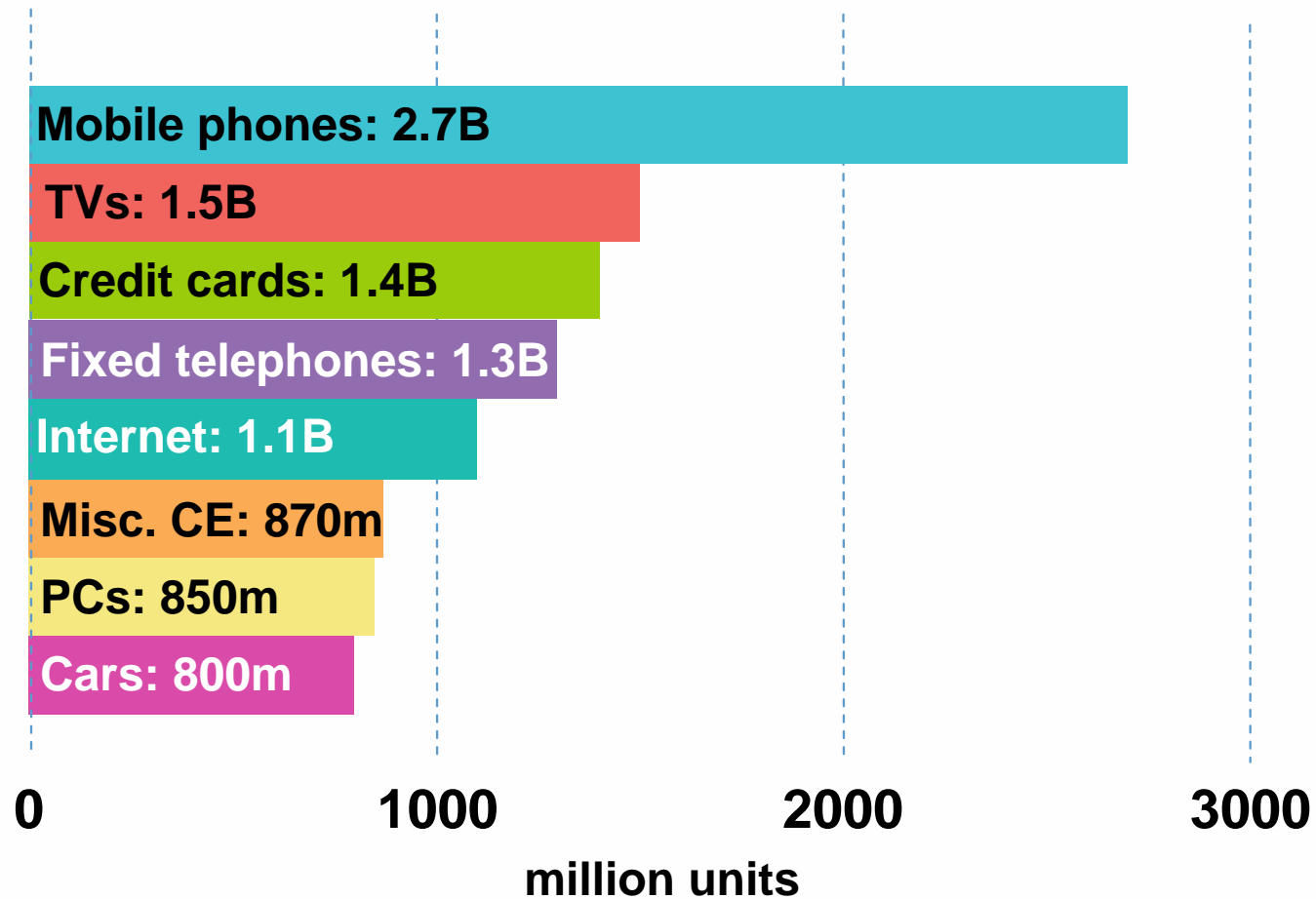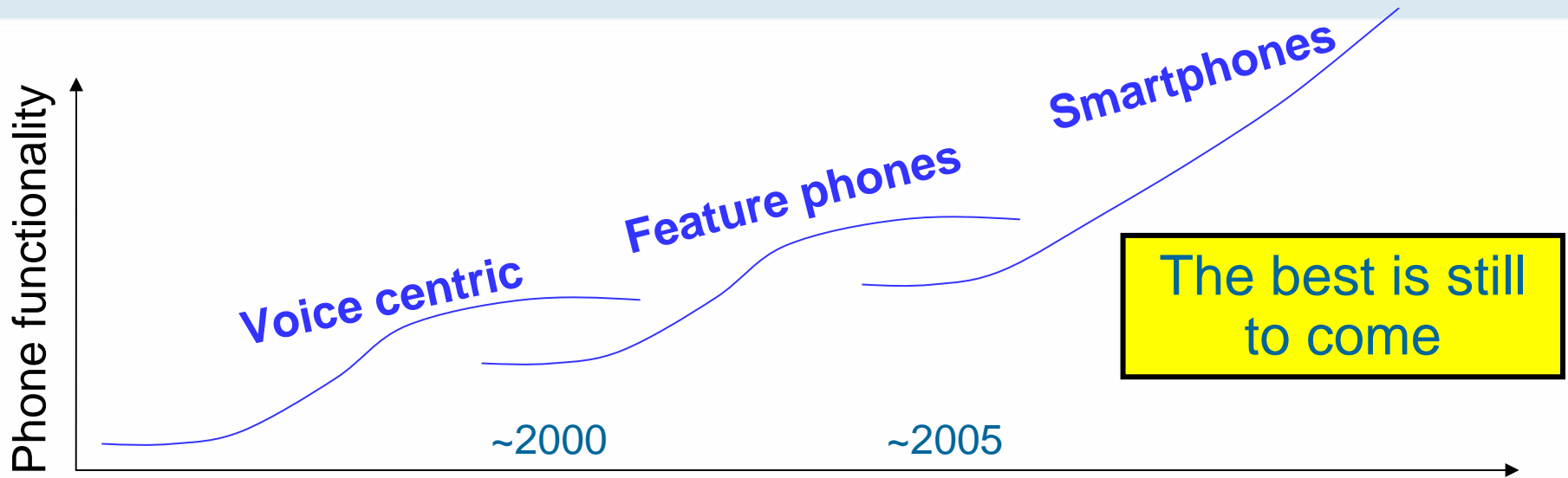
"Misc. CE" include: PDAs, mp3 players, PVRs, camcorders, game consoles and digital cameras

Source: Communities Dominate Brands – Tomi Ahonen & Alan Moore
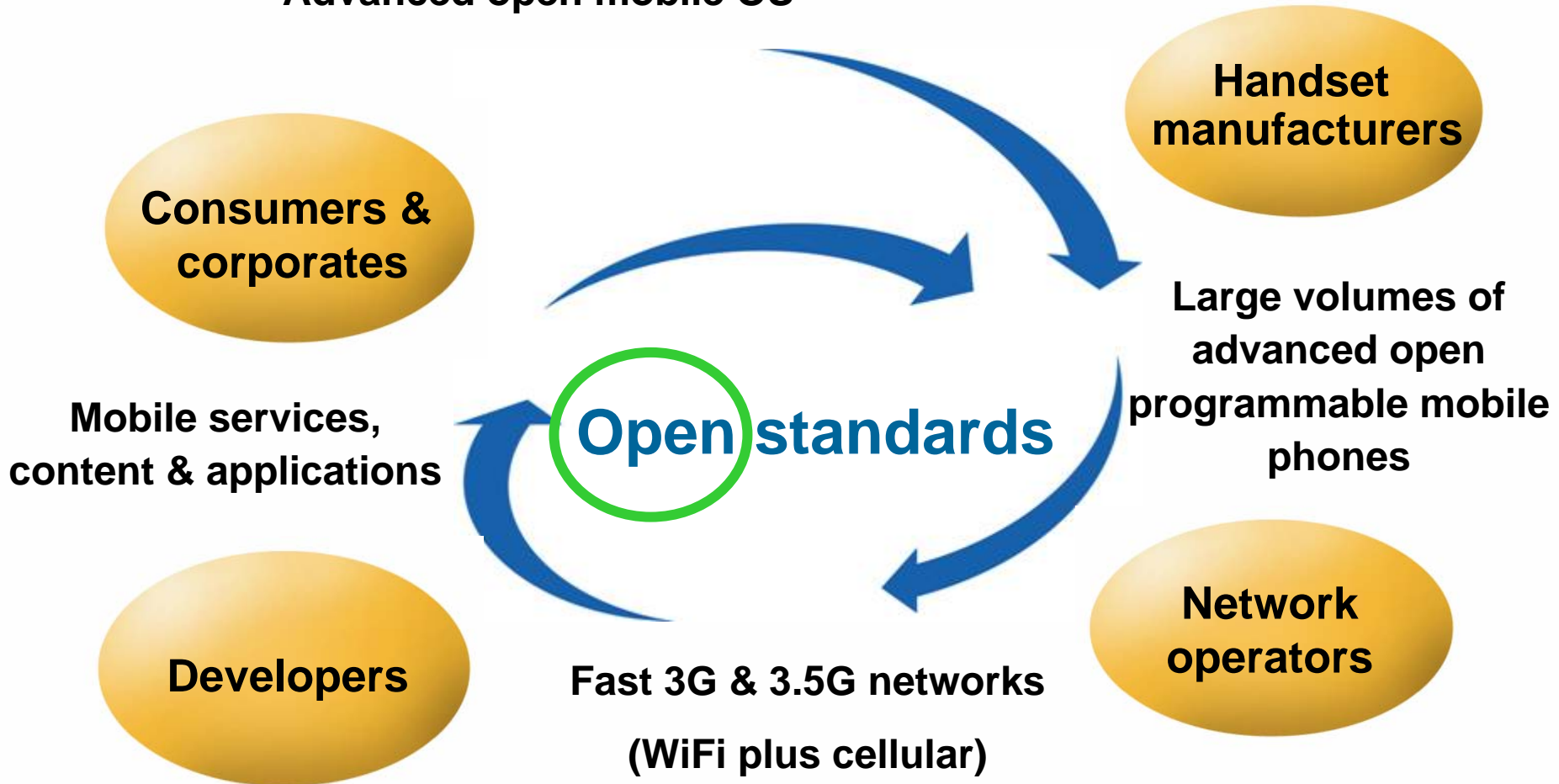
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Three waves of mobile phones

Voice centric

Feature phones

Smartphones

Phone functionality

~2000   ~2005

The best is still to come

• Great communications	• Graphics display	• Rich programmability
• Voice (& text)	• Colour	• Virtuous cycle
• Pocketability	• Camera	• Innovation
• Size	• Audio: Ringtones+	• Applications & services
• Weight	• Video	• *Personal productivity*
• Battery life	• Memory	• *Business productivity*
• Robustness	• Information	• Mobile commerce
• Reliability	• Personalisation	• Customisability

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The smartphone market open virtuous cycle

Advanced open mobile OS

Handset manufacturers

Consumers & corporates

Large volumes of advanced open programmable mobile phones

Mobile services, content & applications

Open standards

Developers

Fast 3G & 3.5G networks

(WiFi plus cellular)

Network operators

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"Open" means

- Programmable
- Interchangeable
- Collaborative
- Open-minded
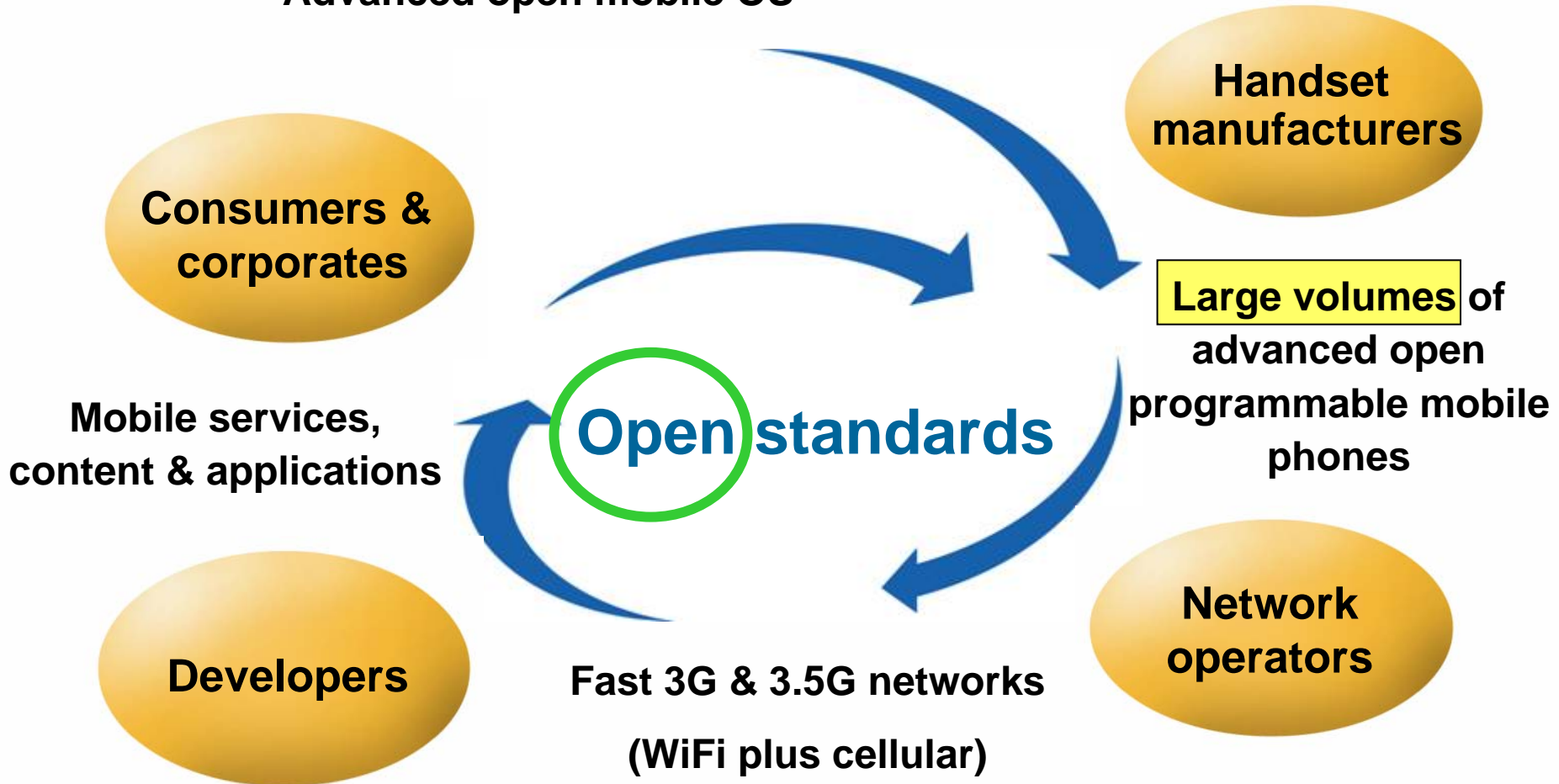- Free-flowing

Opportunities build on openness

"Closed" means

- Fixed functionality
- Non-standard add-ons
- Overly competitive
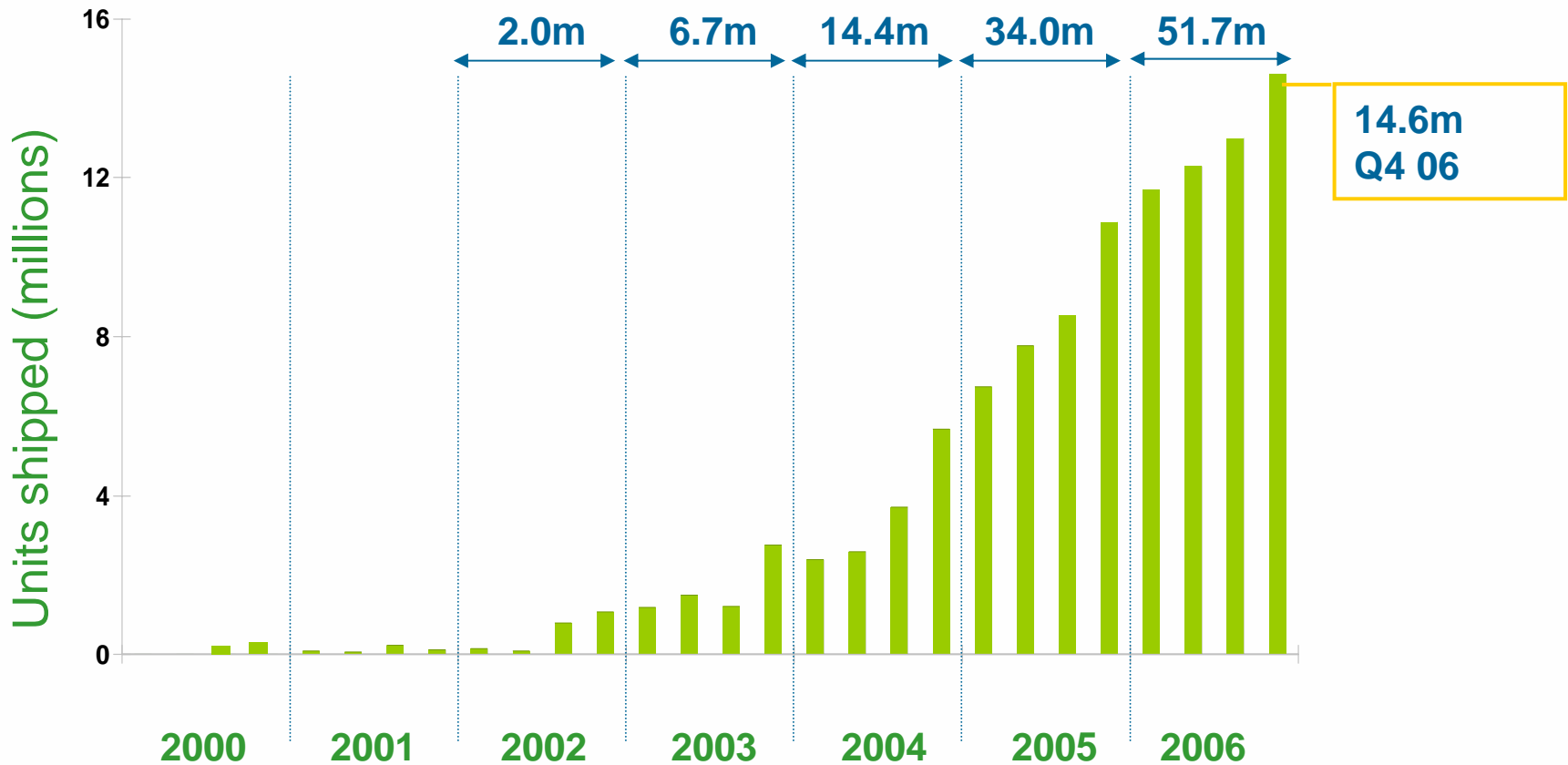- "Divine right" attitude
- Bottlenecks and chokes

Risks threaten a resurgence of closure

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The smartphone market open virtuous cycle

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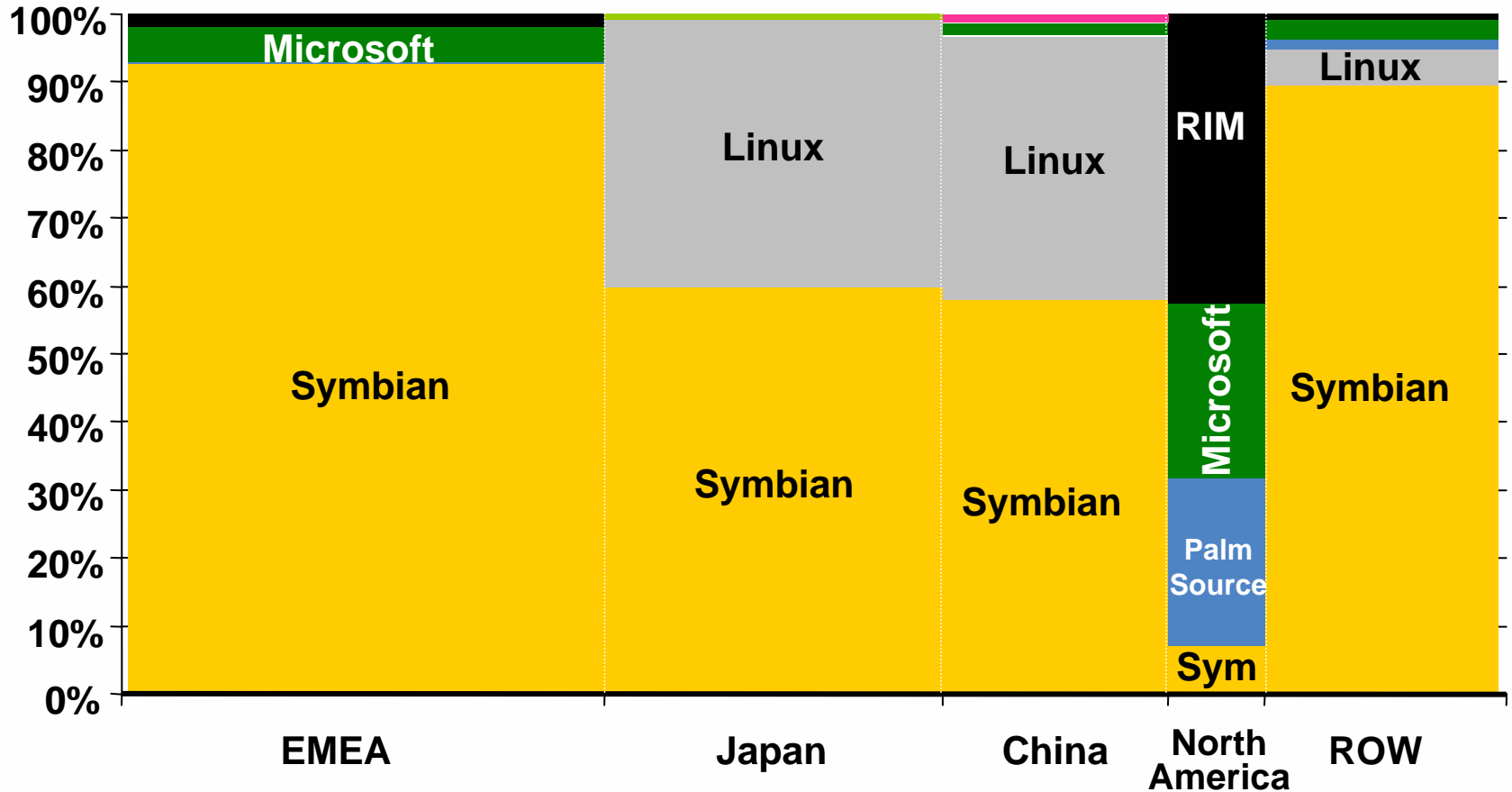
Network operators
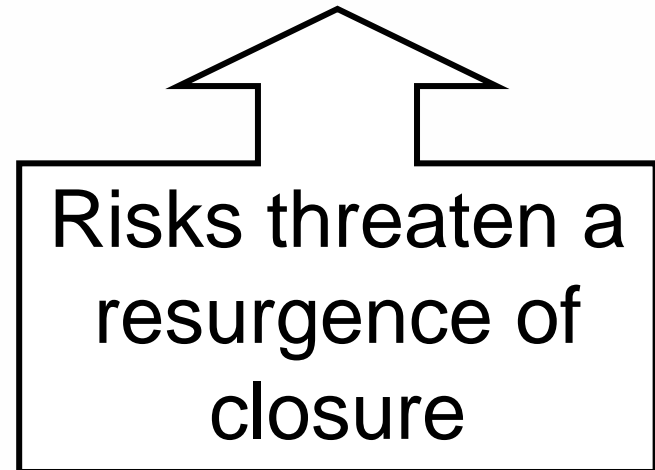
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Symbian smartphone shipments

110 million cumulative units shipped at the end of Q406
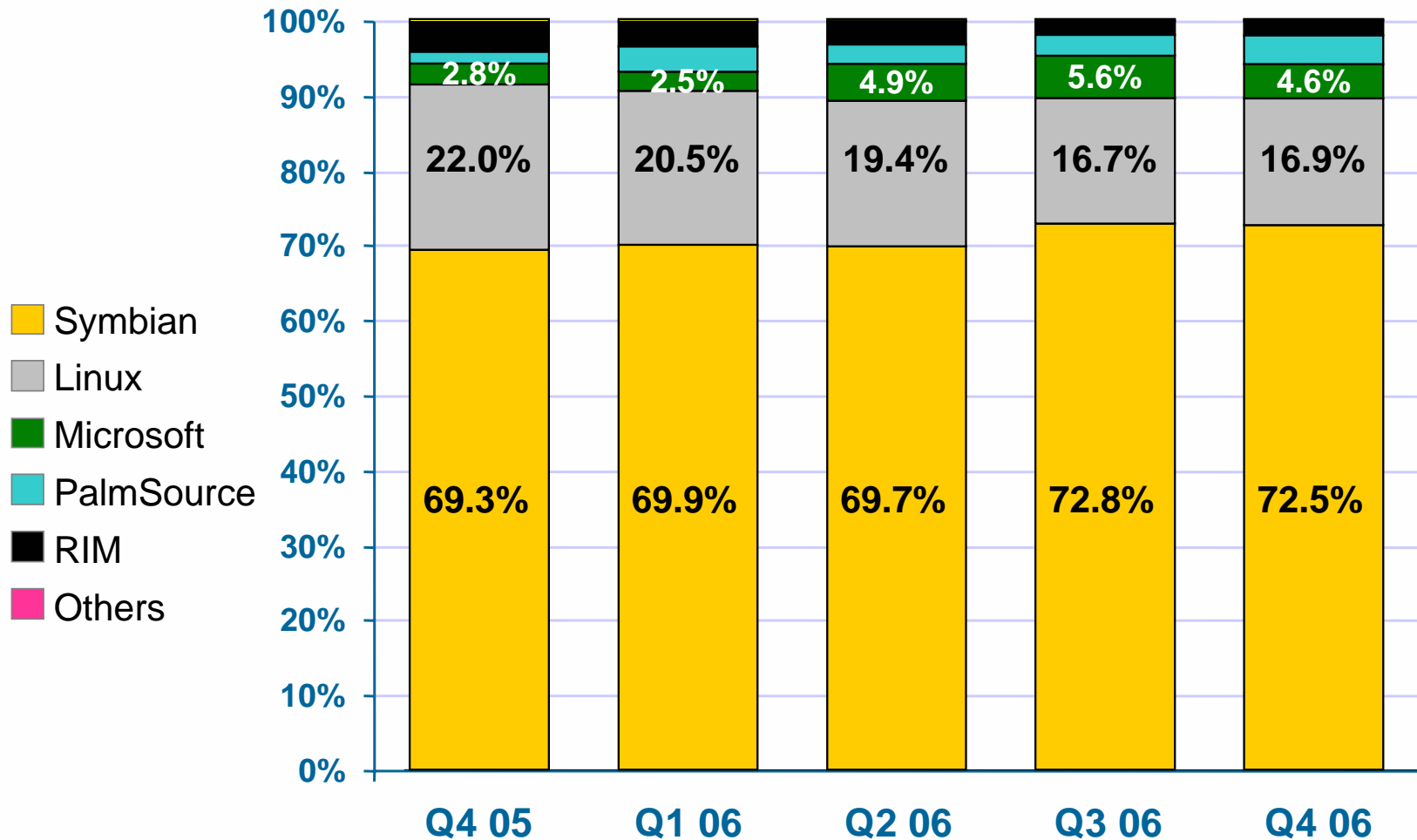
Regional smartphone sales breakdown (Q4 06)

Source: Canalys

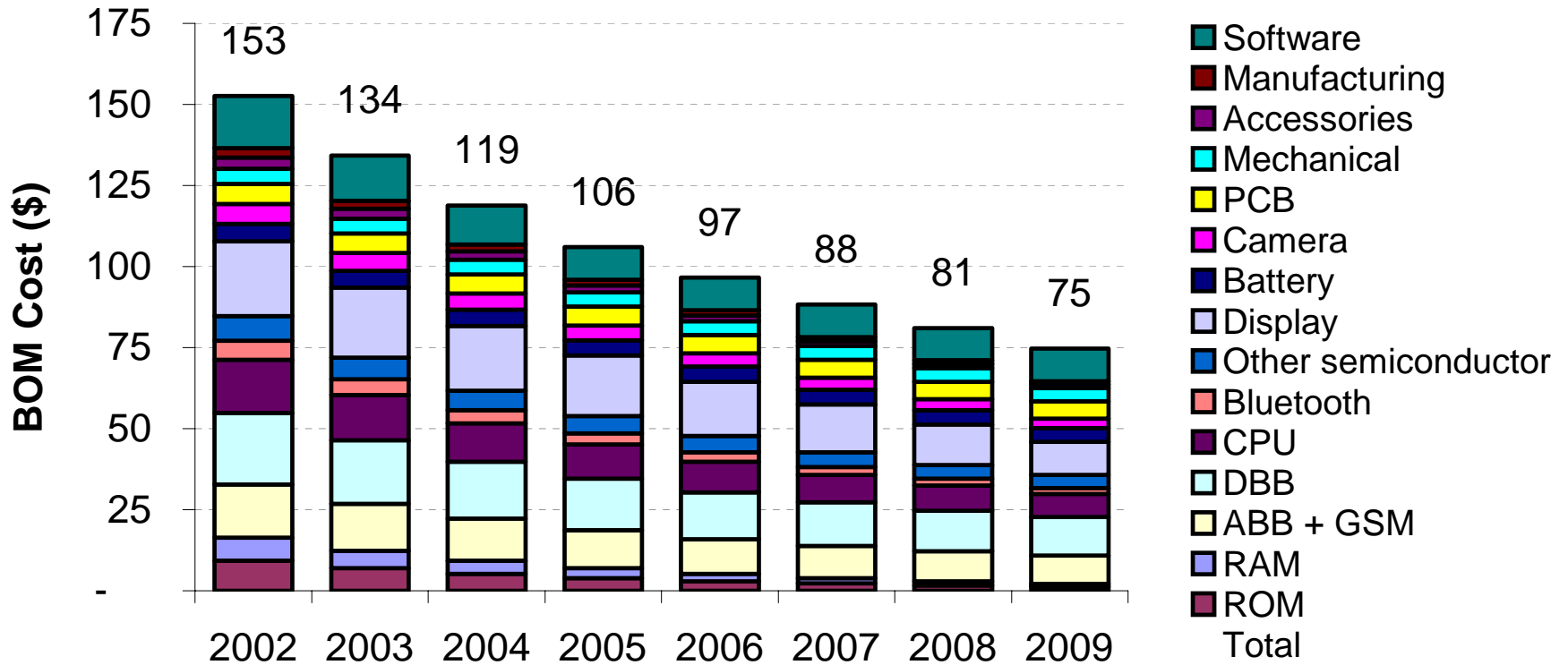Total Q4 2006 smartphone sales: 20,217,920

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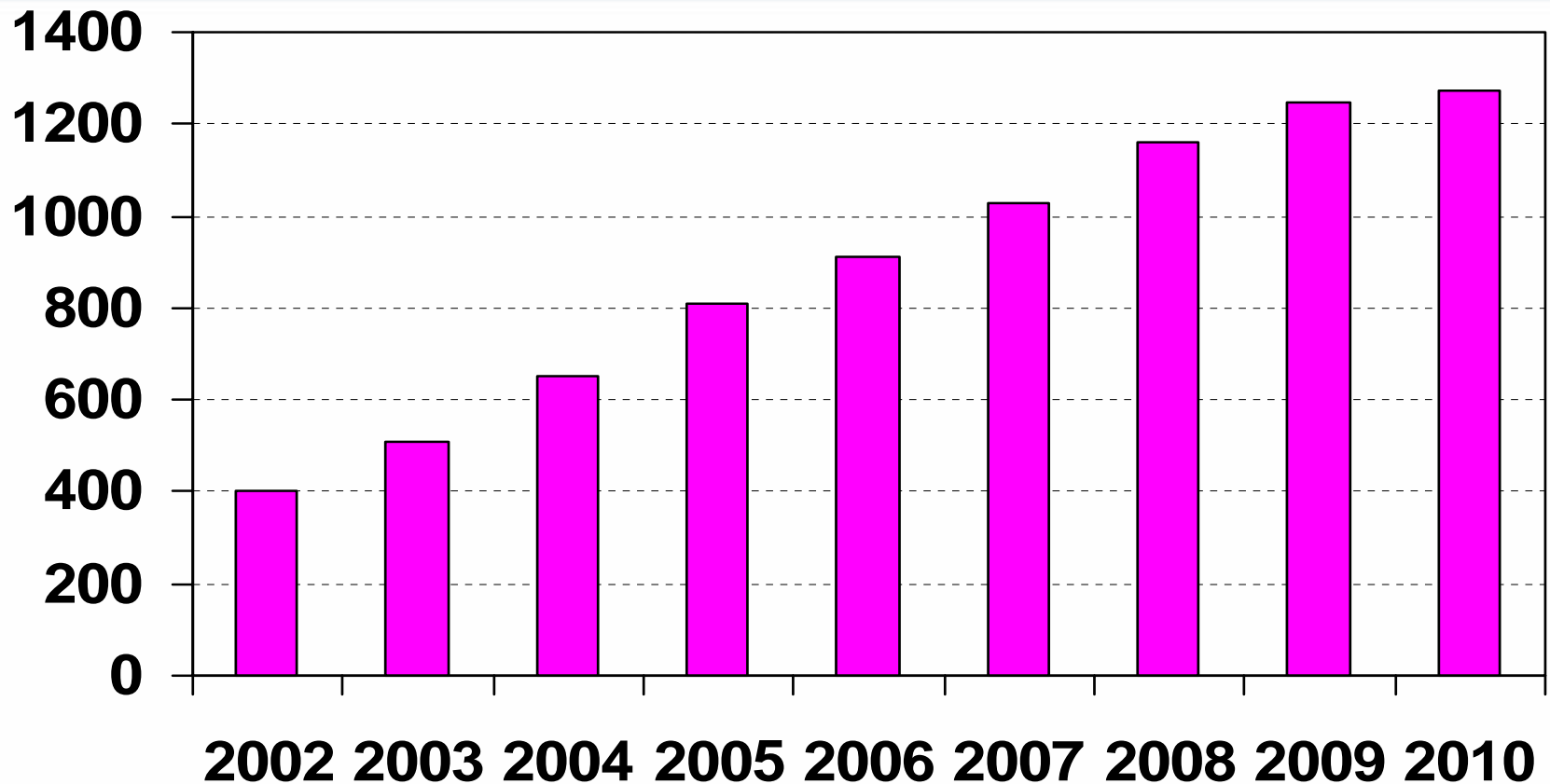# Sustained smartphone market share

Source: Canalys

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Smartphone Bill Of Materials cost decline

Notional threshold BOM

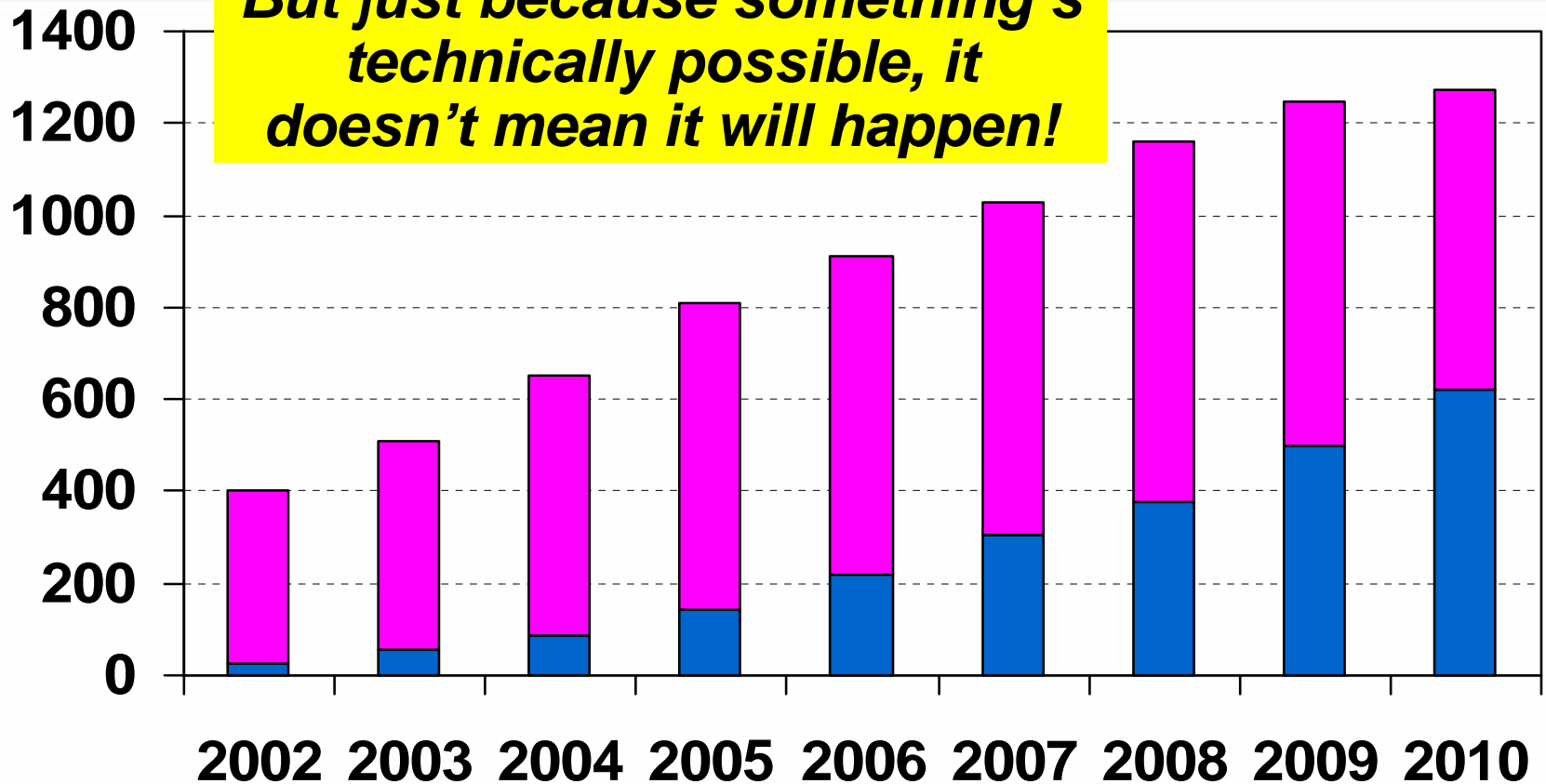# Mobile phone market: sales per annum (M)

Smartphone *addressable* market per annum (M)

But just because something's technically possible, it doesn't mean it will happen!

Legend: ■ Smartphones ■ Other phones

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Technology adoption life-cycle

Can accept poor usability

Won't accept poor usability

Early adopters, visionaries

THE CHASM

Innovators, technology enthusiasts

Early majority

Late majority

Laggards, sceptics

Customers want technology and features

Customers want complete solutions, reliability, and convenience
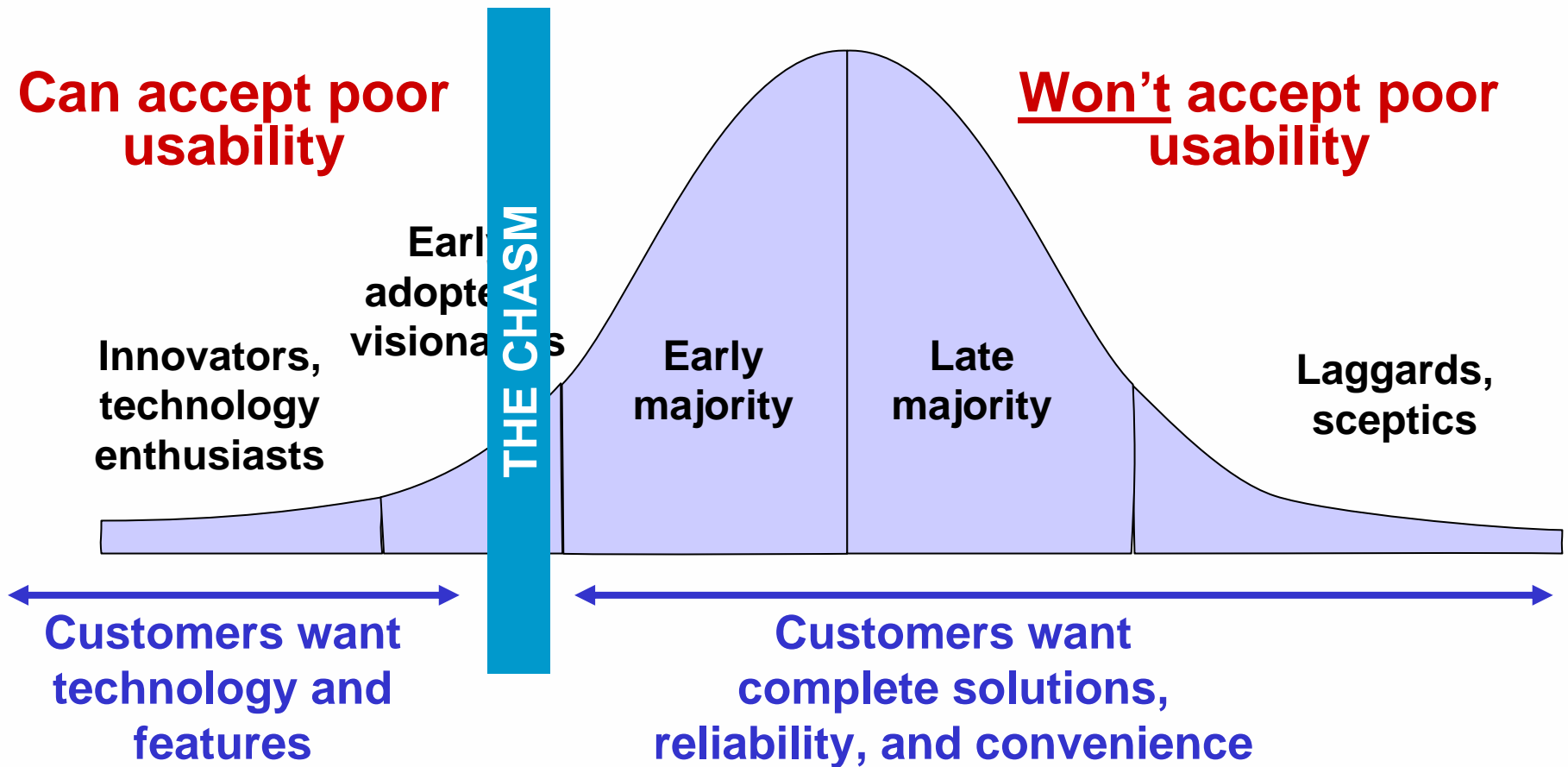
(source: Geoffrey Moore)

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Smartphones will cross the chasm if:

- They allow users to build on & do more of the things that caused users to buy phones in the first place

    …**Communication** (and messaging)

    …**Safety & connection** (timely info in context)

    …**Fashion & fun** (personalisation)

- AND they allow users to do these things **simply & swiftly**

    …(Even though the phones themselves are increasingly complex)

- AND on that basis, provide additional functionality of genuine value to users

    …**For example, becoming people's preferred personal mobile gateway into the digital universe…**

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Mobile gateway into the digital universe

All company and product names & logos are registered trademarks of their respective holders

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Accessing the digital world, while mobile

- Improved bandwidth – faster wireless networks

- Improved display technology

    … More pixels, higher resolution, more colours, sharper screens

- Enhanced UIs, keyboards, HWR, auto-complete

    … Easier for users to enter data

- Predictable, flat-rate data charging systems

    … Removing users' fear of unexpectedly large phone bills

- Intelligent web browser software!

    … Page re-layout, intelligent proxies, incremental redrawing…

- Intelligent non-browser software!

    … Dedicated native applications…

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News

Information

Communities

Wikis

Libraries

Messaging

Shopping

Banking

Gambling

Content

Mobile gateway into the digital universe

Forums

Education

Entertainment

Chat

Planning

Gaming

Dating

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News

Information

Communities

Collective

Wikis

Libraries

~~ging~~

~~hopping~~

Banking

~~Gambling~~

Content

Mobile gateway into the digital universe

Forums

~~ion~~

Entertainment

Chat

Planning

Intelligence

~~Dating~~

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Convergence: *Novelty via unexpected convergence*
Smartphones as pocket melting pots

Health monitor

Games console

Newspapers

To-do list

Diary

Alarm clock

Tickets

Vouchers

Keys

Camera

Camcorder

Wallet

PDA

Radio

Dictionary

Map

TV

Books

BlackBerry

Watch

Calculator

Web tablet

Music player

Smartphones everywhere

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Vision: Analysts' forecasts

- Andrew Brown, mobile devices specialist at <u>IDC</u>

  - ... **Cumulative sales of smartphones will reach over 1 billion units by 2011**

  - ... The smartphone segment of the handset market is seeing strong annual growth and is expected to rise from 57 million units in 2005 to around 250 million units by the end of 2010

  - ... The advent of single chip designs will attract a growing number of licensees and drive greater penetration into the mid-market

- Stuart Robinson, Director, <u>Strategy Analytics</u>

  - ... **Cumulative sales of smartphones will reach 1 billion units by the first quarter of 2011**

  - ... The smartphone segment of the handset market is expected to rise from 45 million units in 2005 to around 300 million units by the end of 2010

- Nick Spencer, Analyst, <u>Canalys</u>

  - ... **Global shipments of smartphones will reach 1 billion by 2012**

  - ... We are still at an early stage of market development, with businesses & consumers only scratching the surface of what is and will be possible with such devices
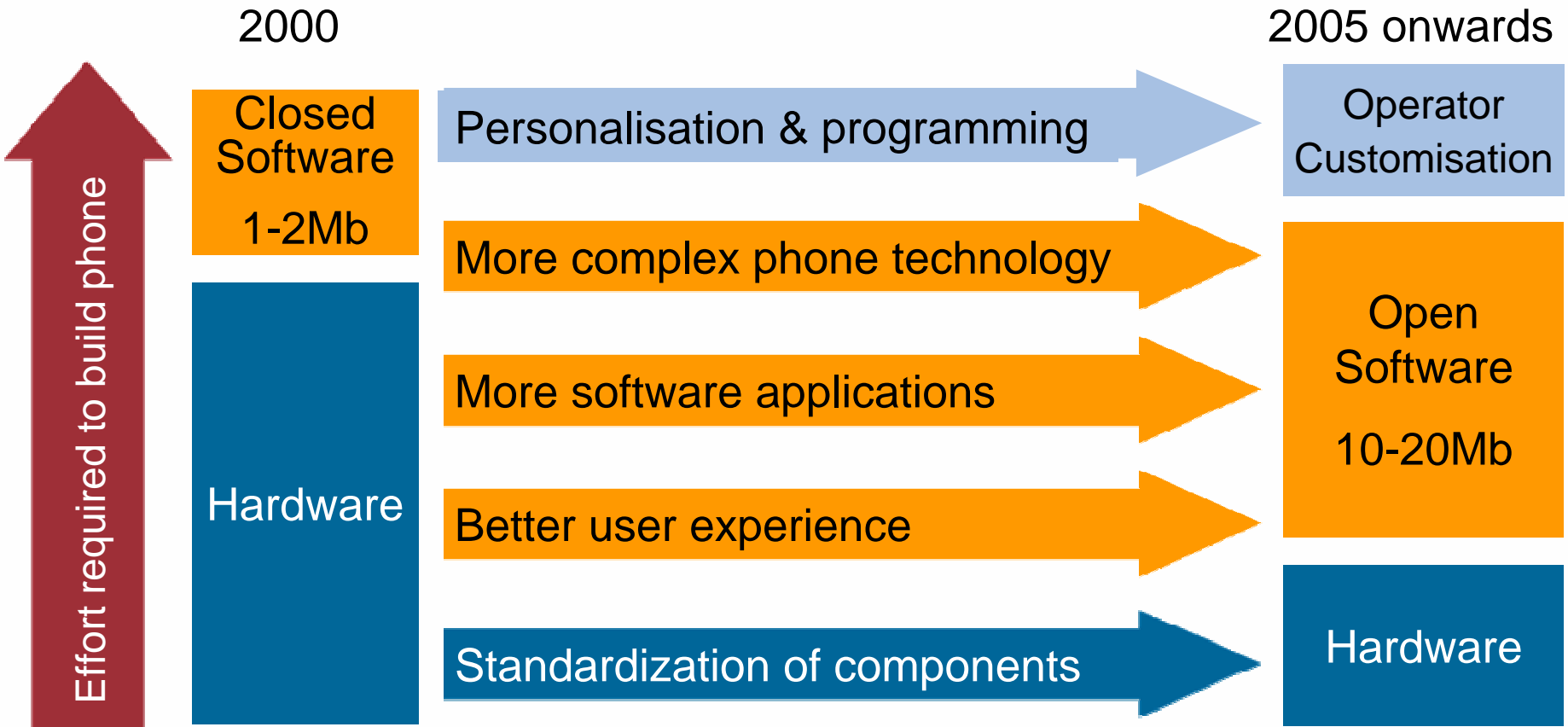
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Smartphone project economics

David Wood

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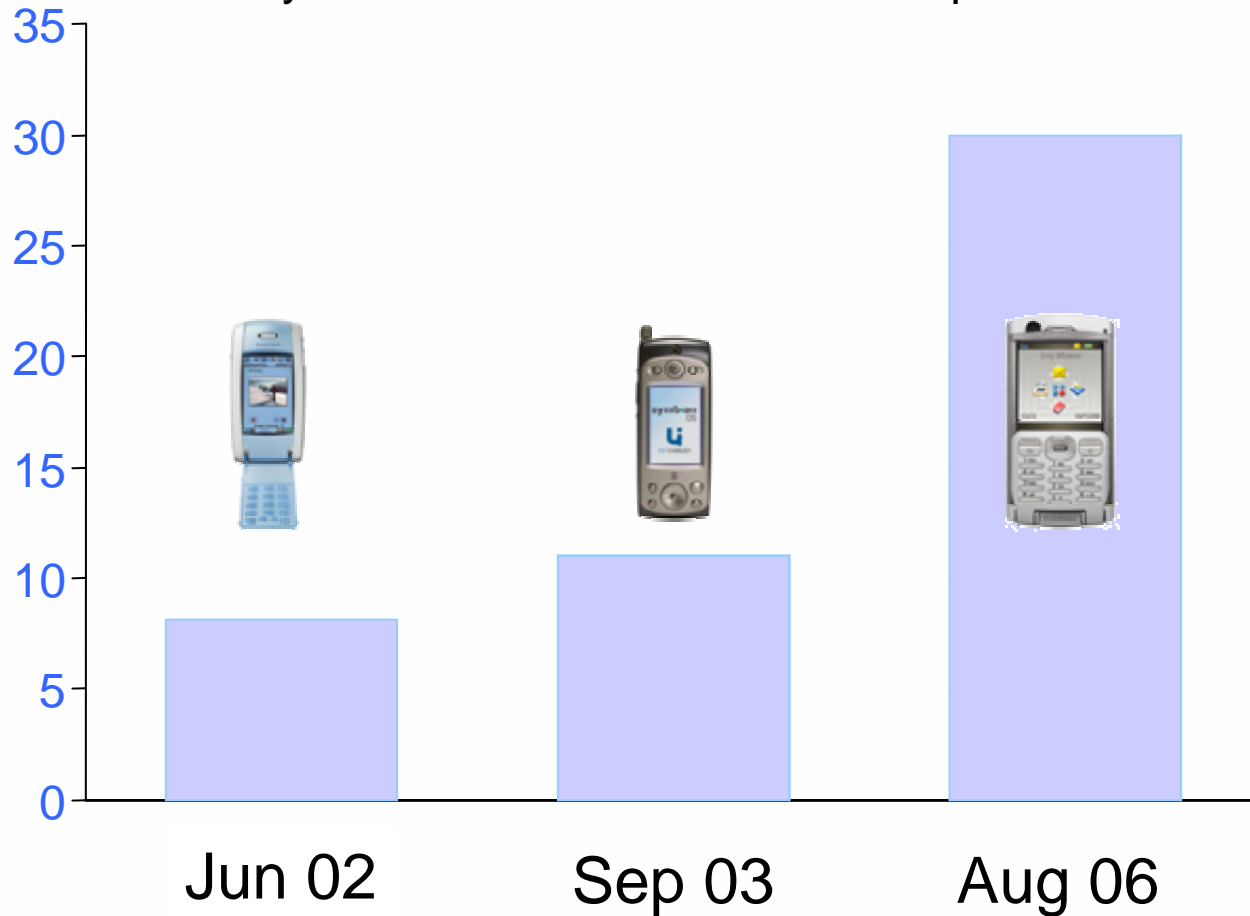
The increasing value of software

complexity

Symbian ecosystem technology growth

No. of Symbian Ecosystem Partners with embedded software

Ecosystem added value – indicative products

| | Jun 02 | Sep 03 | Aug 06 |

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What is the cost of smartphone project delays?

- Model: assume product lifetime sales of 500,000 units

  … If the smartphone meets its target market opportunity

- Assume the development takes 9 months (if on time)

- Assume product lifetime to be 12 months

  … If it meets its target market opportunity

- Product lifetime sales will reduce if late to market

  … This takes into account the effect from competition from other products

- Estimated sales units in any month is the maximum of:

  … The sales possible from the production ramp-up

  … The sales possible from the declining market window

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Cost of smartphone project delays (2)

Legend: On-time delivery

Sales profile (thousands of units monthly)

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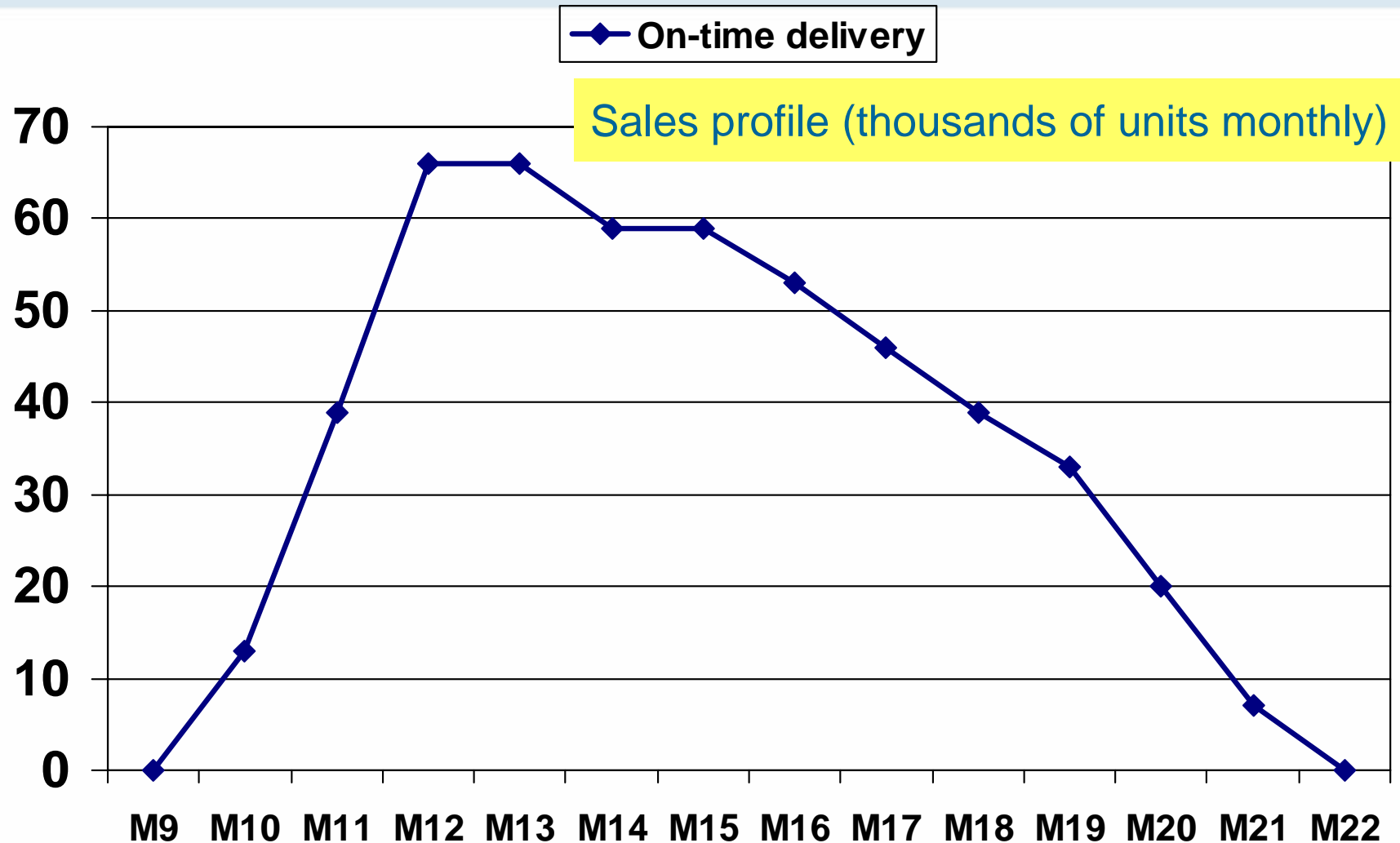
Cost of smartphone project delays (2)

Cost of smartphone project delays (2)

Sales profile (thousands of units monthly)

Legend: On-time delivery · One-month delay · Four-month delay

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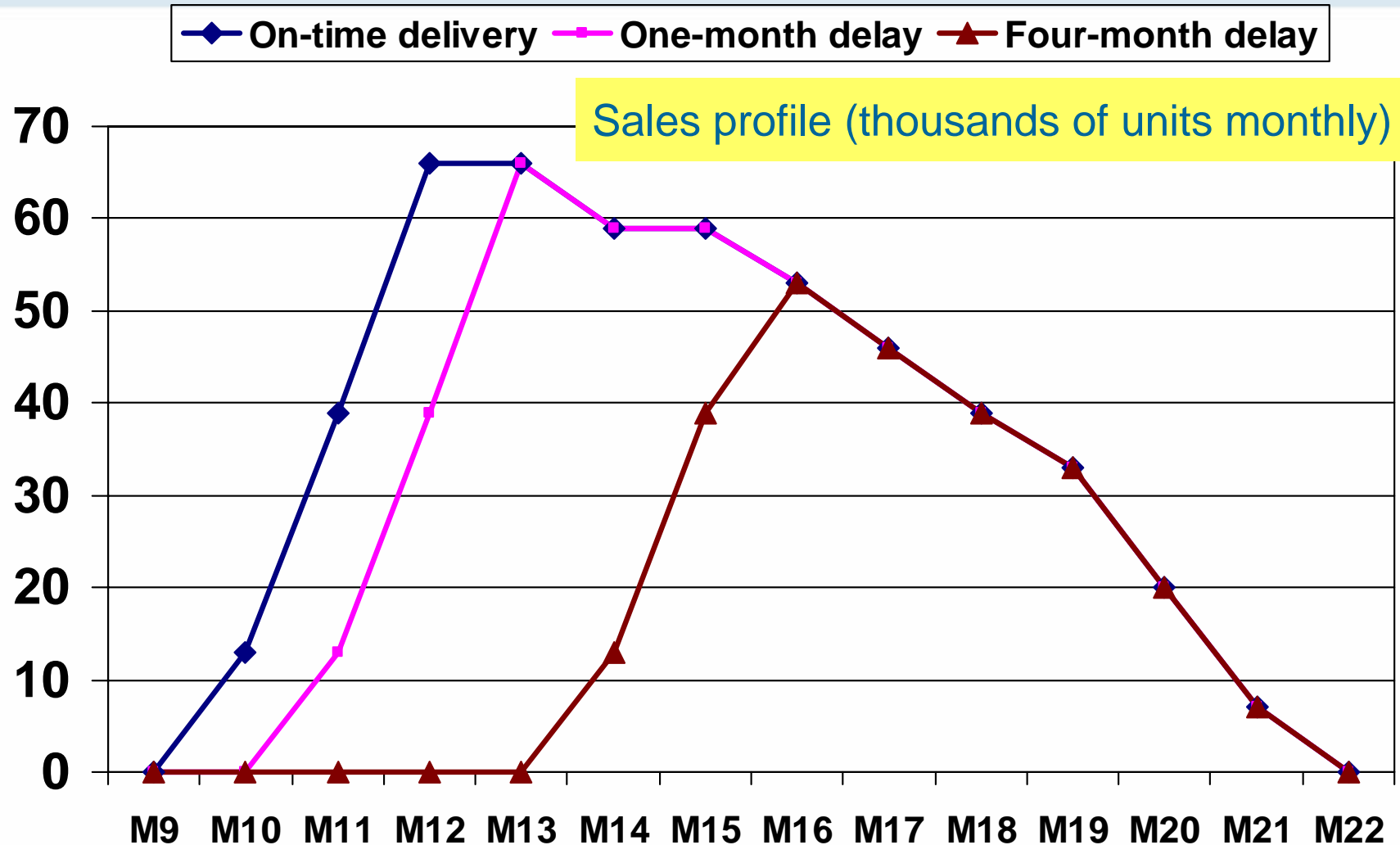
Cost of smartphone project delays (3)

- Assume bill of materials of phone is USD 150

- Assume target selling price of USD 300

  ... (Fee paid by operator to the phone manufacturer)

- However, the possible selling price declines over time

  ... Due to the effect of market competition

M9 = 9 months after project start, etc

Profit from sales (USD) vs. months (M9–M21)

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Cost of smartphone project delays (4)

- Assume development effort ramps up during the project, to a maximum of 120 heads working on the project. After launch, there is still some development effort (maintenance)

   …Assume average fully loaded cost of person per year is USD 150,000

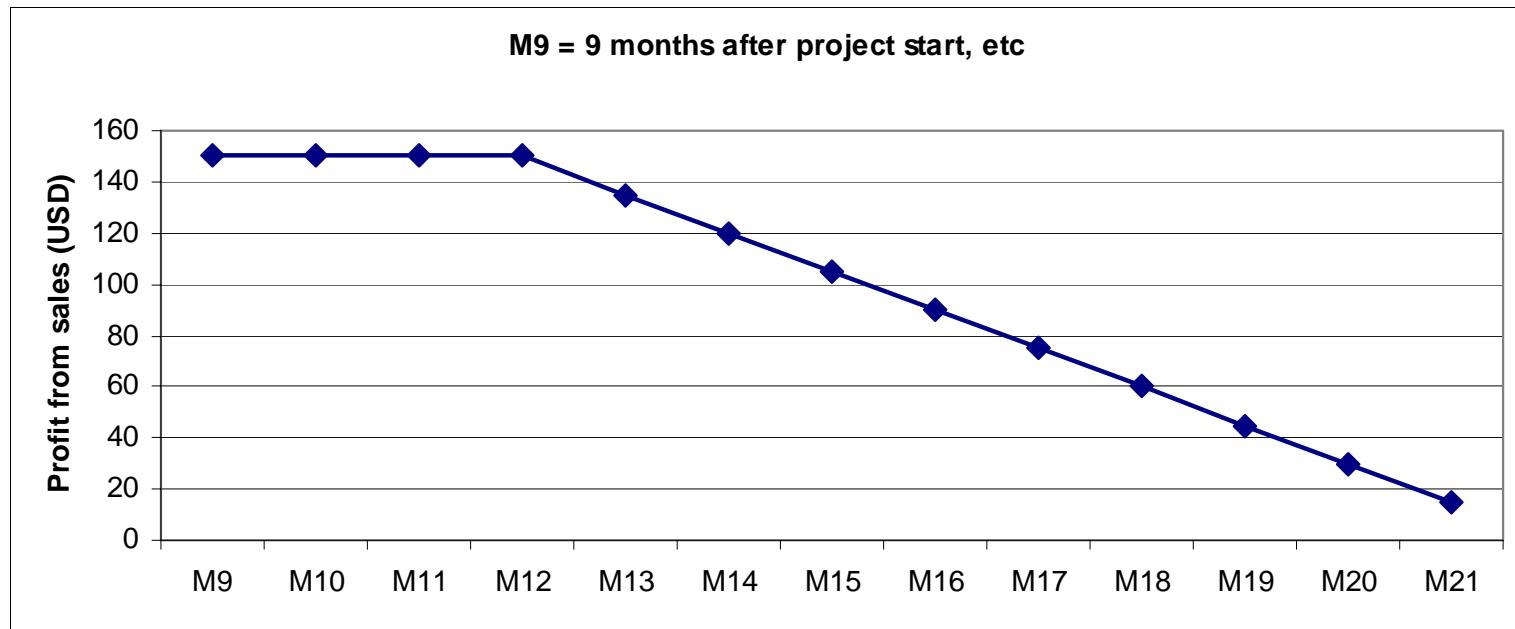- The commercially most significant effect of project delays is not the additional development cost, but rather the reduced market window

Number of months delay	0	1	2	3	4	5
Total development cost	12,825,000	14,250,000	15,675,000	17,025,000	18,375,000	19,725,000
Number of units sold	500,000	434,211	368,421	309,211	250,000	197,368
Total earnings from sales	52,697,368	42,828,947	33,355,263	25,460,526	18,453,947	12,927,632
Net profit	39,872,368	28,578,947	17,680,263	8,435,526	78,947	-6,797,368

c. $10M loss of profits per month delay!?

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Causes of project delays – Symbian review

- Under-strength licensee team or organisation: 16.9%

- Sub-optimal processes (eg build configuration): 6.3%

- Project impact by slips in earlier projects by licensee: 15.8%

- Licensee major re-planning of roadmap or resource: 6.7%

- Commercial discussions with 3rd parties not closed: 12.0%

- Licensee has 3rd party software problems: 6.3%

- Lack of operator interest to drive project completion: 10.8%

- Delay in meeting lead operator requirements: 6.3%

(These are "proximate causes" not "root causes")

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Should you focus on reduced time-to-market?

- IBM discovered 20 years ago that projects that focused on attaining the shortest schedules had high frequencies of cost and schedule overruns

- Projects that focused on achieving low defect counts had the best schedules and the highest productivities

- Source: Steve McConnell, 1999, "After the goldrush"

  … Subtitle, "Creating a true profession of software engineering"

The more haste, the less speed

Focus on quality, not reduced TTM

Learn & apply best principles of large-scale software development

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Ten steps to smartphone project success

David Wood

EVP Research, Symbian

Ten steps to smartphone project success

Smartphone project success

Bone deep comfort with Symbian OS

Symbian OS

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Deep comfort with Symbian idioms

- **R**obustness   Cleanup stack

  … Error handling matters: Expect things to go wrong

- **O**penness   Active objects   ECOM

  … Expect the software to change or new modules to be added

- **P**erformance   Descriptors

  … Expect the hardware to be under-powered

- **E**fficiency   Asynchronous

  … Expect the user to be in a hurry

- **S**ecurity   Capabilities   Signing

  … Expect to have to earn trust

  Understand the "why" as well as the "how"

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Ten steps to smartphone project success

Smartphone project success

Bone deep comfort with Symbian OS

Intense market awareness
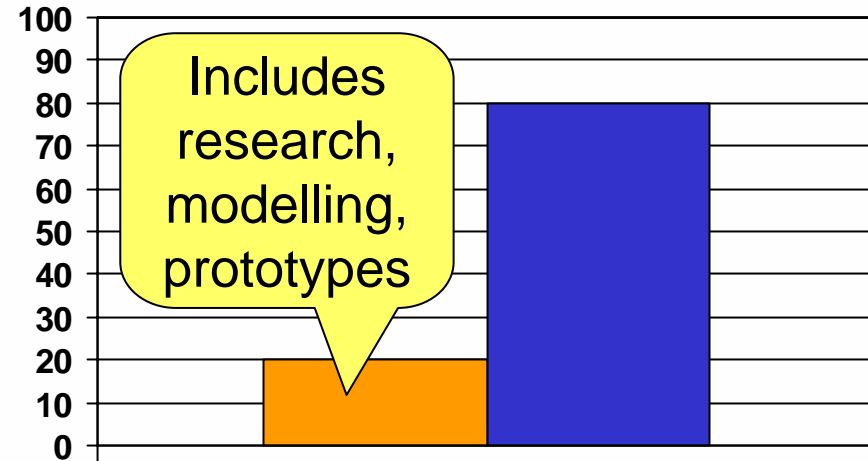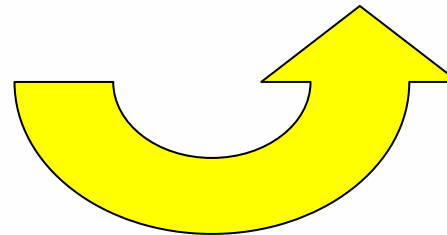
Symbian OS

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Smartphone project success

Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness
Symbian OS		

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Ruthlessly simplify

Especially when constrained

- **Software inevitably tends towards greater complexity**
  - … This is the second law of thermodynamics for software
  - … (The first law is that software inevitably tends to grow in bulk)

- **Complexity has n-squared effects**
  - … Many more relations to understand

- **Keep seeking to simplify the design**
  - … Well-defined classes
  - … Expose fewer APIs rather than many APIs
  - … Avoid long inheritance trees; Avoid using inheritance for "cleverness"
  - … Re-factor designs on a regular basis, wherever possible

- **Keep seeking to simplify the development process**
  - … Re-factor the development process on a regular basis

- **Note – make things as simple as possible, but no simpler**

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Ten steps to smartphone project success

Smartphone project success

v2 product: re-use not re-invent

v2 people: experienced team

Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness

Symbian OS

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Take the platform viewpoint, not a product one

Return on investment

The subsequent return on Platform investment is huge

The first project can be hard

Extend product lifetime; Allow reduced manufacturing costs

Time

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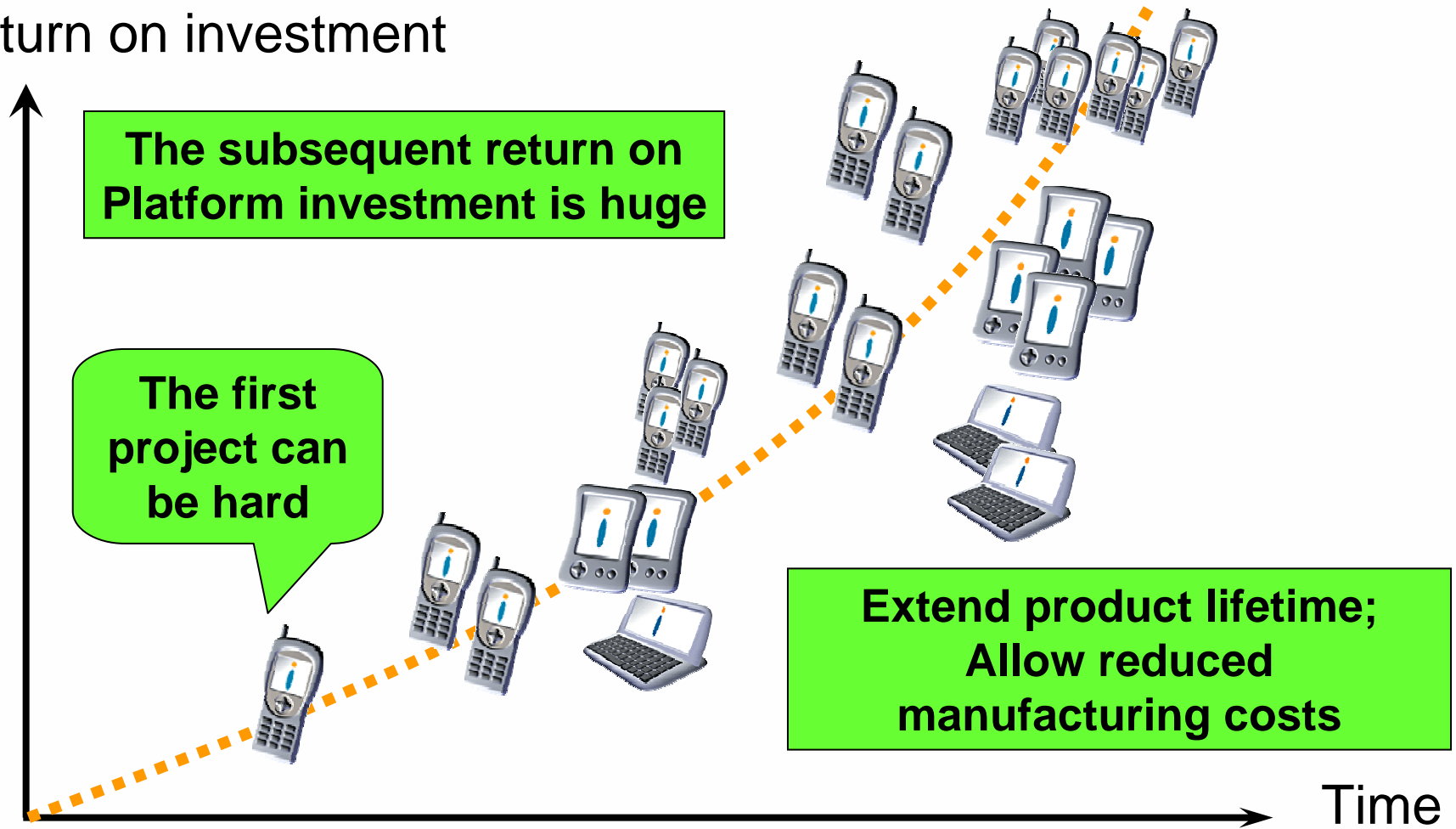
The 'Open Platform Savings Effect' for operators: Implementing a set of applications & services

10%   10%   15%   25%   20%   10%   10%

| Selection | | Development | | Training | | Support |

 ↳ Customisation ⇧   ↳ Testing ⇧   ↳ Launch ⇧

- 40%   - 50%   - 90%   - 40%   - 40%

- 40%

Source – Northstream / Nokia research 2005 – *'How open platform based phones reduce operator costs'*

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Ten steps to smartphone project success

Smartphone project success

Strong, capable, dedicated leader

Strong integration, testing, & gate-keeping

v2 product: re-use not re-invent

v2 people: experienced team

Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness

Symbian OS

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The big picture
of a Symbian OS development project

Symbian OS
+ Symbian OS components

Silicon

Hardware design

Wireless stack

Multimedia

UI framework
+ apps from UI framework

Third party
apps & middleware

Consultancy
+ Training
+ Documentation
+ Tools

Processes

Customisation
+ **Integration**
+ Innovation

Testing
+ Optimisation
+ Localisation

Revenues

Certification
+ Approvals

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Practise iterative development

- If you don't know for sure what you're doing, don't do it on a large scale

- Integrate "little and often"

    … Integrating too much at once makes quality dip so far it takes a month to recover

    … so that no-one has a recent build to work with because recent builds are worse quality than earlier ones

    … so engineers are forced/encouraged to develop/debug against out-of-date software

    … so their work will not integrate well into the Mainline

- Practice rigorous "gatekeeper discipline"

Ten steps to smartphone project success

Smartphone project success

Make great use of tools
Strong, capable, dedicated leader
Strong integration, testing, & gate-keeping
v2 product: re-use not re-invent
v2 people: experienced team

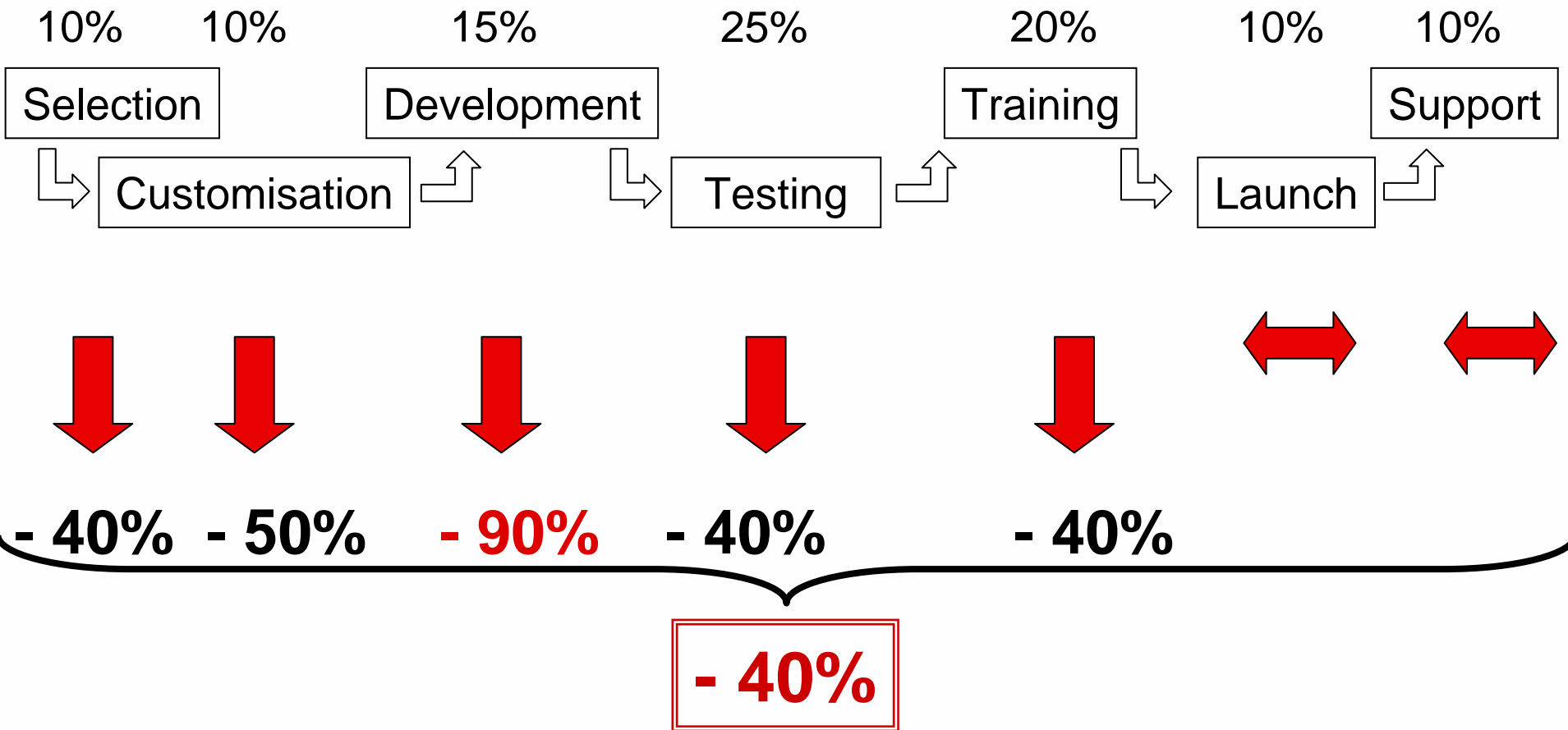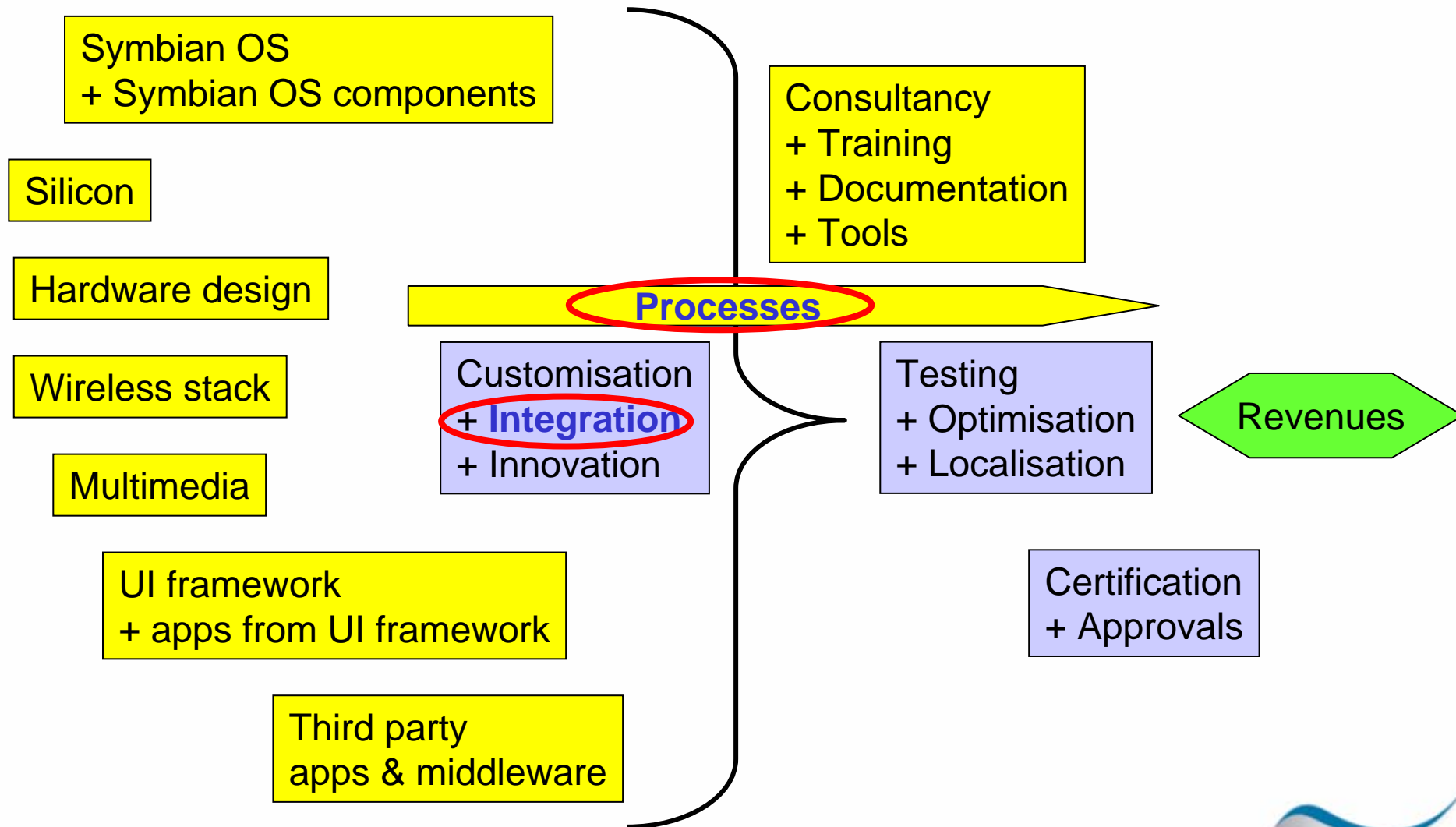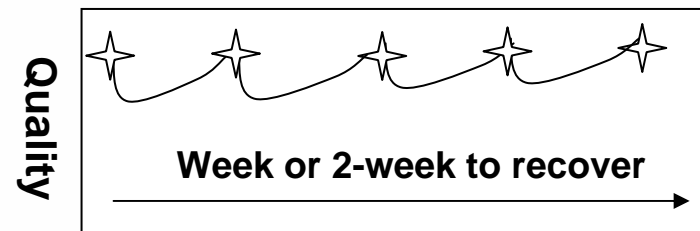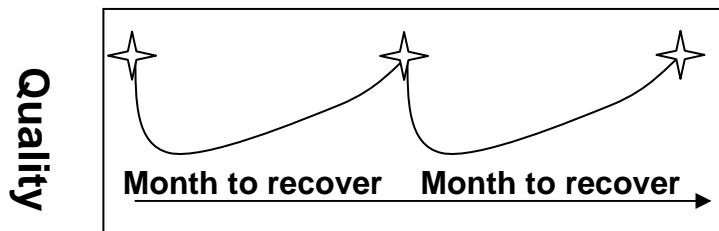| Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness

Symbian OS

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Appoint a "tools champion" in your team

- Understand all the software tools used by the team
  - … Ensure that team members receive suitable training on how to get the best out of the available tools

- Understand and prioritise all the potential software tools that could be used by the project
  - … Evaluate the tools offering available from third-party vendors

- Foresee possible problems with tools as the project proceeds – and plan ahead to forestall these problems
  - … Extra code bulk, more people on the project, etc

- Consider special sub-projects to "productise" tools that have been developed internally
  - … Invest effort to maintain tools

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Tools that you should know and love

- Debugger

- Emulator

- Profilers and loggers

- Static code analyser

- Prototyping tools

- Build system

- Distribution system

- Porting tools

- Interface management tools

- Automated testing tools

Know how to use these tools – AND know their limitations

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Ten steps to smartphone project success

Smartphone project success		
Mastery of ecosystem relationships		
Make great use of tools		
Strong, capable, dedicated leader		
Strong integration, testing, & gate-keeping		
v2 product: re-use not re-invent		
v2 people: experienced team		
Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness
Symbian OS		

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Invest in consultancy

- **Skilled technical consultants in Symbian OS can make a huge difference to the project success**
  - …Timeliness and quality
  - …Don't think of this as an "optional expenditure"
- ***This is the testimony from many previous projects***
- **Expert advice available on**
  - …Tools
  - …Troubleshooting
  - …Optimisation
  - …Architecture
  - …Defect triage
  - …Risk management
  - …Project setup
  - …Connections into Symbian and into third parties, etc

A good software engineer can be 10 times as productive as an average one

A good technical consultant can make parts of your project go 10 times faster

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Cultivate rich network of Symbian-savvy contacts

- The very best developers are surrounded virtually by other very good developers

- You can never know everything by yourself

    … You can never always know where to look for information

- You need a wide variety of highly-knowledgeable contacts

    … Within your team

    … Within your company

    … + outside your company

- Know the most useful newsgroups and web forums

- Share information, to receive information

    … "In order to have a friend, you need to be a friend"

- Maintain your trustworthiness – don't bluff

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Ten steps to smartphone project success

Smartphone project success
Mastery of ecosystem relationships
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Bone deep comfort with Symbian OS	Ruthless drive to simplify	Intense market awareness

Symbian OS

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Pick the right project leader – someone with:

- **The ability to drive completion *of the project as a whole***

  … The ability to drive completion of contractual issues

  … Single-minded focus on project issues, not just the technical issues

- **The ability to "manage up"**

  … To gain the necessary organisation support from higher managers

- **The ability to motivate & focus all the different players in the team**

  … Prevent team members from just working on what interests them

- **The ability to communicate clearly**

  … With all the parties involved in the project

  … Chief collaborator

- **A deep understanding of smartphones and their ecosystem**

- **A deep understanding of complex software systems**
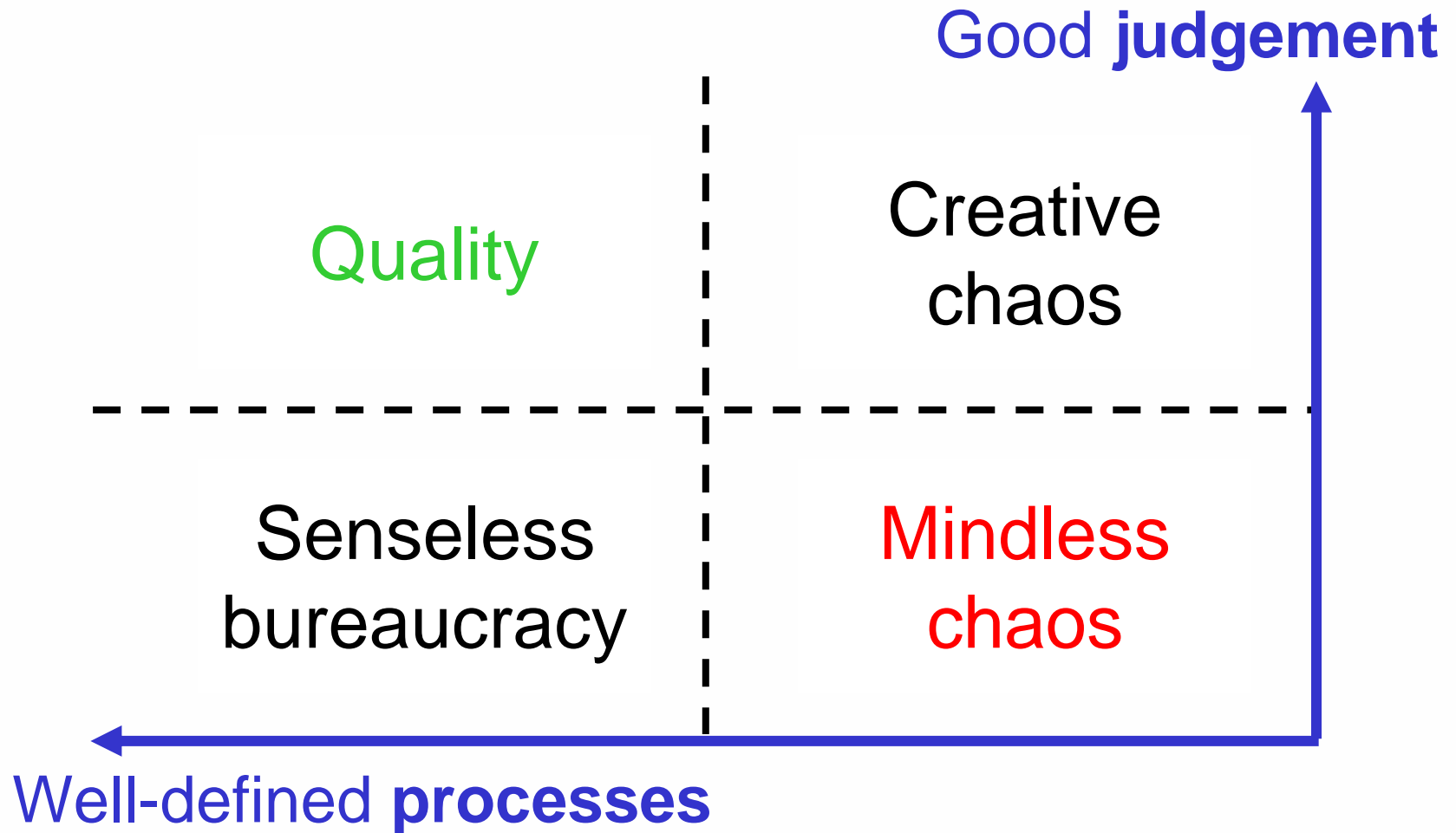
  … An understanding of agility and dynamic planning

Dynamic methods – agile planning

- Design for change – Expect the unexpected
  - … APIs may not work as expected
  - … Phone performance may be different than expected
  - … Networks may not behave as expected
  - … Users may not behave as expected
  - … The competitive landscape may change
  - … Phone model popularity may change (phones delayed or accelerated)
- Don't try to plan everything to the last degree
- Delivering value is more important than sticking firmly to the original spec and plan
- Deliver little and often – and check the feedback carefully
  - … Practice incremental development

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What the project plan needs to cover

- Failing to plan means planning to fail

- BUT it's impractical and unnecessary for a plan to cover every detail

- SO you must identify the "critical chains" for the project
  - … These are the parts of the work that determine the end date
  - … They contain "essential" functionality
  - … So the project cannot ship without them completing

- You have to carefully plan the critical chains
  - … End to end – including the features that have to happen afterwards

- You have to ensure adequate coverage for the critical chains
  - … Adequate resourcing, time for good design, optimisation, testing

- Gradually construct the rest of the plan around the critical chains
  - … Make sure you have identified the right critical chains!

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Aside on "best practice" ("process")

Good **judgement**

Quality

Creative chaos

Senseless bureaucracy

Mindless chaos

Well-defined **processes**

Source: Steve McConnell

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Further reading: "Symbian <u>for software leaders</u>"

- ***Principles of highly successful smartphone development projects***

  … 23 chapters and 3 appendices

- Part I – **Symbian in context**

  … At the heart of the smartphone revolution. Why smartphones will win

- Part II – **Thriving on scale**

  … Streamlining the management of smartphone project groupware, defects, configurations, integration, interfaces, testing, tools, plans and change, and uncertainty

- Part III – **Symbian's design philosophy**

  … Designing for efficiency, robustness, usability, longevity, and commercial success with smartphones.

- Part IV – **Human aspects of smartphone projects**

  … The roles of the project manager, the support network, and renewal

WILEY   David Wood

Principles of Successful
Smartphone Development Projects

Symbian
for Software Leaders

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