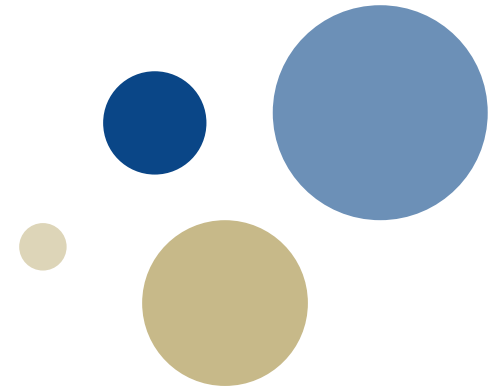




NTNU – Trondheim
Norwegian University of
Science and Technology



IN 5210 IS theory:

Towards understanding 'digitalization'

Eric Monteiro

www.idi.ntnu.no/~ericm

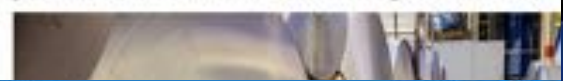


Background

Manufacturing sector

Fourth industrial revolution could unlock £445bn for UK, report reveals

Report led by Jürgen Maier says deal between government and industry could put Britain at forefront of new technologies and create the



App gjør kontoret overflødig i Rema-butikkene



- Det er mye enklere nå, sier butikksjef Lise Marie Storhaug, som for eksempel lett kan bytte vakter med kolleger på mobiltappen og hjelpe kjøpmann Arne Tungland kontinuerlig oppdatert. Foto: Tomas Larsen

Nyheter Handel

- I løpet av fem-ti minutter har vi fått gjort det som tidligere tok mange dager

Bakrommet er snart overflødig i Rema-butikkene. Ansettelse, ansattdata, opplæring og arbeidsplaner styres allerede fra nettbrett og mobiltelefoner.

What if... Robots Replaced Teachers?



Helt nytt studium ble det vanskeligste å komme inn på

Endelig er ventetiden over for kommende studenter - opptaket til høyere utdanning er klart.

På MN-fakultetet er det - i den ordinære kvoten - aller vanskeligst å komme inn på det helt nye studiet Informatikk: digital økonomi og ledelse iF. Poengkravet er 62,1. Hele 19 har kjempet om hver plass på dette studiet.

For søkere med førstegangsvitnemål kreves det 51,9 poeng for å komme inn her - knepent slått av farmasi med 52,0.

- Studieprogrammet tar hensyn til ønskene fra arbeidsmarkedet og gir studentene en unik og ettertraktet utdanning, sier dekan Morten Dæhlen i sin blogg om "Dig.øk"-studiet.

Han kaller det et knallsterkt alternativ til utdanningene innen industriell økonomi ved andre læresteder.

Siden studieprogrammet er nytt, kan man ikke sammenligne med tidligere år, men flere av de andre studieprogrammene innen informatikk øker i poengkrav, for eksempel:

Informatikk: design, bruk og interaksjon øker fra 50,9 i 2016 til 53 i ordinær kvote (42,1 for primærsøkere).

Informatikk: programmering og systemarkitektur øker fra 51 i 2016 til 53,1 i ordinær kvote (42,9 for primærsøkere).



- Det vi tenner på her nå, Margit Abel Grape (til venstre) er teknologilærer i utdanning.

Mener



Her, i Ole-Johan Dahls hus i Forskningsparken, skal de nye informatikkstudentene holde til. Foto: Jan-Tore Egge/Wikimedia Commons

digitalization

computerization

serviciation

ICT

automation

virtualization

Technological determinism?



Investments & employment



- US: **investments** in IT grew annually by 20% in 1990
- US: **employment** 2m (1992), 3.5m (2000)

Recent Norwegian statistics (SSB)



OPPDATERT

23. mai 2017

NESTE OPPDATERING

Foreløpig ikke fastsatt

4 %

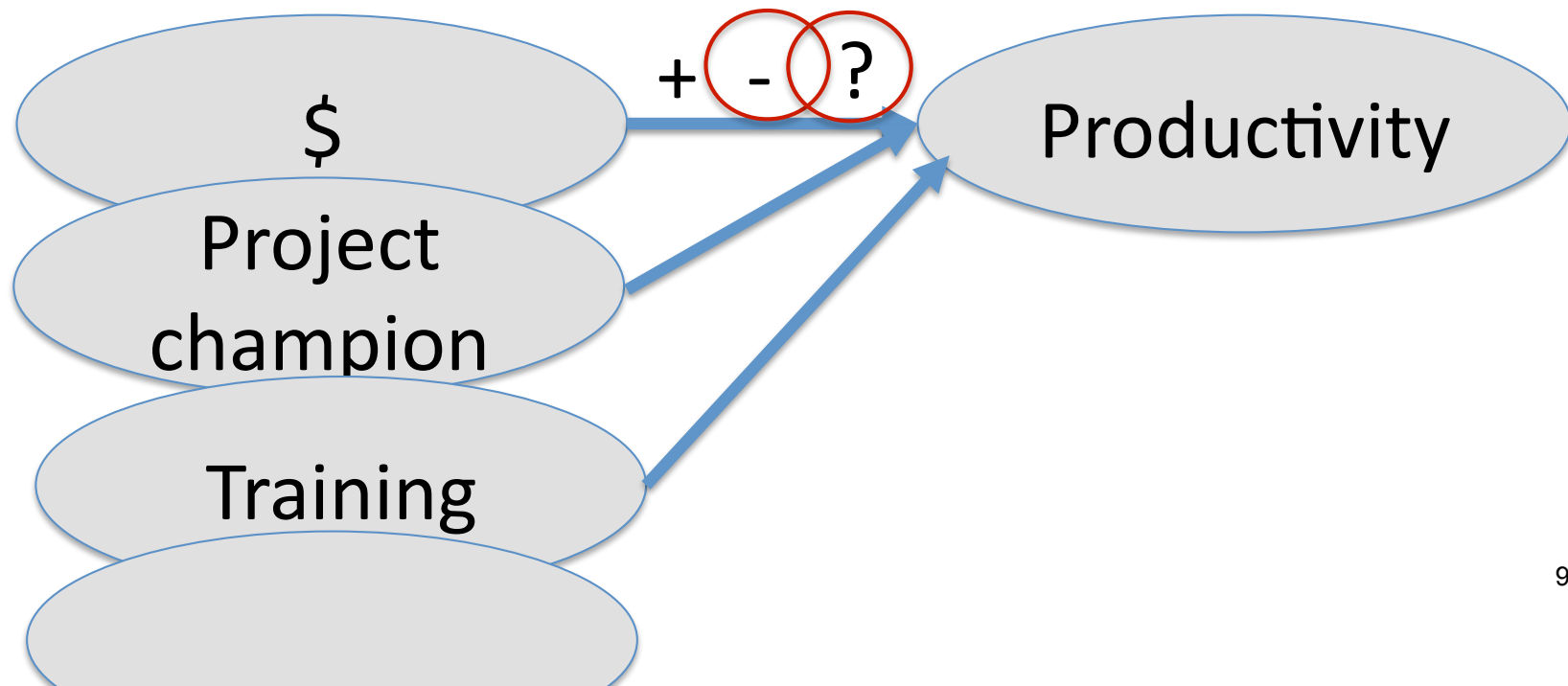
økning i omsetning for informasjon og kommunikasjon i 2015

Informasjon og kommunikasjon, strukturstatistikk. Næring 58-63. Endelige tall			
	2015	Prosent	
		2014 - 2015	2011 - 2015
Foretak			
Antall foretak	16 527	6,3	14,7
Sysselsatte	95 352	2,7	8,6
Omsetning (mill. kr)	229 798,1	3,8	16,3
Bearbeidingsverdi (mill. kr)	104 430,8	2,3	17,2
Brutto driftsresultat (mill. kr)	34 504,2	0,3	10,6
Bedrifter			
Antall bedrifter	17 384	8,0	14,3
Sysselsatte	93 648	1,5	7,8
Omsetning (mill. kr)	228 324,3	4,0	15,9
Lønnskostnader (mill. kr)	68 834,9	3,1	19,7
Bruttoinvesteringer (mill. kr)	10 730,6	16,6	33,0

Macro \neq micro effects



- Macro- but not micro effects and vice versa
- 'Productivity paradox':



“[Y]ou can see the computer age everywhere except in the productivity statistics” *



1. **Not** automation (qua **substitution**)
2. **Complementaries** (customer interaction, internal communication)
3. **Transformation**

- R Solow

Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *The Journal of Economic Perspectives*, 14(4), 23-48.

Barras, R. (1990). Interactive innovation in financial and business services: the vanguard of the service revolution. *Research policy*, 19(3), 215-237. 10



Sociotechnical: use of technology

Use/utility/value: functional vs symbolic

- Technology used for more than utility, purpose
- Display outwards
- **Identity**
- Fashion, design



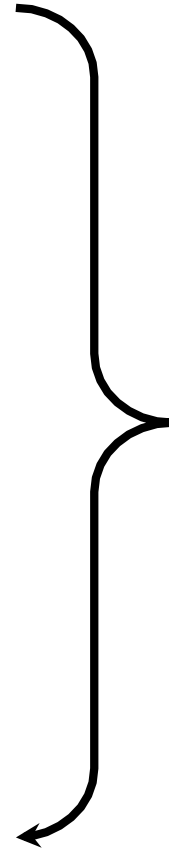
Ex.: Mobile



”Use” of technology

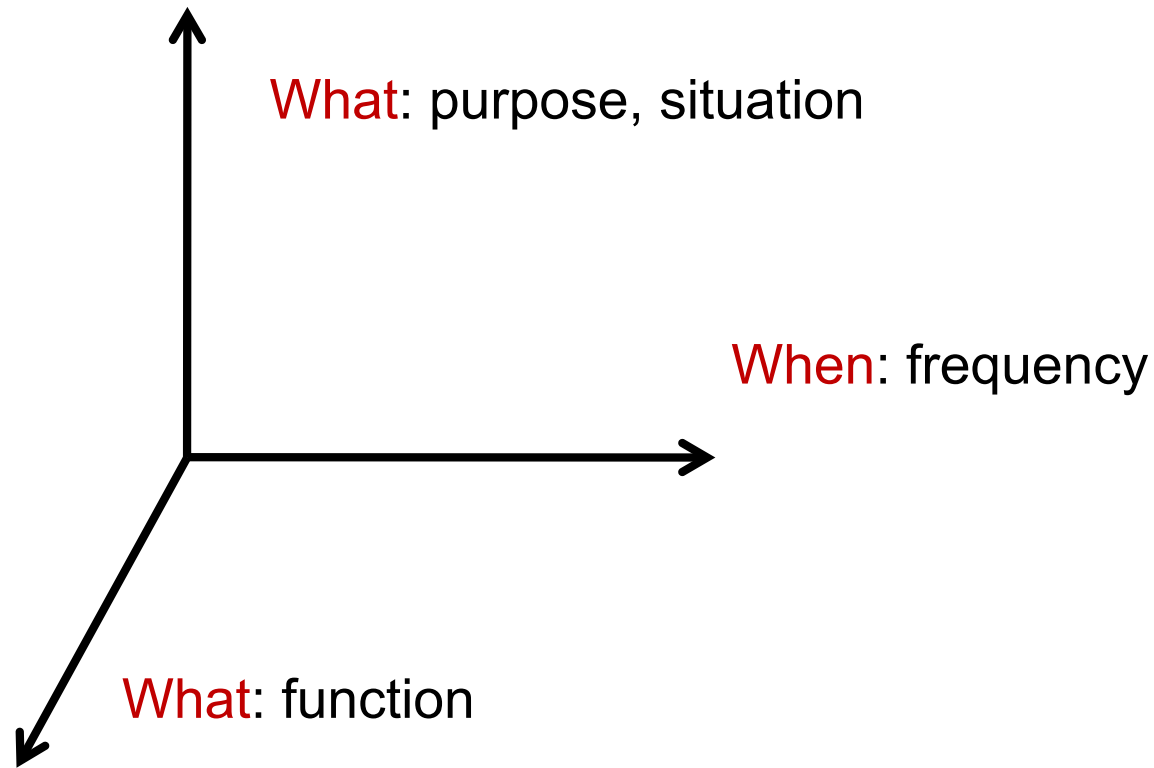


- Seen
- Touched
- Tried
- Some use
- Used a lot
- Used selected functions
- Used all functions
- In routine use



... all is "use" ?!

Ex.: possible vocabular ?



”Getting the job done”



[Milkshake](#)



Designing technology

Ex.: payment platforms

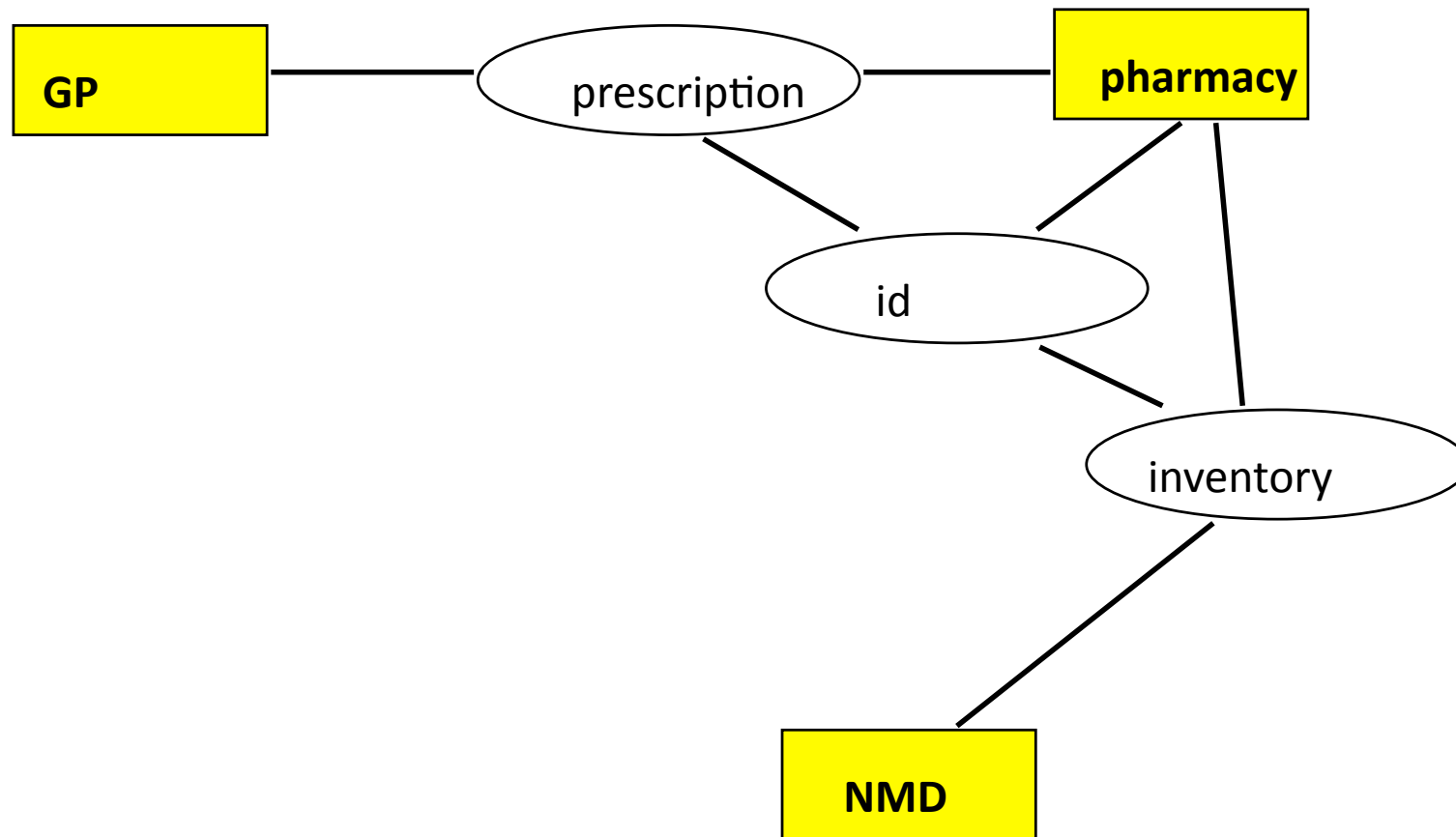
- Banks:
 - Accounts/ transactions
 - Debit cards
- Credit card companies
 - Digitalization of the card
- Telecom
 - Charged as teleservices
- Mobile phone
 - In-app payment
 - mCash, Vipps, ...



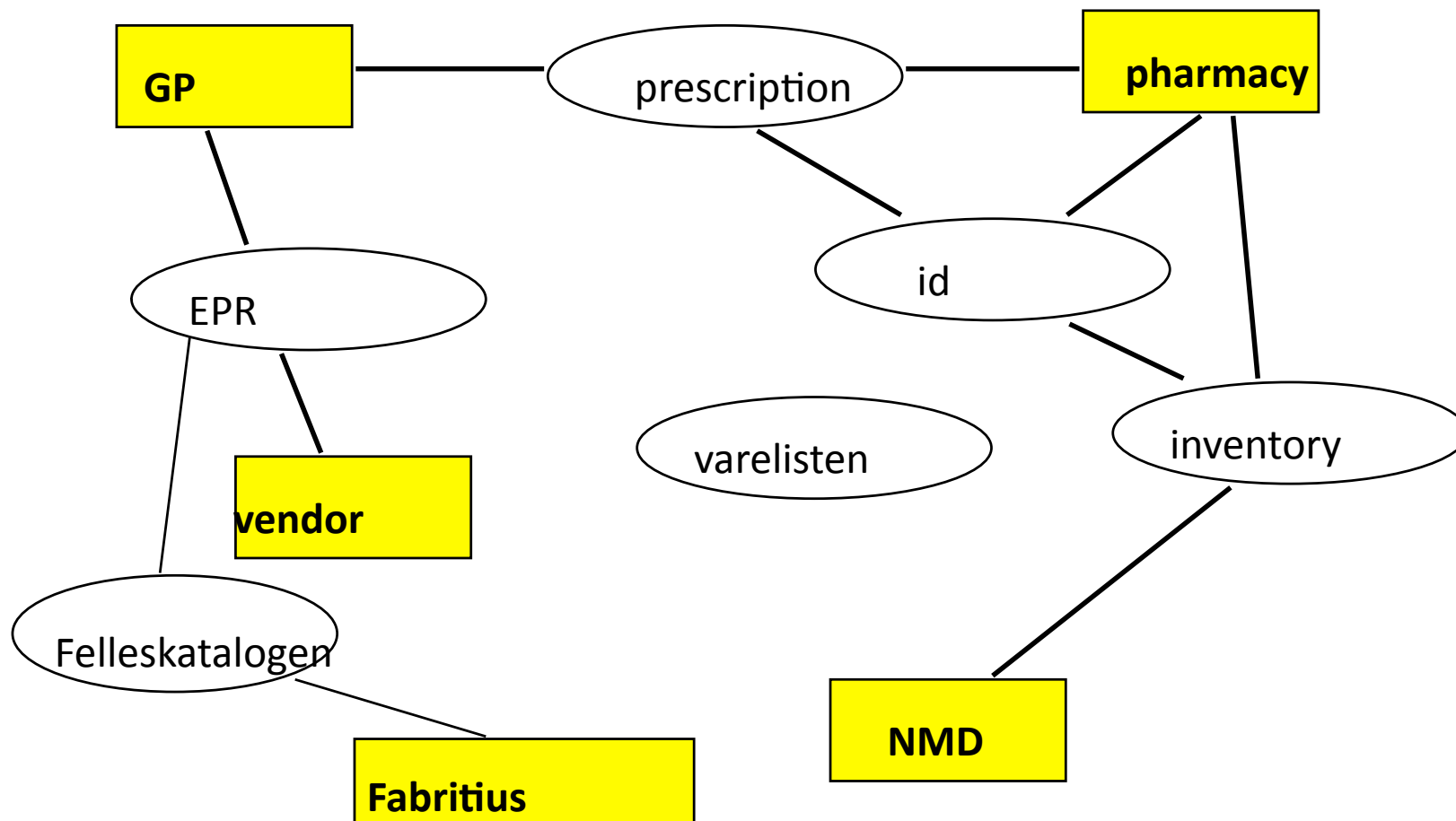
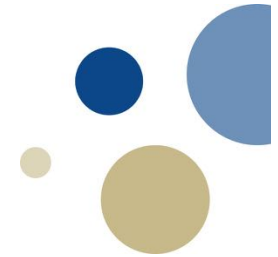
ePrescription



ePrescription



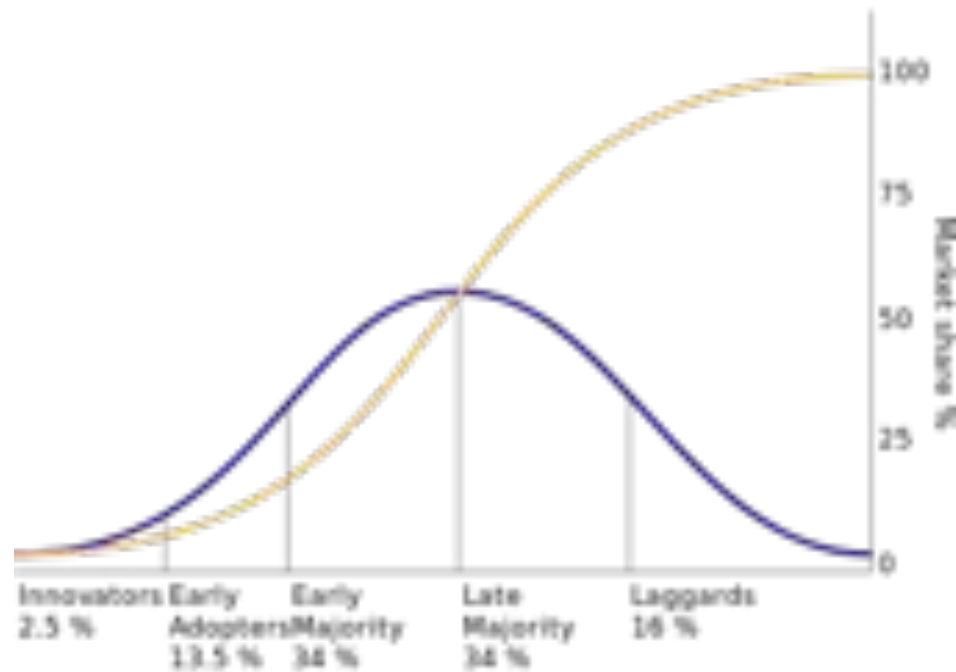
ePrescription





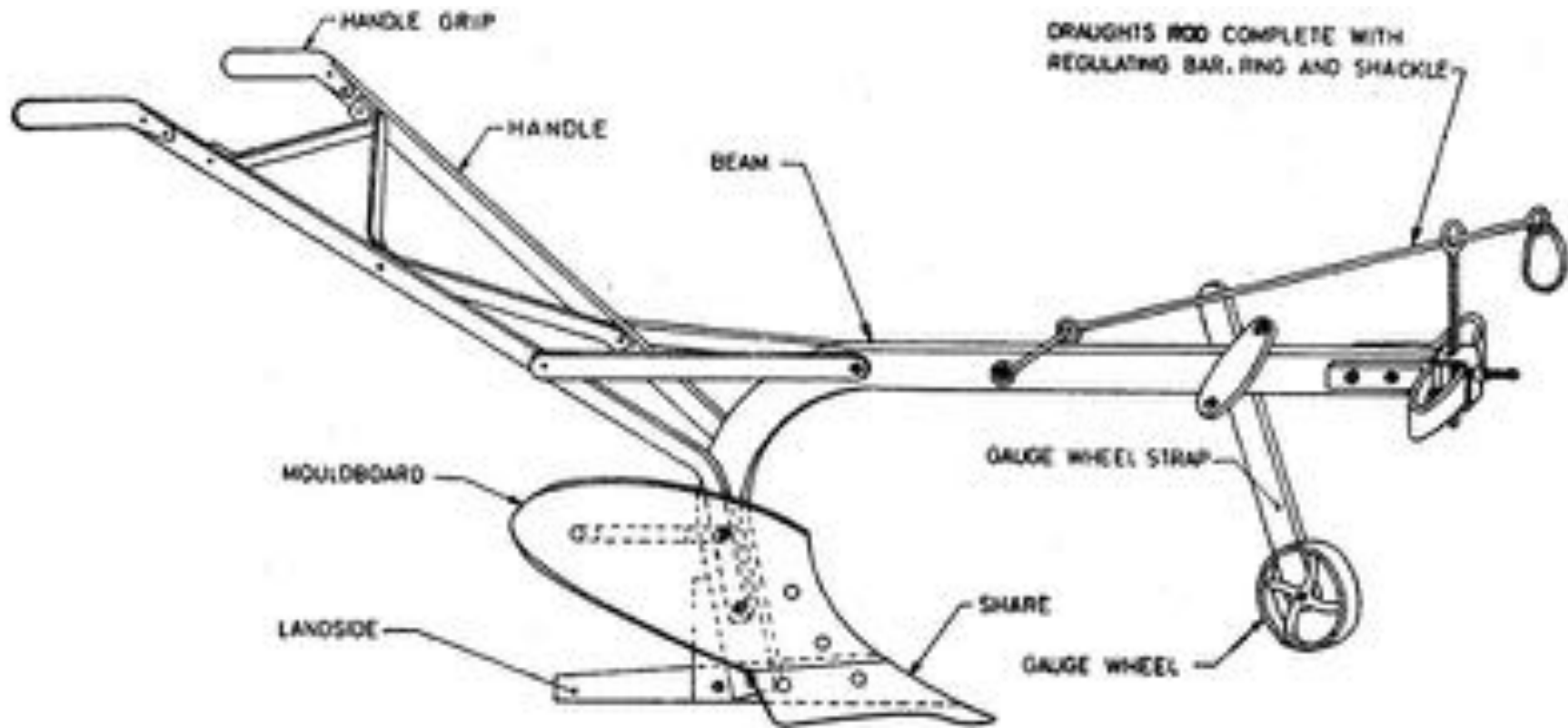
Uptake, diffusion of technology

S-curve diffusion vs Leapfrog

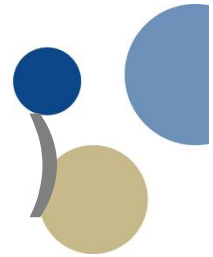


Ex.: Mpesa

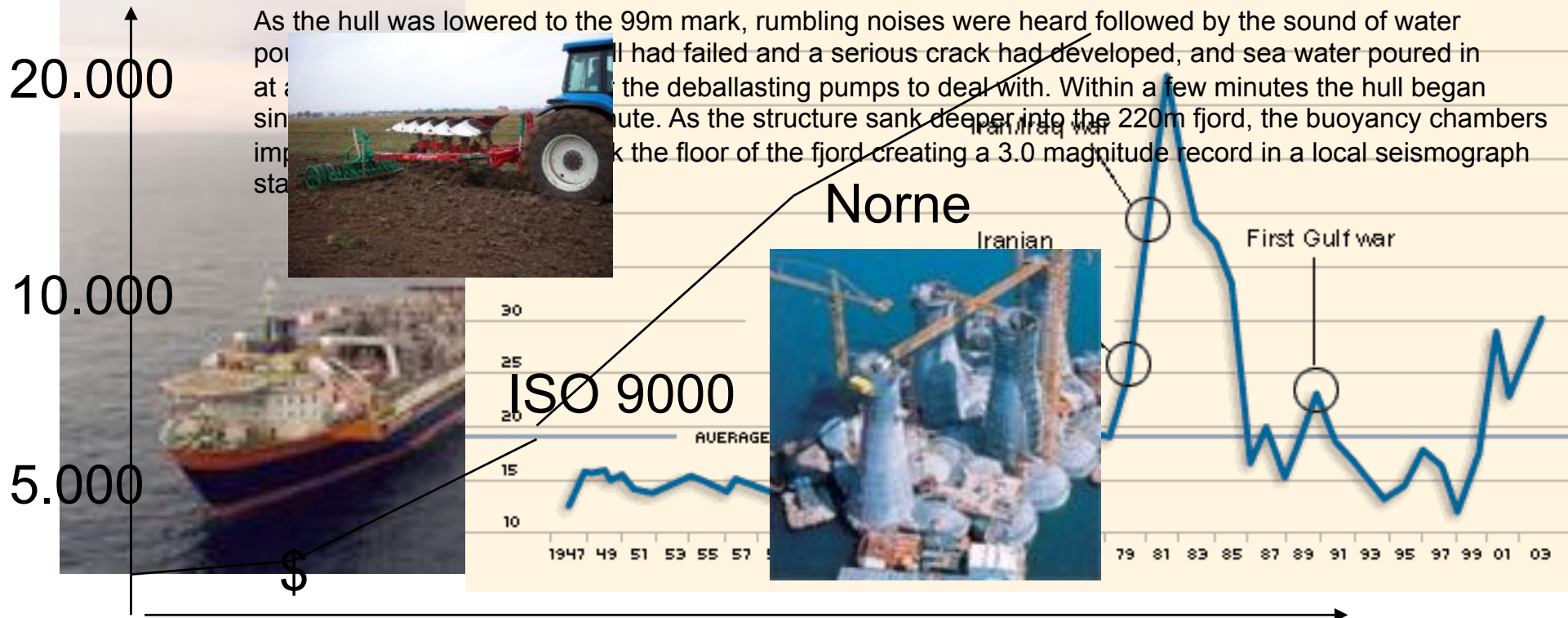
Critique: no dynamics (artefact)



Ex.: Lotus Notes Statoil (1992-)



Oil and war Crude oil price per barrel in 1996 dollars. Source: WTRG Economics



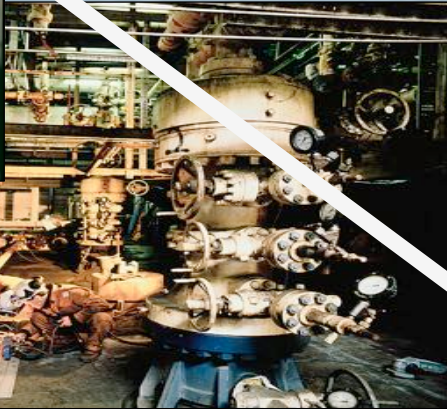
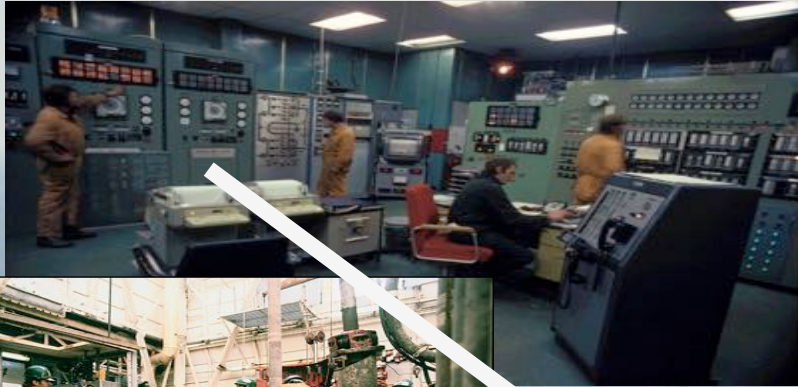
1994

1996

1998



'Liquefaction': IoT, data science

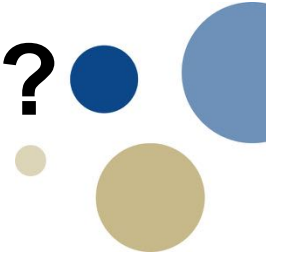


Relevance: data science, IoT



- "Data increasingly **self-referential**"/ "**computational** rendition of reality" (Kallinikos)
- "**Algorithmic phenomenon**" (Orlikowski)
- **IoT**: referent → reference
- "synthetic situation" (Knorr Cetina)

Sand: physical or digital – or both?



- 0: physical inspection, tactile, samples
- 1: sensor: sound or electro-magnetic

“We tried several approaches, but in the end we landed upon the simplest way of measuring sand content: that of grains of **sand flowing across the probe** every second”.

- False alarms, on- vs offshore operators

(cont.'ed)

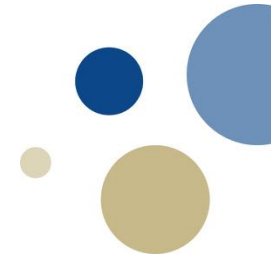


- 2: trends, not numbers

"I'm quite certain we have sand entering the well," he continues, "but then I look at the down-hole pressure here," pointing at a green trend line plotted in the same coordinate system. "I realize that almost no fluids are streaming through the well. I would normally ask the control room operators to choke down [that is, reduce the flow rate on the well] to prevent sand from damaging the production equipment. In this case, however, I am asking them to choke up. We are dangerously close to a shut-in pressure where sand will simply flow back down the pipeline."

"It [the information] was just [presented as] a number, but what does that number mean? They needed to see trends, and be aware of the system's limitations. They needed to consider factors that affected the measurements, but which were not sand related. So, if they had an alarm, they had to manually assess whether the alarm was an actual incident."

(cont.'ed)



- 3: predictive algorithm

" We quickly realized that input data comes with a lot of **uncertainties**. (...) When the quality of the input data varies the visualized output is basically meaningless. So we had to implement a way of visualizing the input data, too."

measurement

"Say we monitor **100** wells. For 80 of these wells this sand rate will have no erosion consequence [that is: it will not, within the set time period result in erosion that is outside safe levels]. For these there is no problem. **But for the remainder 20 wells** erosion may be an issue, and the production engineers need to pay particular **attention** to them.



Platforms & ecosystems

A 'platform'

- **What** is it?
- **Why** does it matter?



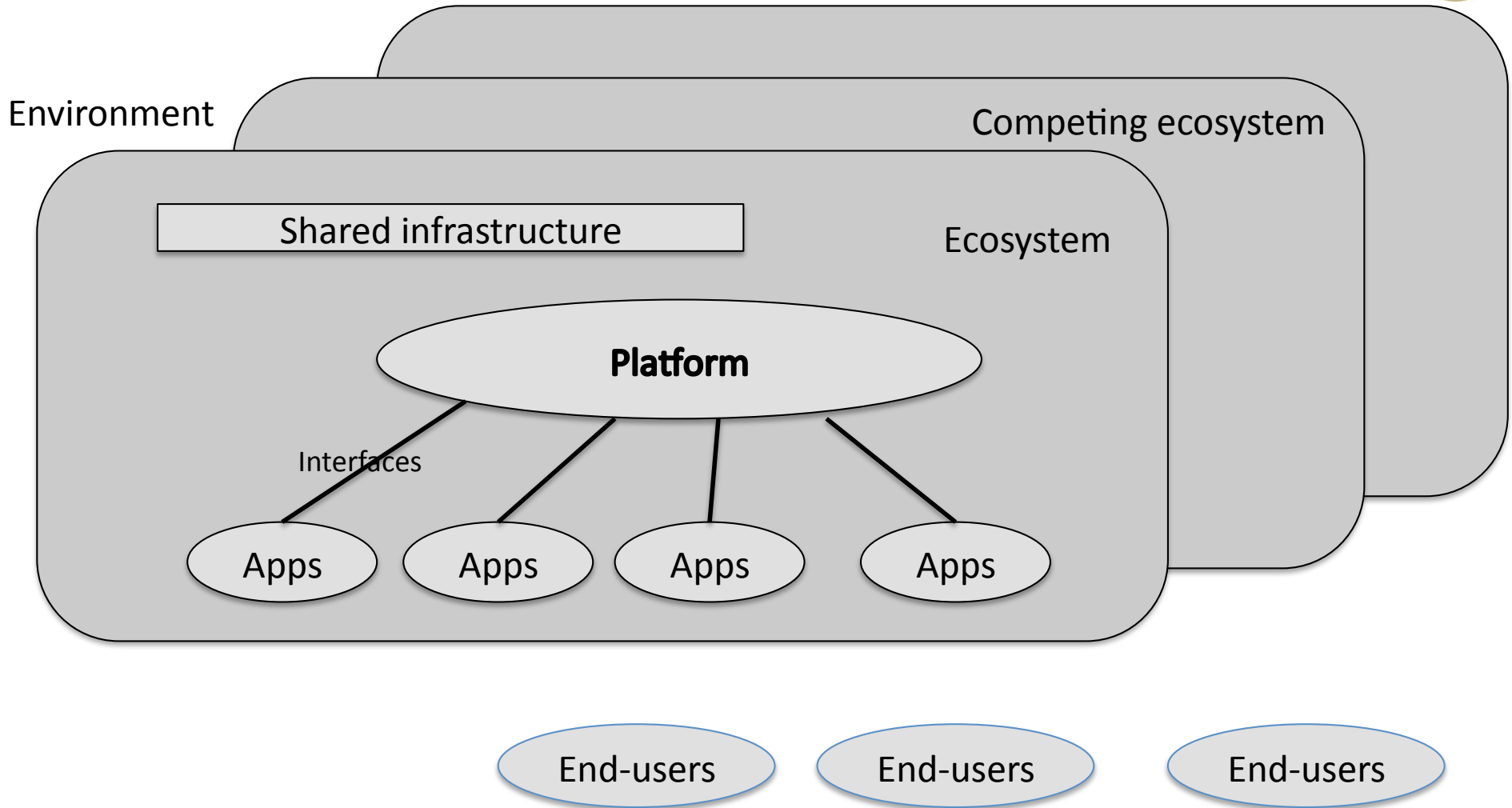




Google's Innovation Ecosystem

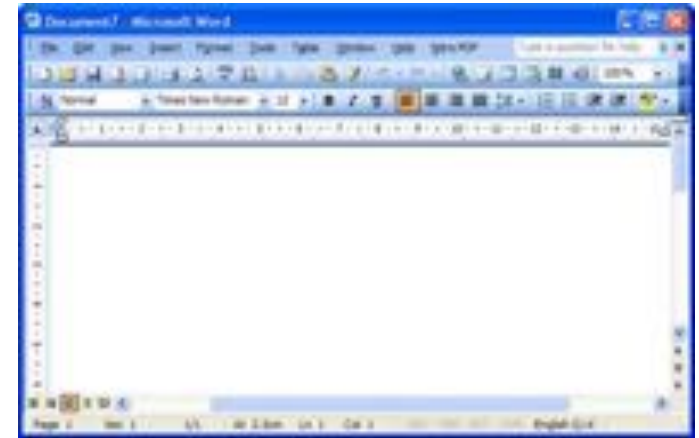


Elements of a platform ecosystem



Network externalities

- External to user/
technology **relation**
- Tied to network of
other users



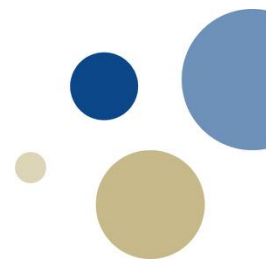
ICT



QWERTY KEYBOARD

~ `	1	@	#	\$	%	^	&	*	()	-	=	Delete
Tab	Q	W	E	R	T	Y	U	I	O	P	{	}	
Caps	A	S	D	F	G	H	J	K	L	:	"	Enter	
Shift	Z	X	C	V	B	N	M	<	>	?	/	Shift	
Ctrl		Alt									Alt	Ctrl	

Lock-in



Frykter nye bonuspoeng

Norwegian-sjef Bjørn Kjos frykter at Arbeiderpartiet åpner for at SAS Braathens får dele ut bonuspoeng på innenlands flyruter igjen.

AV EINAR N. SPANG

17.jan.2006 06:00, oppdatert 17.jan.2006 06:41

Uten bonusforbudet som varer til neste år, ville Norwegian aldri klart å etablere seg i Norge.

Da den forrige regjeringen gjennom Victor Norman forbod flyselskapene å gi bonuspoeng, var Arbeiderpartiet mot et slikt forbud.

Color Air måtte gi seg

Samtidig mente mange at SAS' (og den gang selvstendige Braathens') bonusprogram gjorde det umulig for andre selskaper å konkurrere på innenlands ruter.

Blant annet hadde Color Air, et flyselskap eid av gründeren Olav Nils Sunde, kastet kortene. Årsak: Det var umulig å få passasjerene over fra SAS og Braathens fordi de da ikke fikk tilgang til bonusopptjeningen.

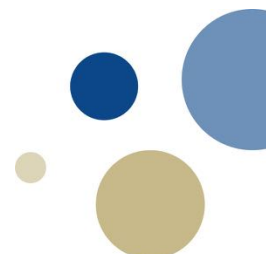
Dette blir et av de viktigste spørsmålene for konkurransen innen luftfart i Norge i tiden fremover, og Norwegian-sjefen Bjørn Kjos legger ikke skjul på at en gjeninnføring av en bonusordning på SAS Braathens norske flyginger vil innebære en kraftig konkurransedreining.

— Da forbudet mot bonusprogrammet kom, så ble det lagt foreløpig for en periode på fire år. Det betyr at ordningen skal vurderes innen 2007. Color Air var et greit eksempel på at det er umulig å konkurrere med lavprisyflyginger innen Norge med en slik konkurransefordel for SAS Braathens. Vi ga også klar beskjed om at det ikke kom på tale å etablere norske ruter dersom ikke bonussystemet ble forbudt, sier Kjos, som har liten tro på at det blir innført igjen.

Arbeiderpartiet var mot



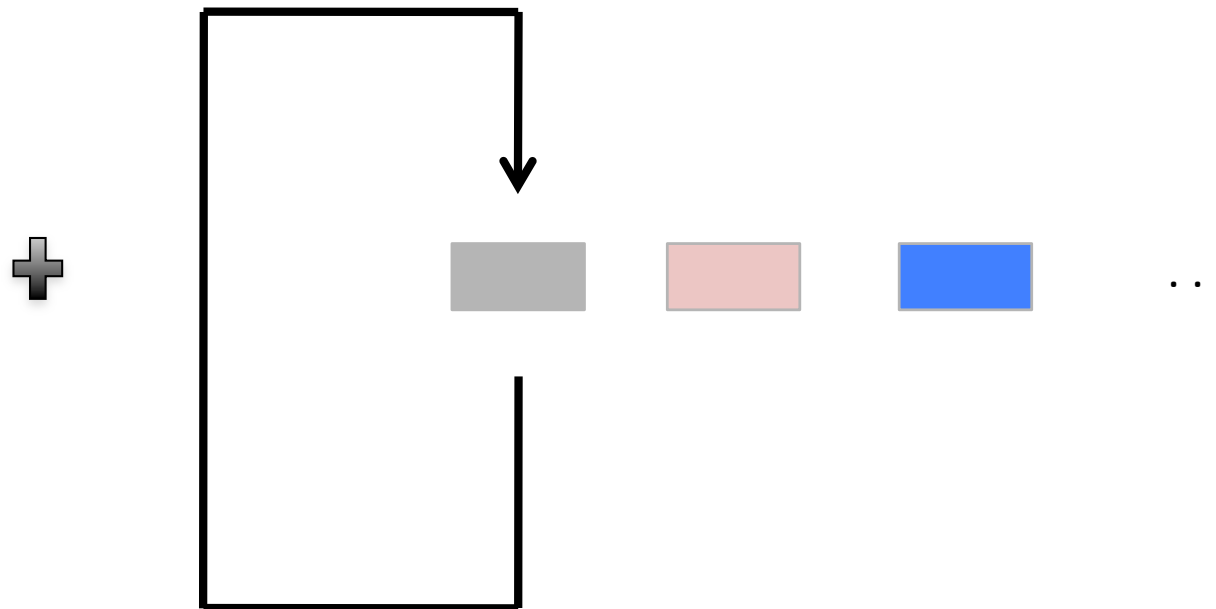
ARTIKKEL



Network externalities



- Same-side vs **cross-side** effects



- Ex.: iOS & Apps (cross-side)
- Ex: traffic, cars (same-side)

Chicken-or-egg



- How to bootstrap?
- **Non-linear** effects
- Collective action: **1 + 1 = 2 ?**
 - **Bandwagon** effect
 - game theory
 - Ex: crossing a street (non-linearity)
 - Ex: traffic junction (coordination)
- Subsidize?
- **Ex 1.:** Public goods (=platforms) paid by government (roads, **infrastructure**,...)
- **Ex 2.:** cross-side network externalities

Evoluton in platforms



- Differentiate from competitors
- Create value
 - Valuable?
 - Rare?
- Sustain value
 - **Inimitable?**
 - Non-substitutable?
- Resources: capabilities, functionality, user base, apps, patents, reputation,



gobi

Connect with your community

Share moments in collaborative stories.
Create private groups with friends.
Join public groups of your interest.

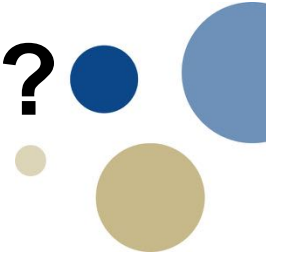
Ex.: Schlumberger's Ocean platform

The screenshot displays a software store interface with a navigation bar at the top. The navigation bar includes categories: All, 2013, Geophysics, Geology, Petrophysics, Reservoir Modeling, Reservoir Engineering, Drilling, Production, and Information Management. There are also links for Help and Cart (0 items).

The main content area features a grid of software products, each with a thumbnail image, a title, a brief description, and an 'Add to Cart' button. Each product also has a '30 14 days' label, likely indicating a trial period.

- ARK CLS OpendTect Connector**: Facility to transfer 3D seismic and horizon data between Petrel and OpendTect.
- ARK CLS Seismic Colored Inversion**: A superior fast-track method for the inversion of seismic data.
- ARK CLS Seismic Net Pay**: Seismic Net Pay (SNP) provides an improved workflow from seismic attributes.
- ARK CLS Seismic Spectral Blueing**: Shapes spectra of seismic data to be consistent with the Earth's reflectivity.
- ARK CLS Seismic Toolbox**: A package of powerful software tools to enhance data.
- Blueback Geology Toolbox**: A series of plug-ins enhancing functionality in the geomodeling workflow.
- Blueback Geophysics Toolbox**: More than 50 plug-ins enhancing the functionality in Petrel geophysics.
- Blueback Project Management Toolbox**: Control your Petrel projects and content with the Project Management Toolbox.

Subsidizing: how much, how long?



- Pdf: **readers** for free, premium for **editing**/ sharing/ commenting/..
- Logic of network externalities: size is everything
- Facebook "growth is everything"
- Content is king (youtube)

[Technology](#)

Car firms to build electric charge network

© 29 November 2016 | Technology

Share



Several large car firms are working together to create a high-powered, electric-vehicle-charging network across Europe.

BMW, Daimler, Ford and Volkswagen Group, including Audi and Porsche, say they will build 400 charging sites.

The plug-in points will provide ultra-fast charging for cars along major roads.

Tesla cars will not be able to use the charge points as they use different systems.

The network will be based on combined charging system standard technology. Drivers will be able to top up using plugs charging at a speed of 350 kW, which is considerably faster than the current market leader.

A statement from the car companies said their goal was the quick build-up of a sizeable number of stations in order to enable long-range travel for battery electric vehicle drivers.

"This is fantastic news, exactly what the industry needs," said Ben Lane, director of Zap-Map, an app which plots where electric-car owners can charge their cars in the UK.

"As batteries get bigger, the time needed to charge them is longer so more rapid





Conclusion

Learning outcomes



- Historic background of ICT/ digitalization
- Effects of ICT on employment, investments
- Sociotechnical understanding of use, uptake, diffusion of ICT
- Conceptualizing platforms and ecosystems