The Software Industry

(Based on slides by Prof. Dr. Dirk Riehle)


Mac GIMP
Mac GIMP


Online Dashboard
Recent AdWord Events Statistics
Leads By AdWords Report
Cost per Leads By AdWords Report


facebook
Facebook helps you connect and share with the people in your life.


WORLD WARCRAFT

The Software Industry

- The software industry
  - Is the set of **business** that provide
    - Software **products** and
    - Software **services** such as
      - **Operating** services
      - **Consulting** services
        - **Development** services
        - **Implementation** services
  - to other industries as well as itself

- The software industry...
  - Is highly concentrated
  - Is highly internationalized
  - Has strong network effects
  - Has a high speed of innovation
  - Is rapidly expanding into new domains

The Software Industry in 2016 [1]

market capitalization	total	$1.298 trillion
	median	$744.2 million
	highest	$415.4 billion (Microsoft)
	lowest	$177 700 (Innovaro Inc.)
earnings per share	median	$0.20
	highest	$13.23 per year (IBM)
	lowest	– $3.40 per year (Wave)
dividend yield	mean	8.913%
	highest	170.3% (Aware)
	lowest	0.07106% (FICO)

[1] https://www.wolframalpha.com/input/?i=how+big+is+the+software+industry

The So-called “Dot-Com” Bubble and Burst (1995-2000)

Longer term performance


Software
is eating
the world
WSJ, 2011-08-20

Venture Capital and Open Source (Recap)

Increasing Open Source **Investment Pace**

	<5 YEARS	5-10 YRS	>10 YEARS	AGGREGATE
OSS COMPANIES FOUNDED (1ST INST. INV.)	31	19	8	58
VC INVESTMENT BY FOUNDING VINTAGE ($M)	$1,802	$2,847	$255	$4,904
VC INVESTMENT BY YEAR BUCKET ($M)	$4,237	$506	$161	$4,904
VALUATION BY FOUNDING VINTAGE ($M)	$8,174	$12,719	$16,992	$37,886
EXCL. RED HAT			$1,938	$22,832

“It is actually open source software that’s eating the world.” [V15]

The CEO Interview

"Industrial companies are in the information business whether they want to be or not."

—Jeff Immelt

McKinsey&Company

Short History of the Software Industry

- **1959**
  - First mentioning of term “software”
- **1969**
  - US DoJ separates hard- from software
- **1980ties**
  - From vertical to horizontal integration
  - Growth of platforms and ecosystems
- **1990ties**
  - Centralization, dominance of Windows
- **2000ties**
  - Diversification, multiple platforms
  - Growth of open source software
- **2010ties**
  - Back to vertical, cloud computing

Main Industry Players

- **Software vendors**
  - Produce products
    - A.k.a. “standard software” or “commercial off-the-shelf software” (COTS)
- **Operating services firms**
  - Operate any form of software (and hardware)
- **Development services firms**
  - Produce custom software
- **Implementation services firms**
  - Adjust software products for use by customers
- **Regulatory bodies**

Software is a Digital Good

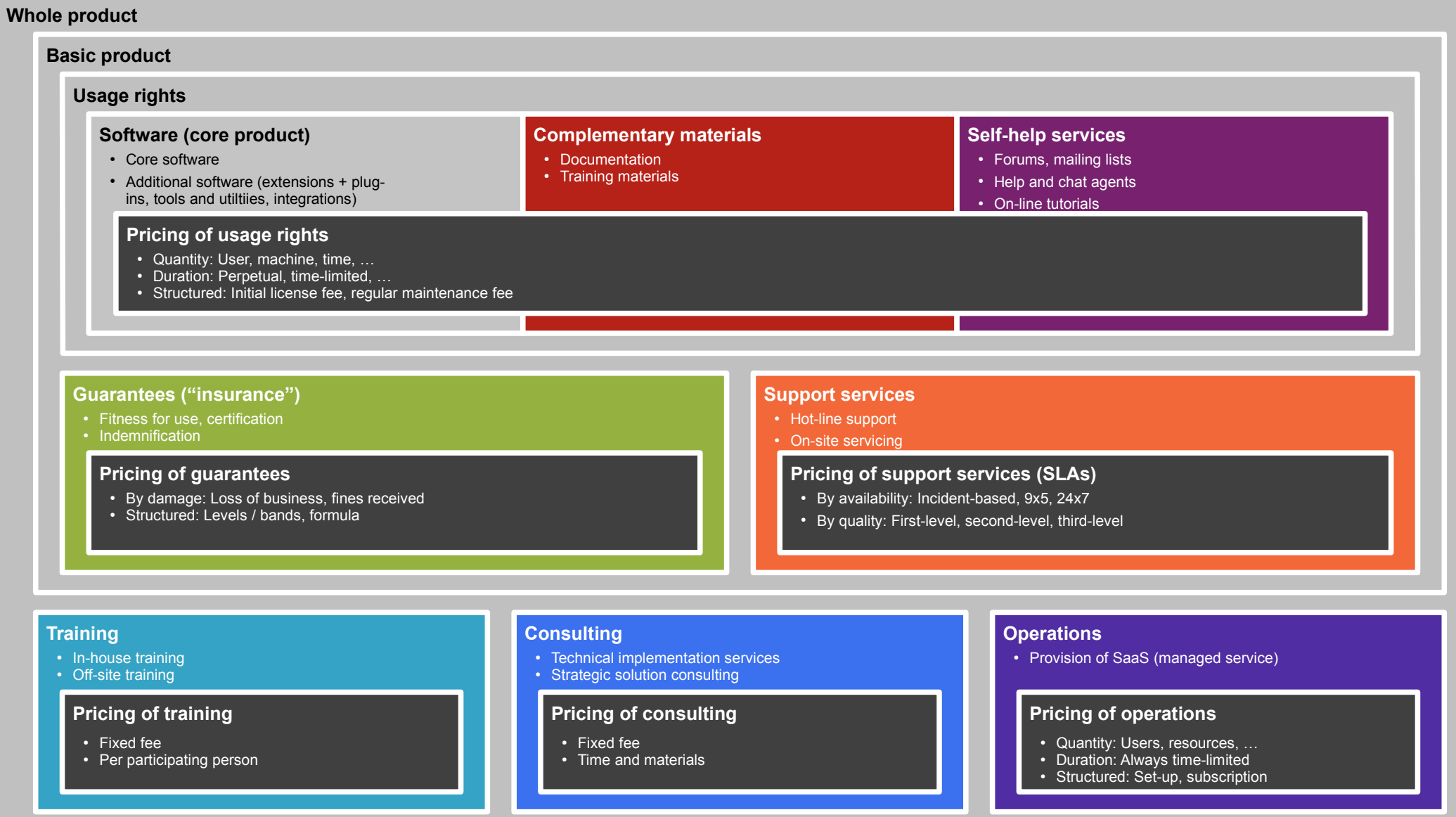
- **Digital good**
  - A digital artifact satisfying a human need
  - Without further intervention
    - No or low reproduction costs
    - Perfect reproduction possible
- **Software** as a digital good
  - Typically high cost to first copy
  - Typically high switching costs
- Examples
  - Consumer software (Games, social media, etc.)
  - Enterprise software (SAP Business Suite, Oracle RDBMS, etc.)

Software as a Product

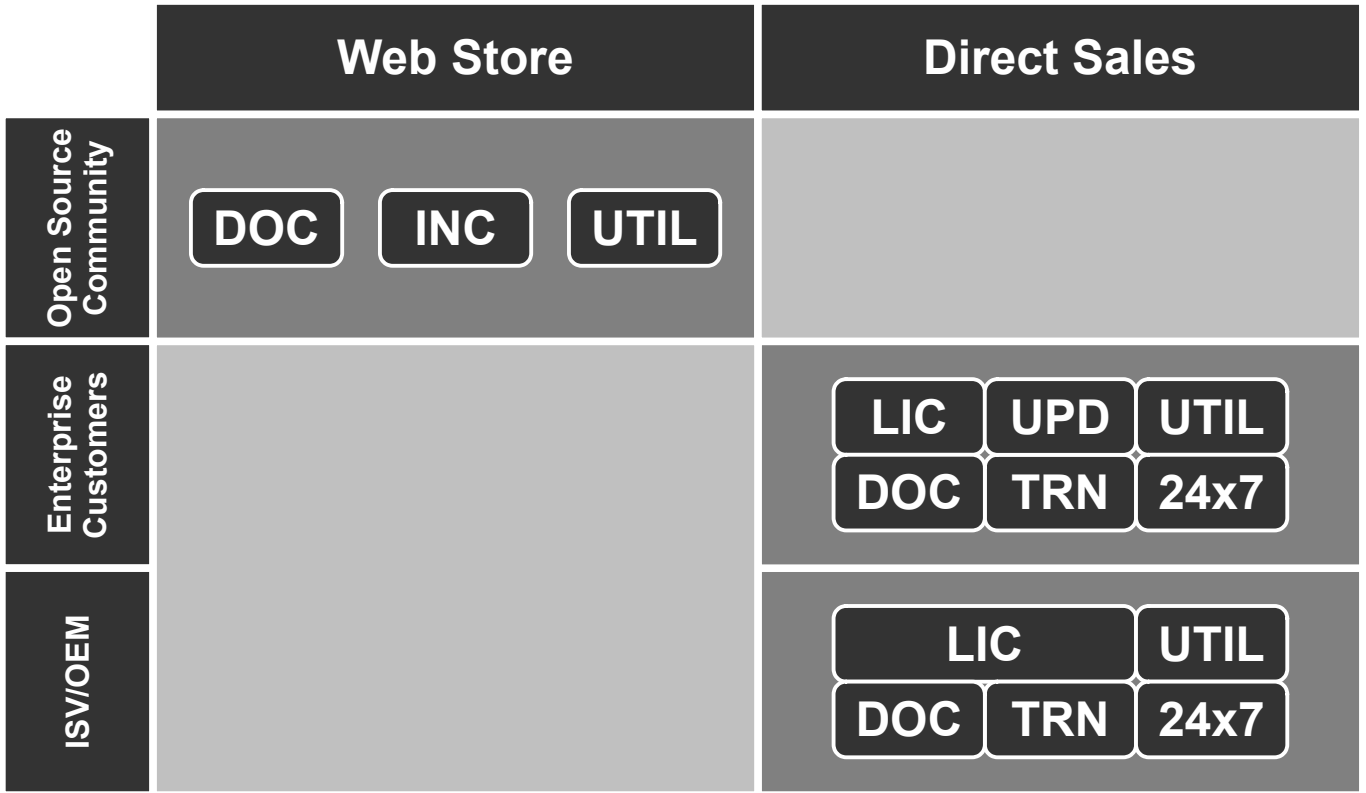
- **Product**
  - A man-made good sold to customers in a market
- **Software** as a product
  - A product sold to either enterprise or retail customers
  - What is sold is a license, a usage right, plus services
- Characteristics
  - Has an open-ended life-cycle: Is born, may life forever
  - Typically requires upfront capital investment (development)

Core, Basic, and Whole Product

- **Core product** =
  - Core software
- **Basic product** = bundle of
  - Software + complementary materials + self-help services
  - Guarantees about fitness for use + indemnification
  - Support services
- **Whole product** = basic product +
  - Training
  - Consulting
  - Operations


Whole product
Basic product
Usage rights
Software (core product)
• Core software
• Additional software (extensions + plug-ins, tools and utiltiies, integrations)
Complementary materials
• Documentation
• Training materials
Self-help services
• Forums, mailing lists
• Help and chat agents
• On-line tutorials
Pricing of usage rights
• Quantity: User, machine, time, …
• Duration: Perpetual, time-limited, …
• Structured: Initial license fee, regular maintenance fee
Guarantees (“insurance”)
• Fitness for use, certification
• Indemnification
Pricing of guarantees
• By damage: Loss of business, fines received
• Structured: Levels / bands, formula
Support services
• Hot-line support
• On-site servicing
Pricing of support services (SLAs)
• By availability: Incident-based, 9x5, 24x7
• By quality: First-level, second-level, third-level
Training
• In-house training
• Off-site training
Pricing of training
• Fixed fee
• Per participating person
Consulting
• Technical implementation services
• Strategic solution consulting
Pricing of consulting
• Fixed fee
• Time and materials
Operations
• Provision of SaaS (managed service)
Pricing of operations
• Quantity: Users, resources, …
• Duration: Always time-limited
• Structured: Set-up, subscription

Commercial Open Source Products [WR13]



DOC Documentation

INC Incident-based support

UTIL Utilities

LIC Commercial license

UPD Update service

TRN Training

...

24x7 24x7 hot-line

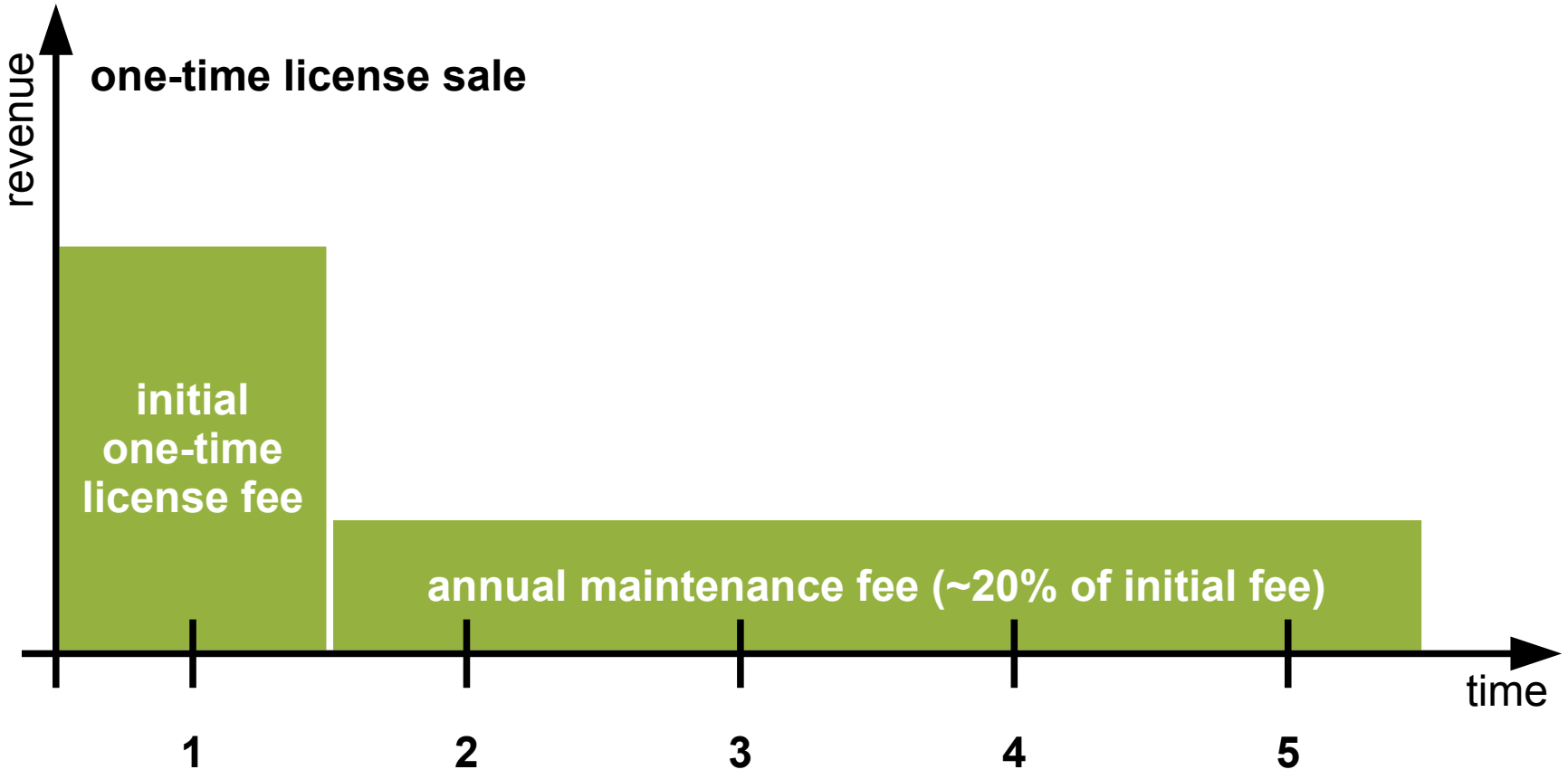
Enterprise Customers vs. Private Users

- Enterprise customers
  - Are willing to trade money for time
- Private users
  - Are willing to trade time for money

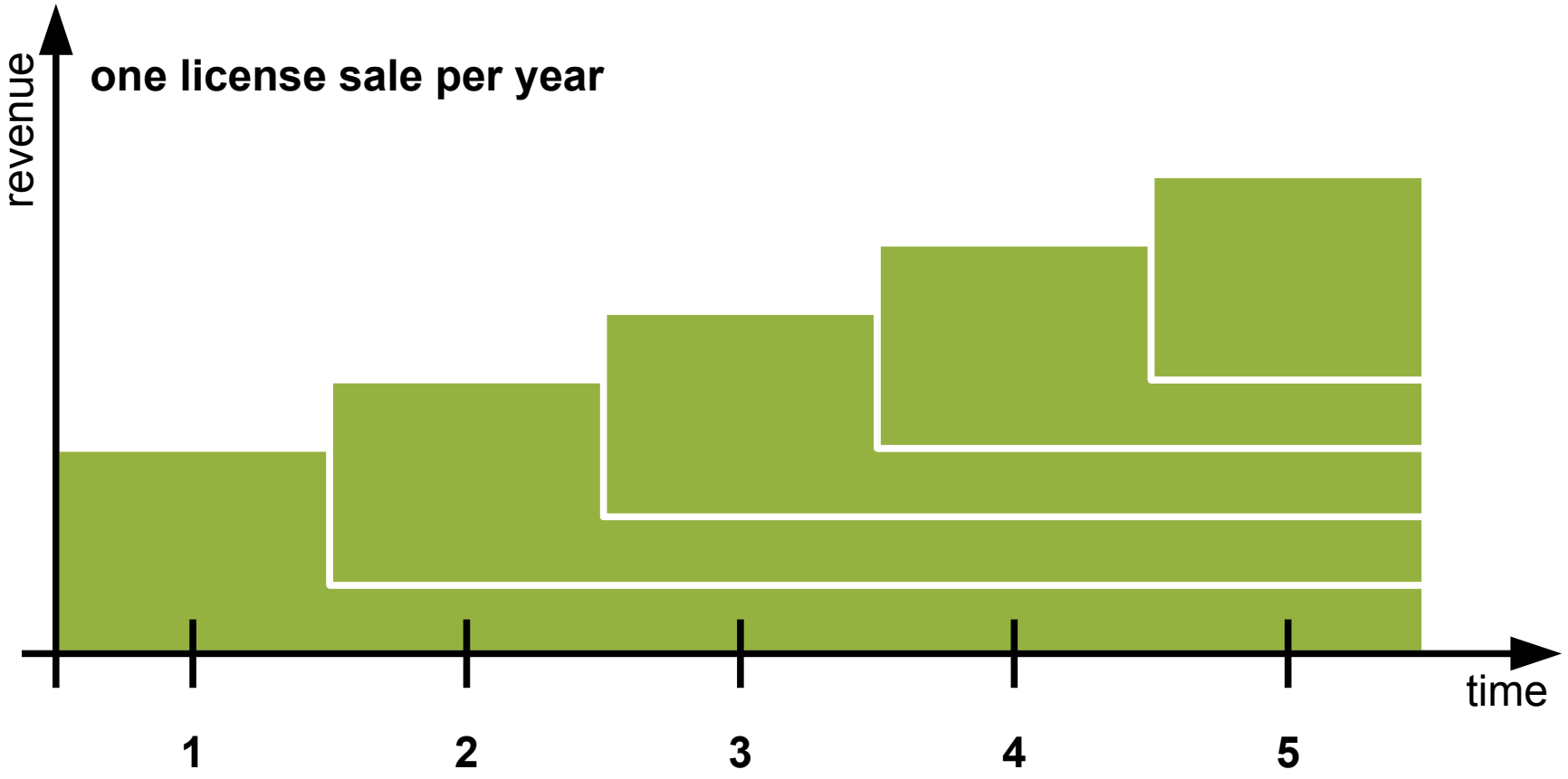
Products, Projects, and Services

- Products are provided by a software vendor
  - “Standard software”, (commercial) off-the-shelf software (COTS)
- Products can be operated by service providers
  - Service providers specialize in specific products
- Projects are performed by consulting firms
  - “Individual software”, custom software
- Many companies do all of the above

Single Product Sale Revenue



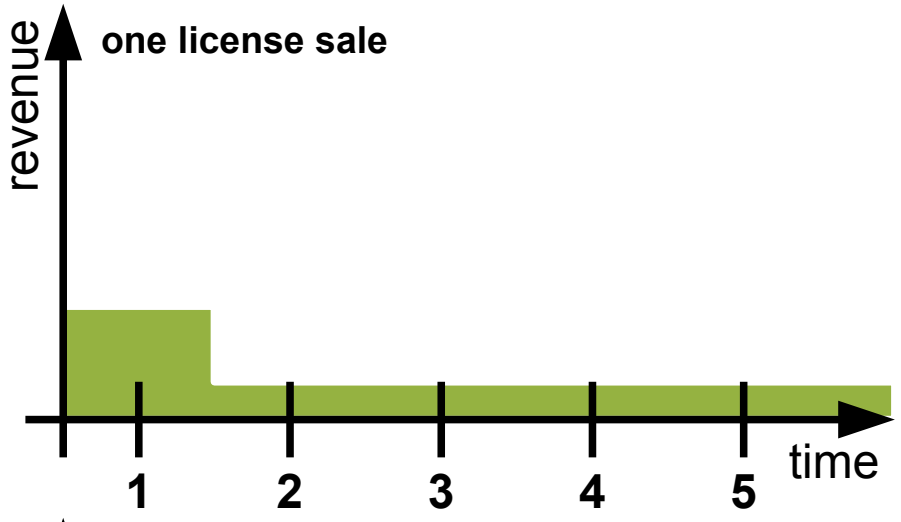
Accumulating Product Revenues (SaaS) [1]

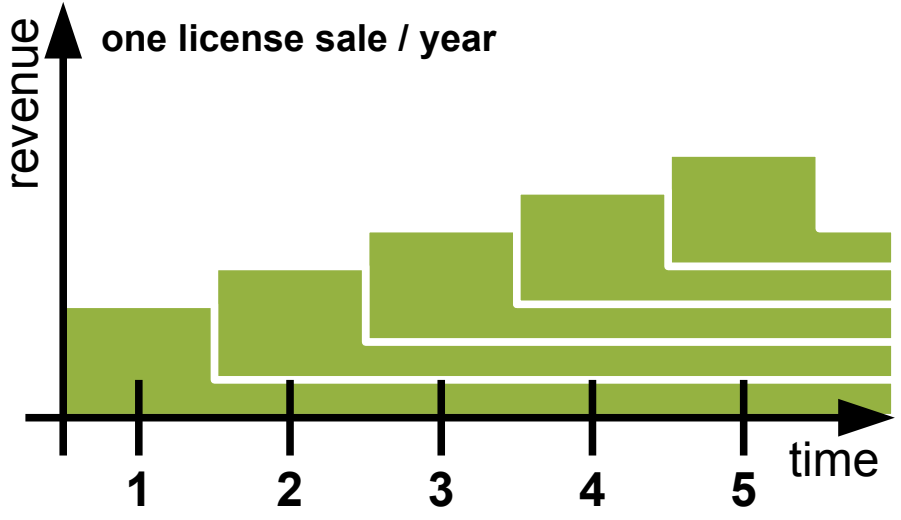


Software Projects

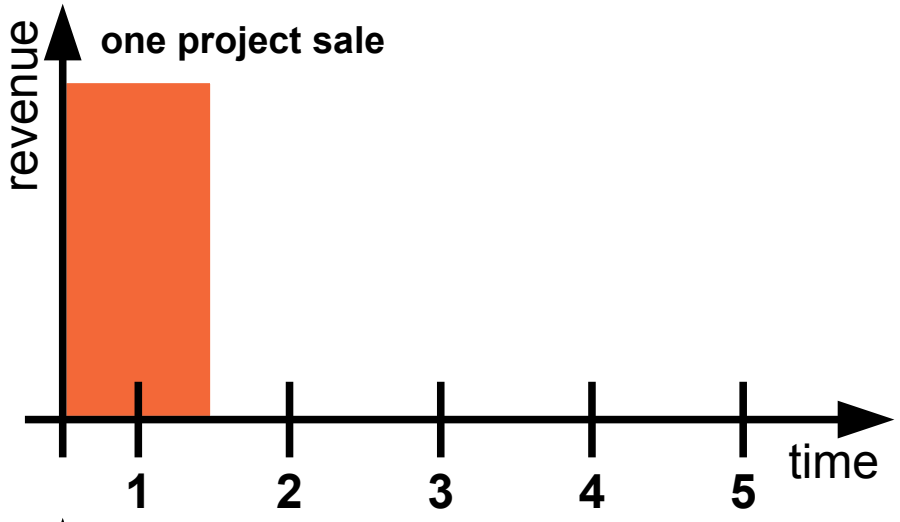
- Projects
  - A process with a defined start and a defined end
- Software projects
  - Revenues correlate with performed labor
    - Fixed price vs. actual labor
  - Accounted for as revenue and expenses
- Examples
  - Bachelor and Master theses
  - Customizing SAP for a customer

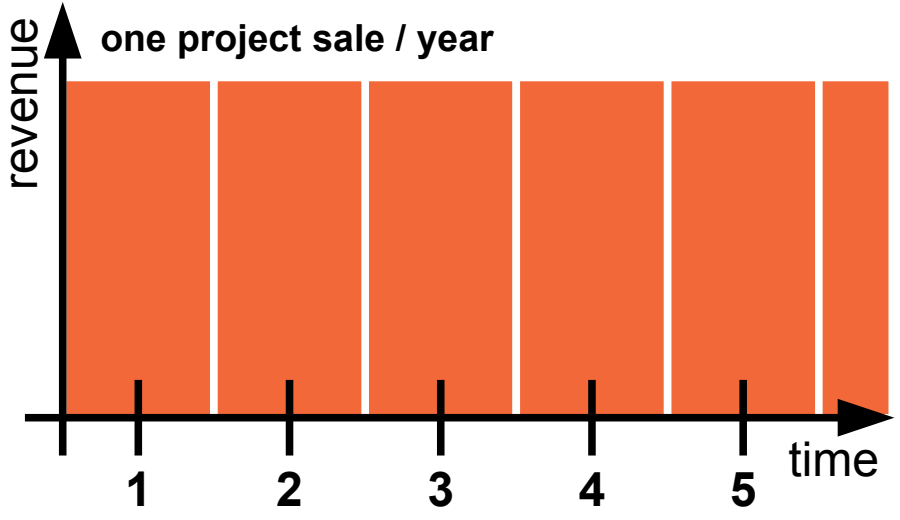
Product Revenue





Project Revenue



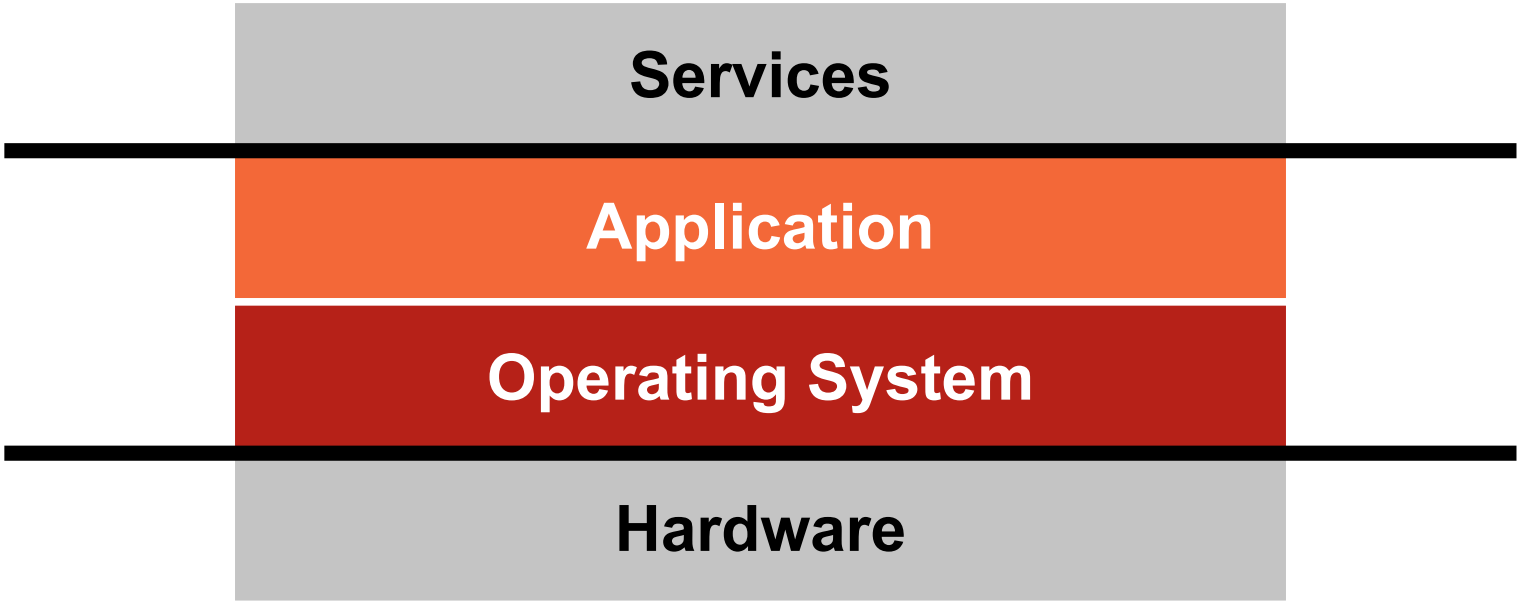


(Software) Products and (Implementation) Projects

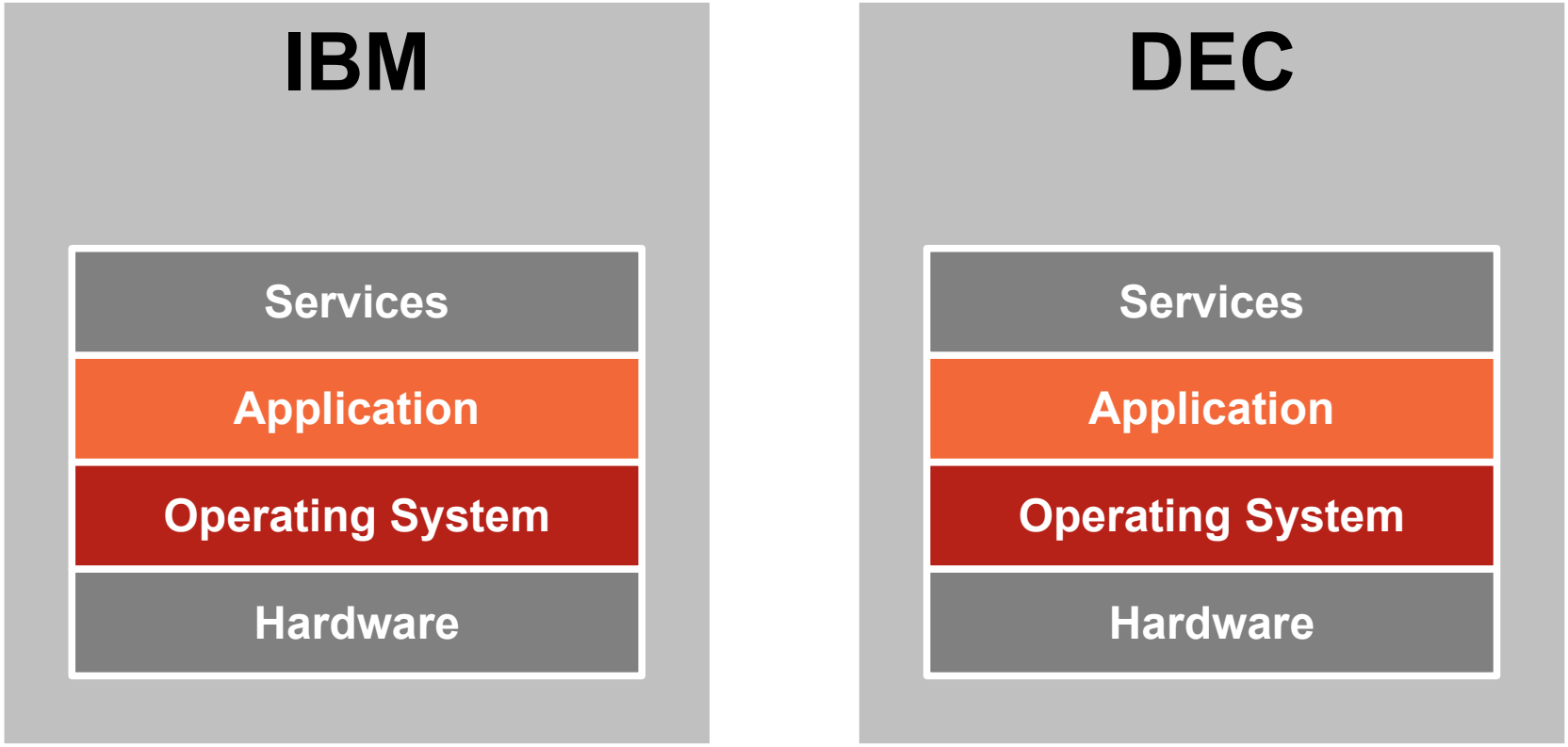
Software Product vs. Project Companies

	Consulting Firms (Custom Development)	Software Vendors (COTS Development)
Advantages	• Not capital intensive • Can be started easily	• Stable maintenance revenue • High market capitalization
Disadvantages	• Somewhat fragile revenue • Little long-term stability • High business volatility • Limited scalability	• Hard to get started • Requires upfront investment • May be slow to react • Most fail, few survive

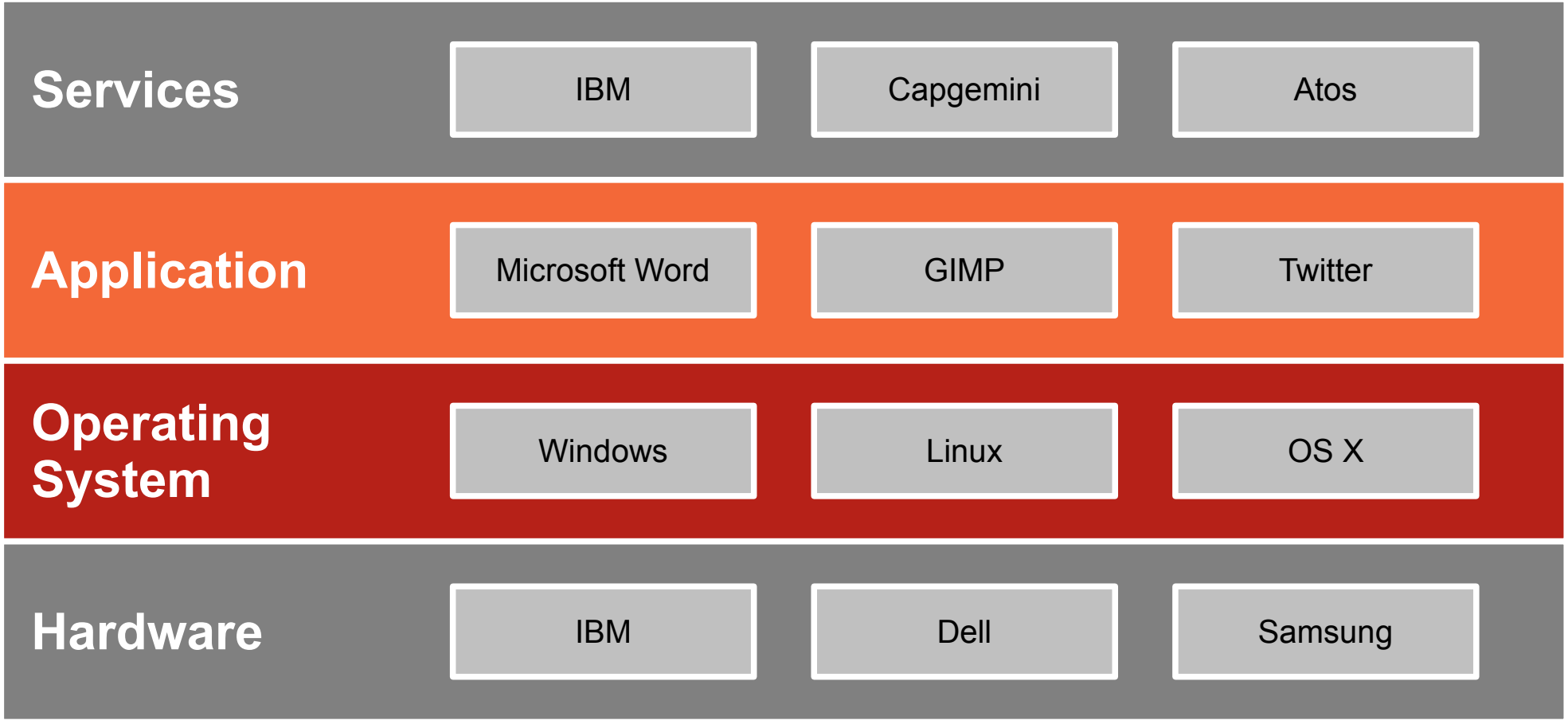
Customers Buy a “Solution”



Vertical Integration (Until 1980ties)



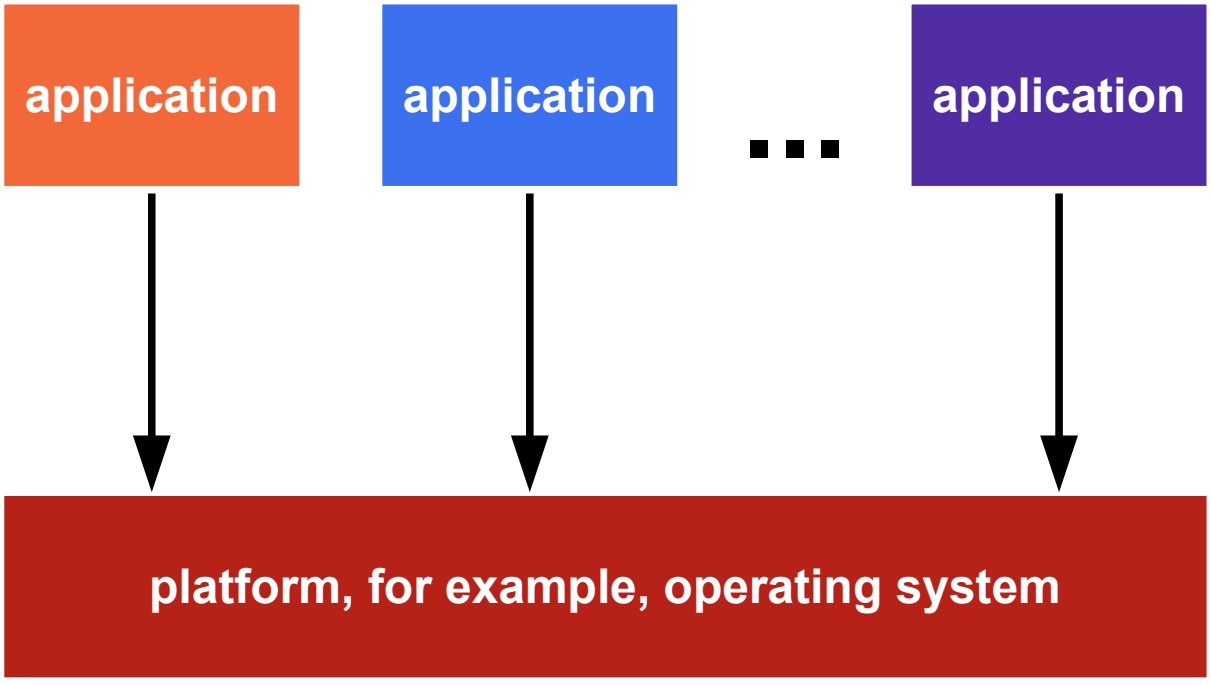
Horizontal Integration (Since 1990ties)



Categories of Software Products

- **Applications**
  - Software that is not built upon
  - Top-layer of the solution stack
- **Platforms**
  - Software that is built upon
  - Everything that is not the top layer
- **Why does everyone want to be a platform?**

Software Platform 1 / 2



Software Platform 2 / 2

- Software platform
  - Is an environment for the development and deployment of applications
    - Implies split between applications on top of the platform
  - Is a full set of application-independent life-cycle functions for applications
    - Among many components, the largest collection (i.e. not just a library)
  - Are often two- or multi-sided
    - Face both ISVs / VARs and end-customers
- Customer (user) value of software platforms
  - By definition, a platform in itself is useless
  - Customer value is only created by applications

Software Platforms as a Product

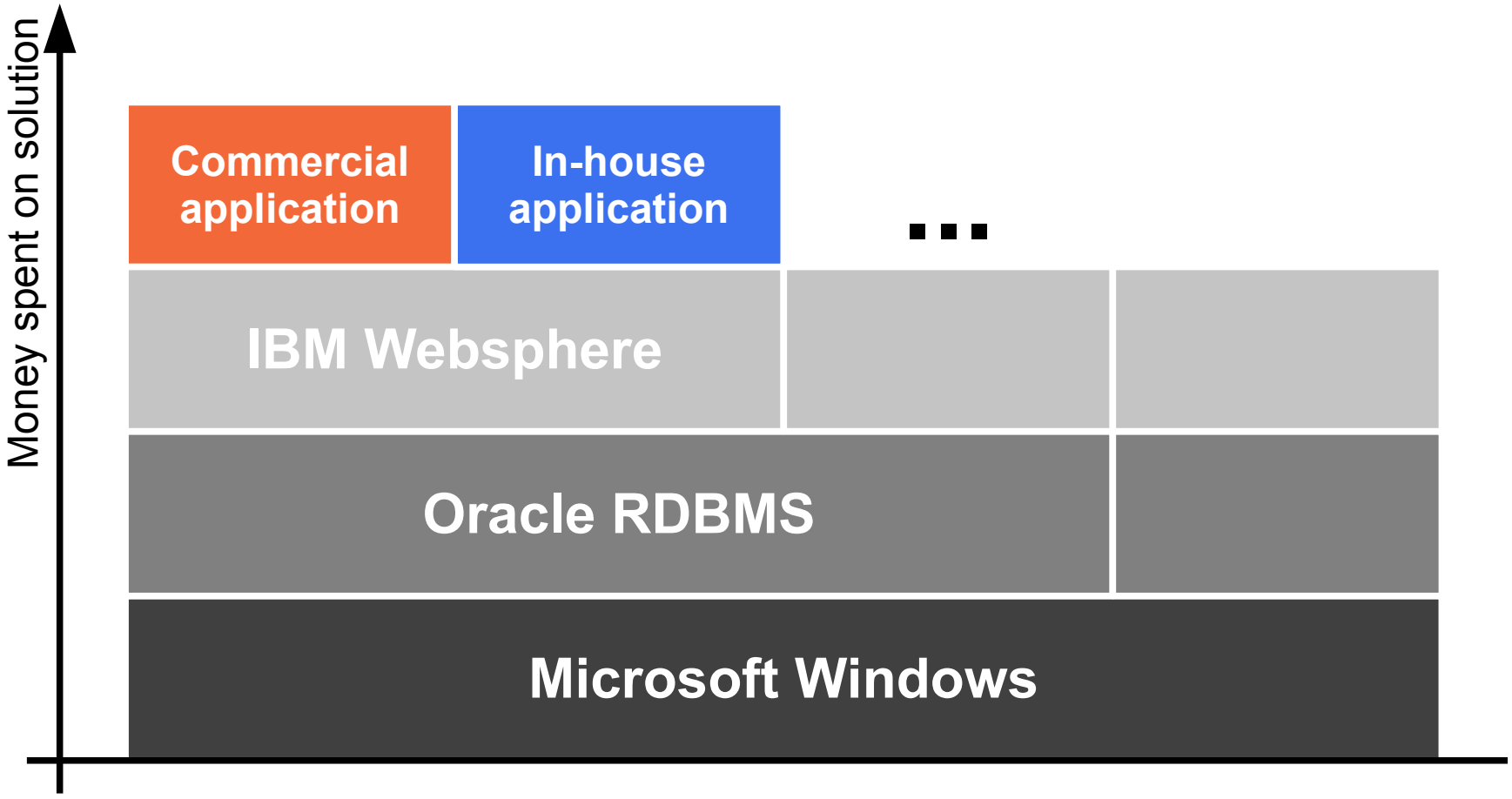
- Platforms are valuable
  - Platforms are needed by the applications running on top of it
  - Platforms can simplify IT department operations costs
- An application license sale implies a platform sale

Software Ecosystem

- Software ecosystem
  - The totality of actors (businesses and individuals),
  - software applications and components,
  - their relationships and goals
  - around a software platform
- Includes but is not limited to a community

Pricing Power 1 / 2

Pricing Power 2 / 2



Software Ecosystem

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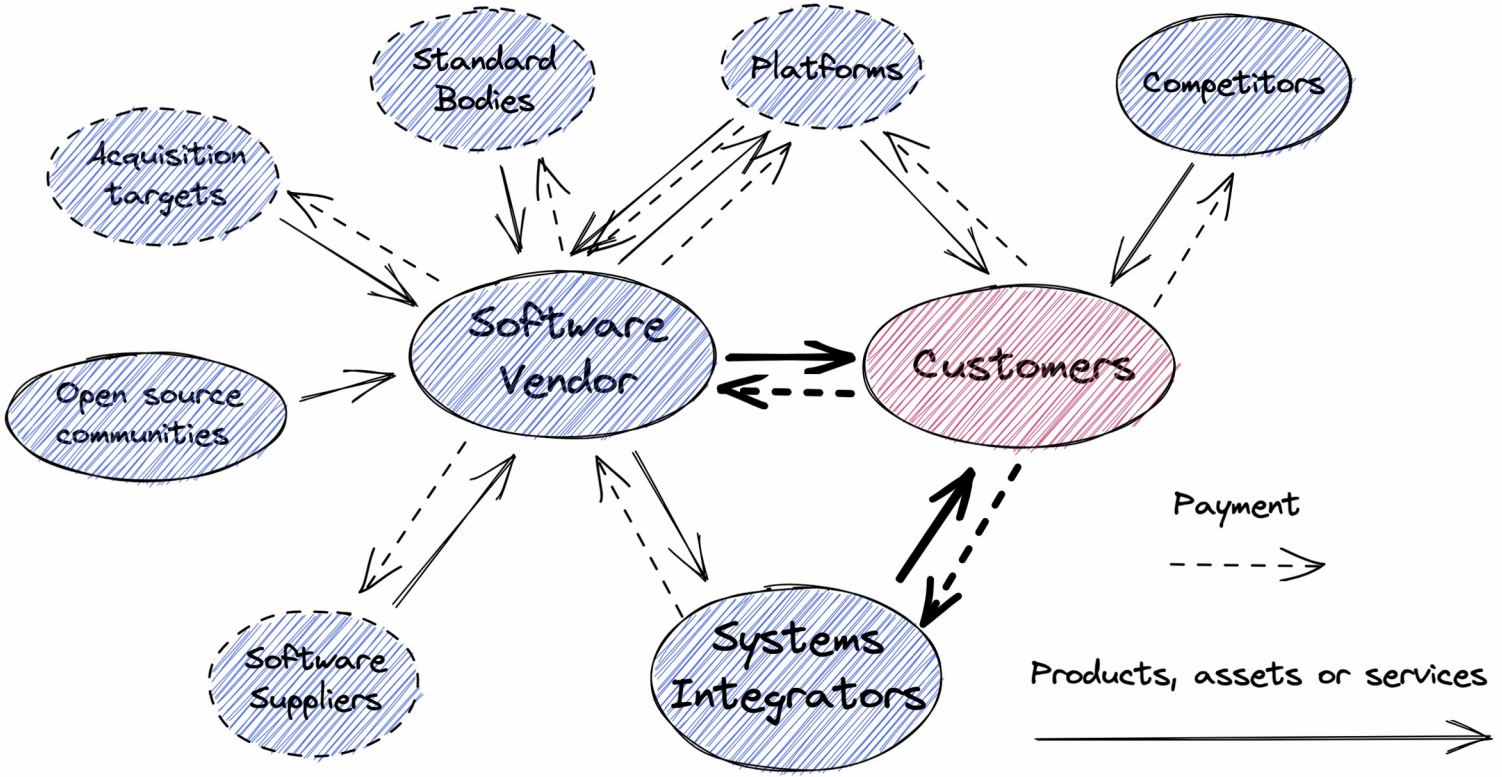
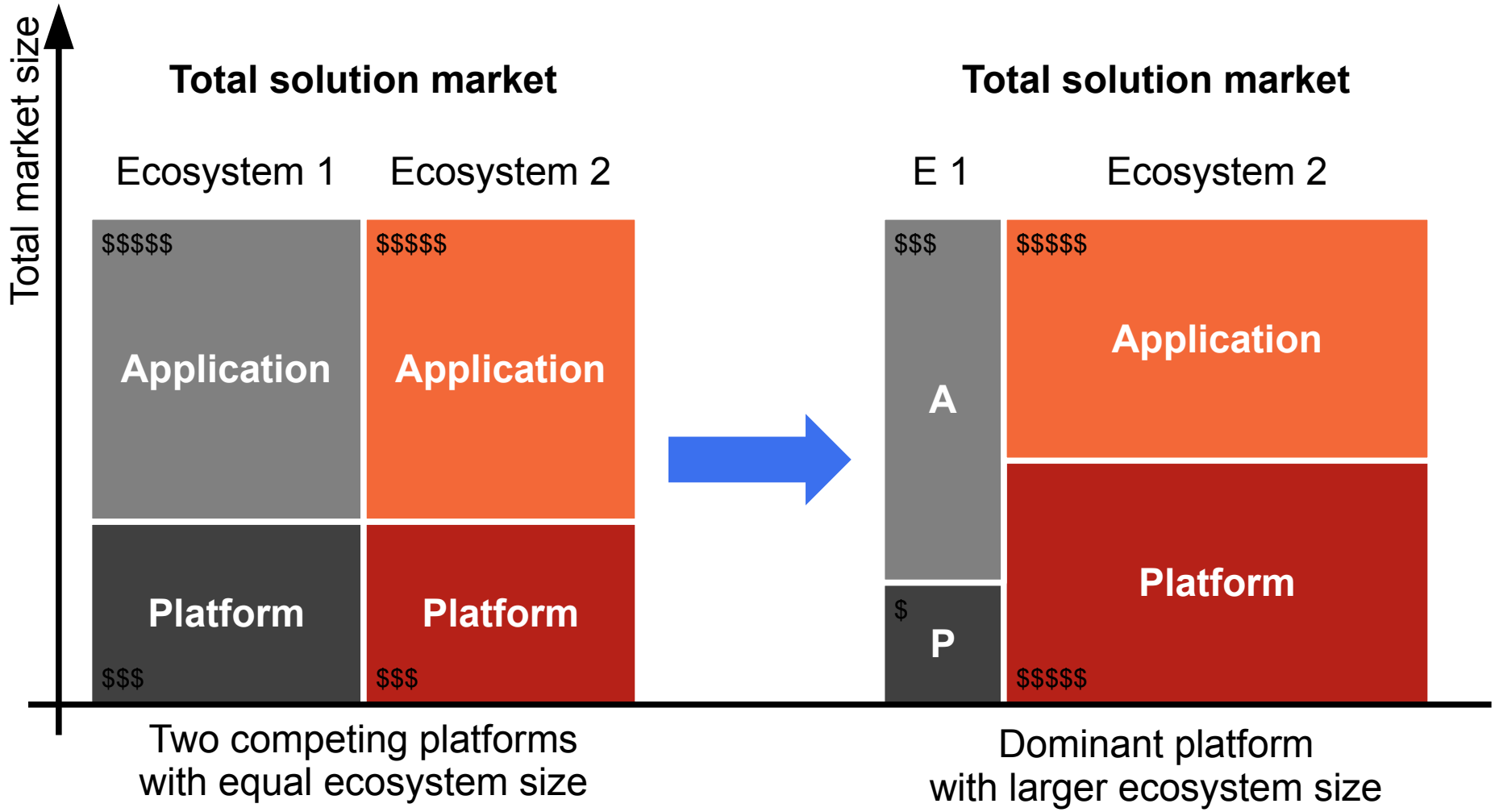
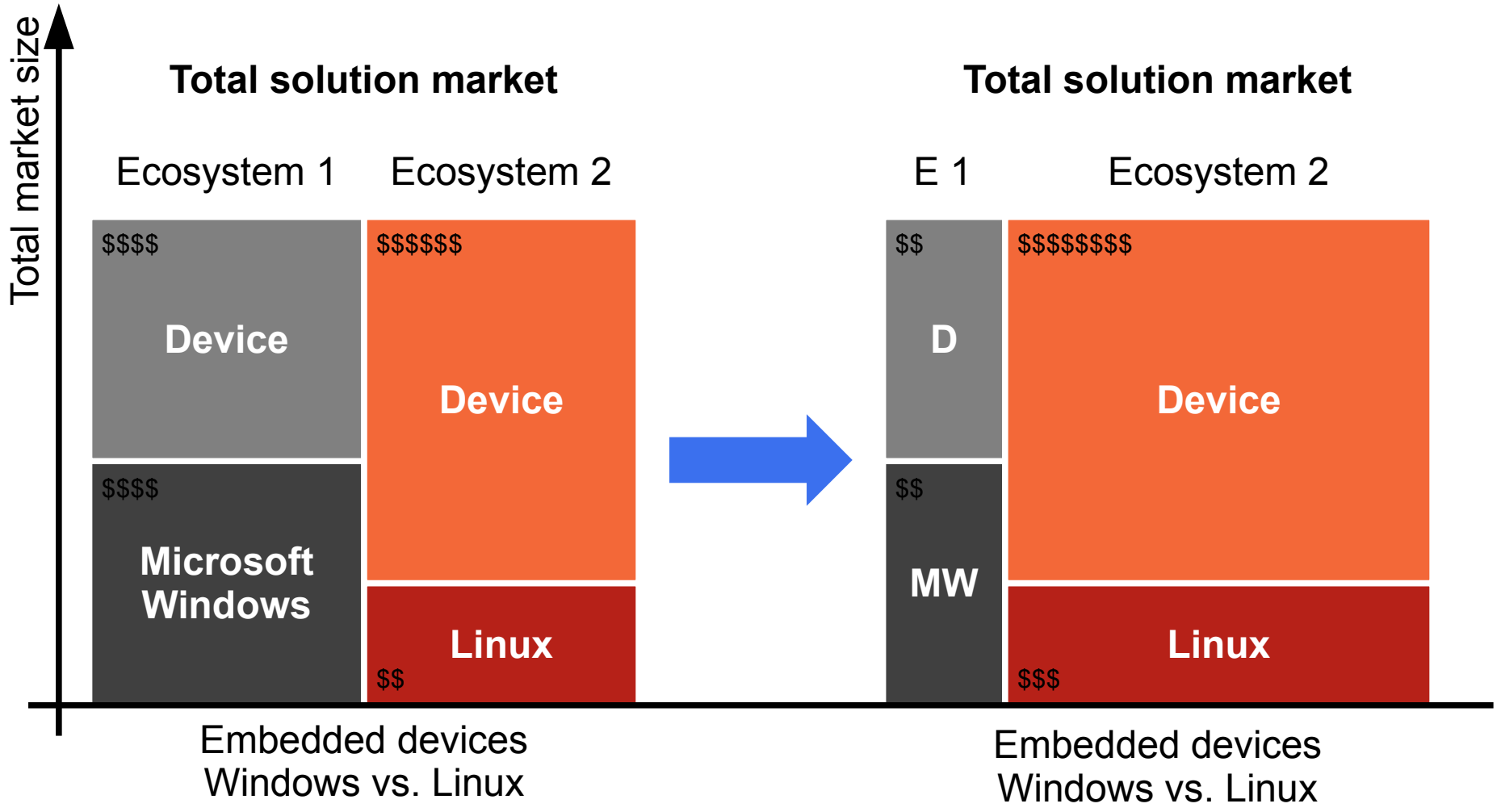
Software Ecosystem



The Software Ecosystem Wars

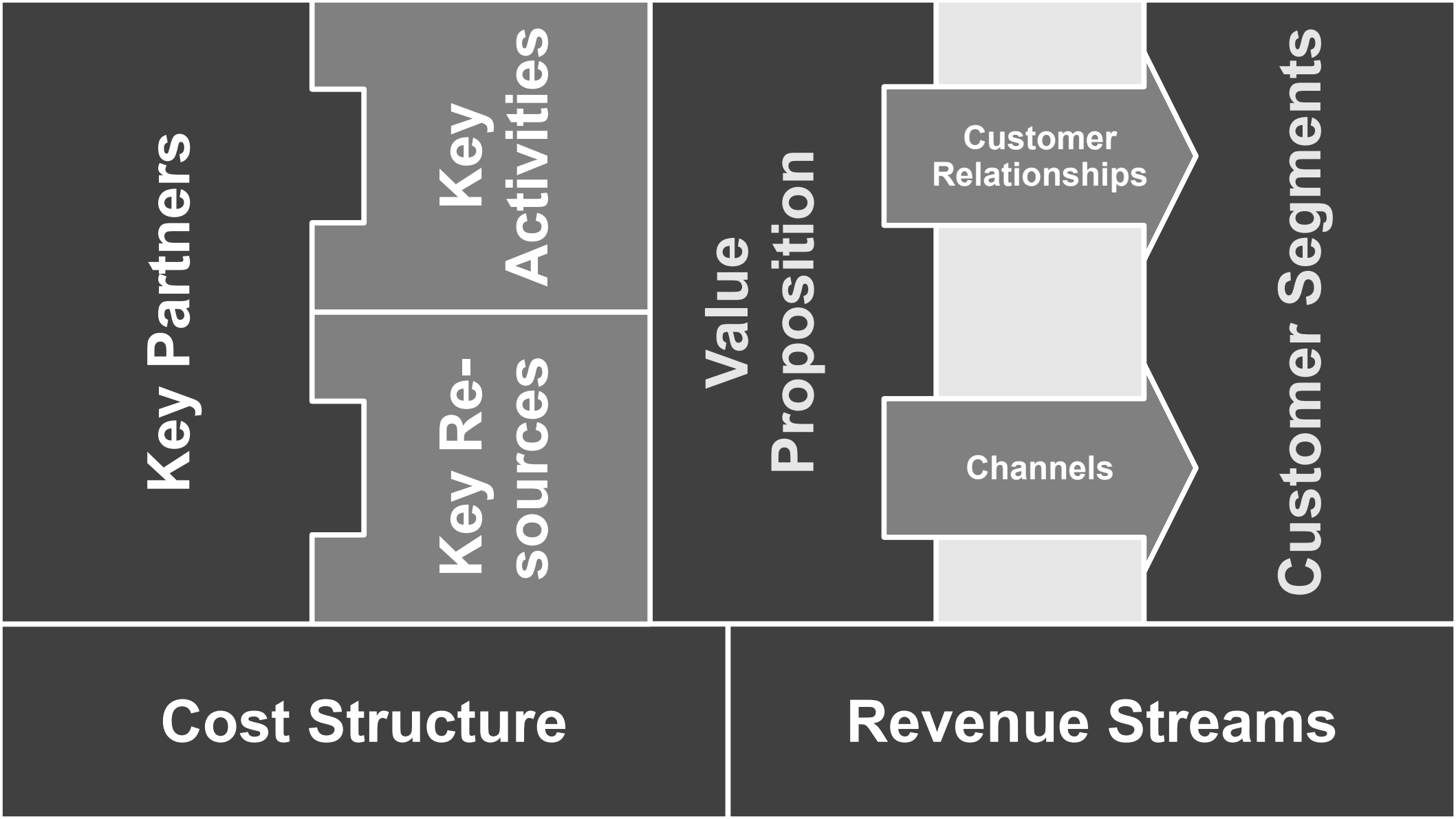


Open Source in the Ecosystem Wars



Business Model

- A **business model**
  - Is a summary description (model) of how a business' elements and their relationships interact to help the business achieve its strategic goals
  - Example elements are products, partners, people, positions, etc. and example relationships are the processes that govern their interaction
- But "open source is not a business model" [A08]
  - But open source can be a key enabler of a business model
  - So much so that the business model is called "open source"


Key Partners
Key Activities
Key Re-sources
Value Proposition
Customer Relationships
Channels
Customer Segments
Cost Structure
Revenue Streams

Microsoft Income Statement (2022) – from K10

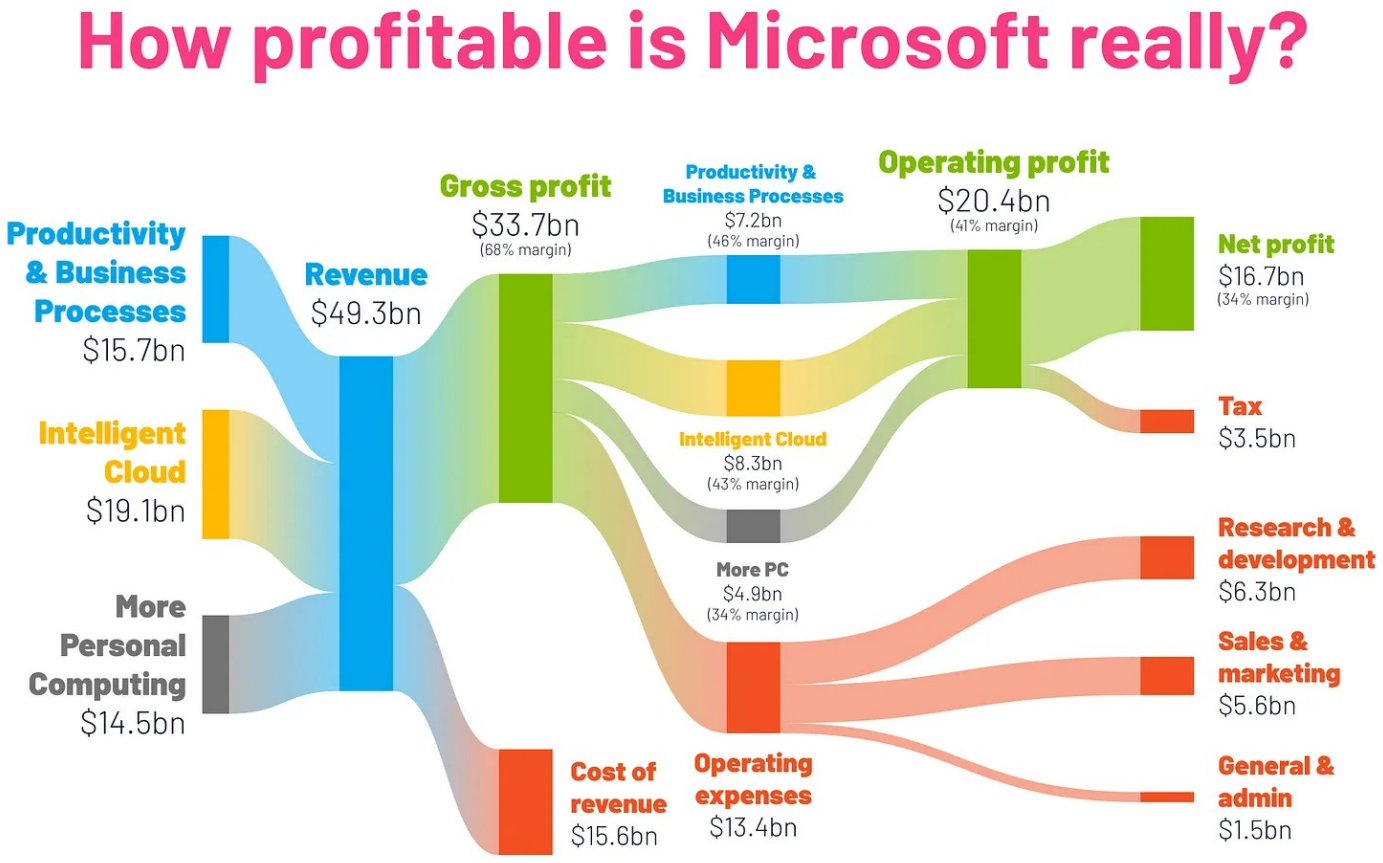
ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

INCOME STATEMENTS

(In millions, except per share amounts)

Year Ended June 30,	2022	2021	2020
Revenue:			
Product	**$ 72,732**	$ 71,074	$ 68,041
Service and other	**125,538**	97,014	74,974
Total revenue	**198,270**	168,088	143,015
Cost of revenue:			
Product	**19,064**	18,219	16,017
Service and other	**43,586**	34,013	30,061
Total cost of revenue	**62,650**	52,232	46,078
Gross margin	**135,620**	115,856	96,937
Research and development	**24,512**	20,716	19,269
Sales and marketing	**21,825**	20,117	19,598
General and administrative	**5,900**	5,107	5,111
Operating income	**83,383**	69,916	52,959
Other income, net	**333**	1,186	77
Income before income taxes	**83,716**	71,102	53,036
Provision for income taxes	**10,978**	9,831	8,755
Net income	**$ 72,738**	$ 61,271	$ 44,281
Earnings per share:			
Basic	**$ 9.70**	$ 8.12	$ 5.82
Diluted	**$ 9.65**	$ 8.05	$ 5.76

Microsoft Income Statement (2022)



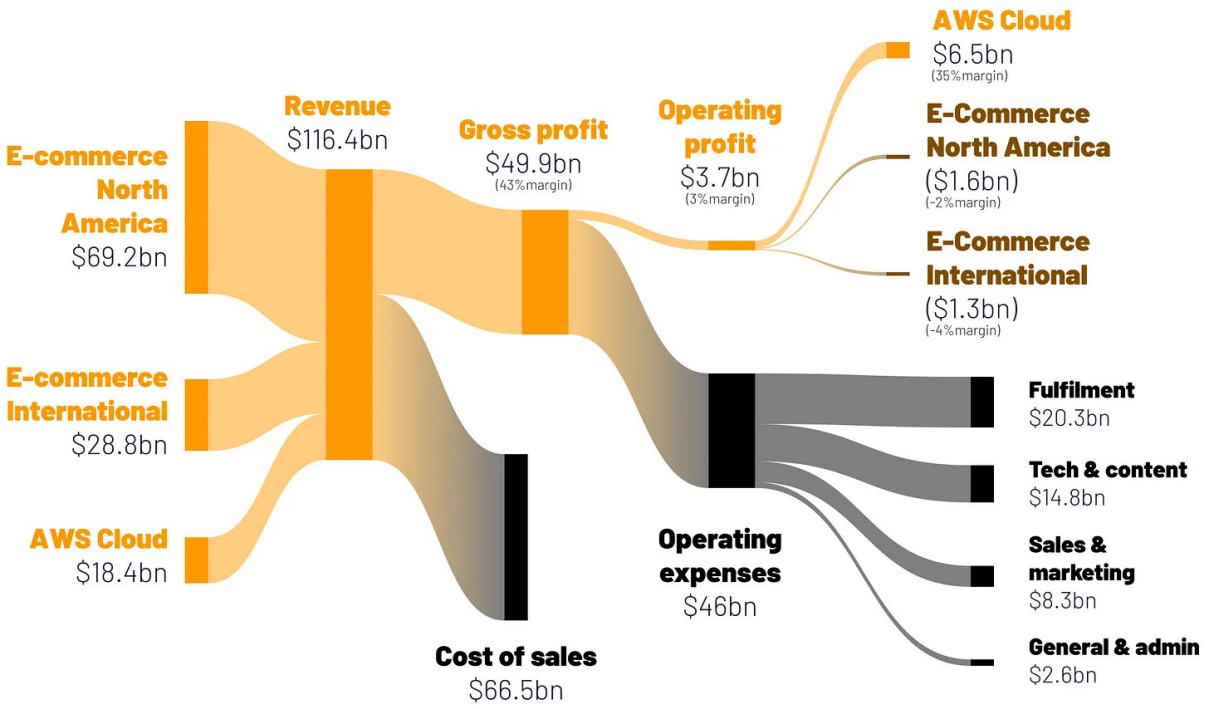
Source: Microsoft 20 2022 financial statements

More charts at (link in bio): genuineimpact.substack.com

genuine impact

Amazon Income Statement (2022)

How profitable is Amazon really?



Source: Amazon 20 2022 financial statements

More charts at (link in bio): genuineimpact.substack.com

genuine impact

Red Hat Income Statement (2019)

RESULTS OF OPERATIONS

Fiscal years ended February 28, 2019 and February 28, 2018

The following table is a summary of our results of operations (in thousands):

	Fiscal Years Ended			
	February 28, 2019	February 28, 2018 (1)	$ Change	% Change
Revenue:				
Subscriptions	$ 2,949,059	$ 2,574,178	$ 374,881	14.6%
Training and services	413,010	346,283	66,727	19.3
Total revenue	3,362,069	2,920,461	441,608	15.1%
Cost of revenue:				
Subscriptions	213,843	185,339	28,504	15.4
As a % of subscription revenue	7.3%	7.2%		
Training and services	284,408	246,458	37,950	15.4
As a % of training and services revenue	68.9%	71.2%		
Total cost of revenue	498,251	431,797	66,454	15.4%
As a % of total revenue	14.8%	14.8%		
Gross profit	2,863,818	2,488,664	375,154	15.1%
Operating expense:				
Sales and marketing	1,378,278	1,195,286	182,992	15.3
Research and development	668,542	578,330	90,212	15.6
General and administrative	304,766	239,316	65,450	27.3
Total operating expense	2,351,586	2,012,932	338,654	16.8%
Income from operations	512,232	475,732	36,500	7.7
Interest income	30,531	18,493	12,038	65.1
Interest expense	19,838	24,569	(4,731)	(19.3)
Other (expense) income, net	(4,870)	8,335	(13,205)	(158.4)
Income before provision for income taxes	518,055	477,991	40,064	8.4%
Provision for income taxes [2]	84,067	216,140	(132,073)	(61.1)
Net income	$ 433,988	$ 261,851	$ 172,137	65.7%

Learnings from a SaaS IPO — Gitlab

- https://blossomstreetventures.medium.com/learnings-from-a-saas-ipo-gitlab-d46df08bfe2d

R&D : une définition controversée ?

🇺🇸 Etats-Unis

Technology and content costs include payroll and related expenses for employees involved in the research and development of new and existing products and services, development, **design, and maintenance of our stores**, curation and display of products and services made available in our online stores, and **infrastructure costs**. Infrastructure costs **include servers, networking equipment, and data center related depreciation and amortization, rent, utilities, and other expenses** necessary to support AWS and other Amazon businesses.

AWS costs are primarily classified as "Technology and content".

Rapport annuel 2021 d'Amazon

🇪🇺 Europe

"Research and development (R&D) expenditure includes pre-production research and development, such as the **search for alternative products, processes, systems, and services**. By contrast, we do not class as R&D expenditure the costs of developing system and user software which is designed to improve productivity and make our business processes more effective."

Rapport annuel 2021 de Deutsche Telekom

Apparté sur la R&D

Enquête sur la "R&D" d'Amazon

Operating expenses:		2020	2021
Cost of sales	"purchase price of consumer products, inbound and outbound shipping costs"	$ 233,307	$ 272,344
Fulfillment	"operating and staffing fulfillment centers and physical stores"	58,517	75,111
Technology and content		42,740	56,052
Marketing		22,008	32,551
General and administrative	"costs are not directly attributable to the production of goods and services"	6,668	8,823
Other operating expense (income), net		(75)	62
Total operating expenses		$ 363,165	$ 444,943

La tech marketée comme R&D

Amazon inclut dans "*Technology & Content*" tous les salaires et coûts d'infrastructures (amortissement, énergie et loyer de ses serveurs, et *data centers*) de sa tech

AWS

Net sales	$ 62,202
Operating expenses	43,670
Operating income	$ 18,532

→ ??? *R&D expenses*

AWS à retraiter

Il reste à retraiter ce montant mais les prix, loyers, énergies, amortissements et même nombres de serveurs & *data centers* ne sont pas publics
↠ Raisonnons par analogie avec un *pure player*

656,8 M€ *Operating expenses* → 76 M€ *R&D expenses*

Une R&D plus réaliste

4,7 Mds€ *R&D expenses*

Sources : Annual Report 2021 d'Amazon, Consolidated Financial Statements 2021 d'OVH

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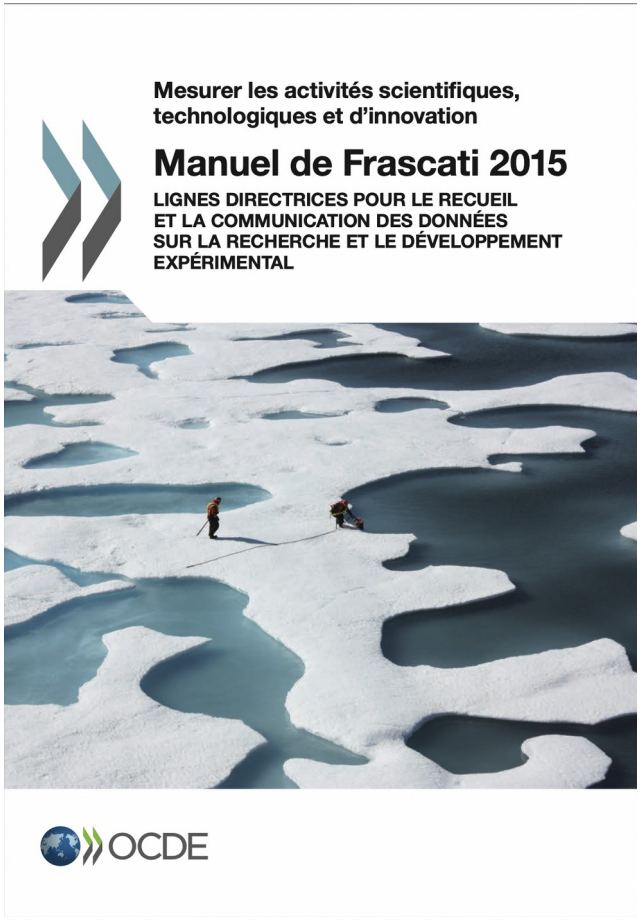
Manuel de Frascati

- Publié par l'OCDE, le manuel de Frascati est une référence méthodologique internationale pour les études statistiques des activités de recherche et développement (R&D). Il standardise la façon dont les gouvernements recueillent l'information sur les investissements en recherche et développement (R&D). Ce Manuel traite exclusivement de la mesure des ressources humaines et financières consacrées à la recherche et au développement expérimental (R&D) souvent qualifiées « d'intrants » de la R&D.
- Même s'il s'agit avant tout d'un outil pour les statisticiens, le manuel de Frascati s'avère pour les gestionnaires de la R&D en entreprise un outil indispensable pour apprécier les efforts de R&D réalisés par leurs équipes, et, le cas échéant, les justifier auprès de l'administration fiscale ou sociale.



Open Source “Business Models”

- Non-profit open source
  - **Community projects** without foundation
  - Open source **developer foundations**
  - Open source **user foundations**
- For-profit open source
  - **Service and support firms**
  - Open source **distributor firms**
  - **Single-vendor** open source **firms**

Open Source and Business Models

- Open source may not be a business model, but it may be …
  - A go-to-market strategy
  - An innovation model
  - A collaboration model
  - A sourcing strategy
  - And many other things
- More on this in later lectures on open source business models

Review / Summary of Session

- The software industry
- Software platforms
- Software ecosystems
- Business models

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  - ...