

representasjoner & målinger, data & indikatorer

in3220/in4220

Tone, 27. oktober 2026

representasjoner & målinger, data & indikatorer

Pensum for alle:

- Muller m.fl.: How data science workers work with data: Discovery, capture, curation, design, creation
- Svein Hovdes notat om Tillit til tall (+ Makt gjennom tall)

Master:

- Schmidt: Of maps and scripts – the status of formal constructs in cooperative work

Ekstra

Om representasjoner og kategorier

- *om representasjoner av arbeid: Suchman x 2*
- *om kategorier og deres konsekvenser: Star x 2, Suchman & Winograd-diskusjonen*

Om data

- *om data: Winthereik, Jones, Bopp m.fl.*
- *om digitale representasjoner: Bratteteig, Dourish & Button*

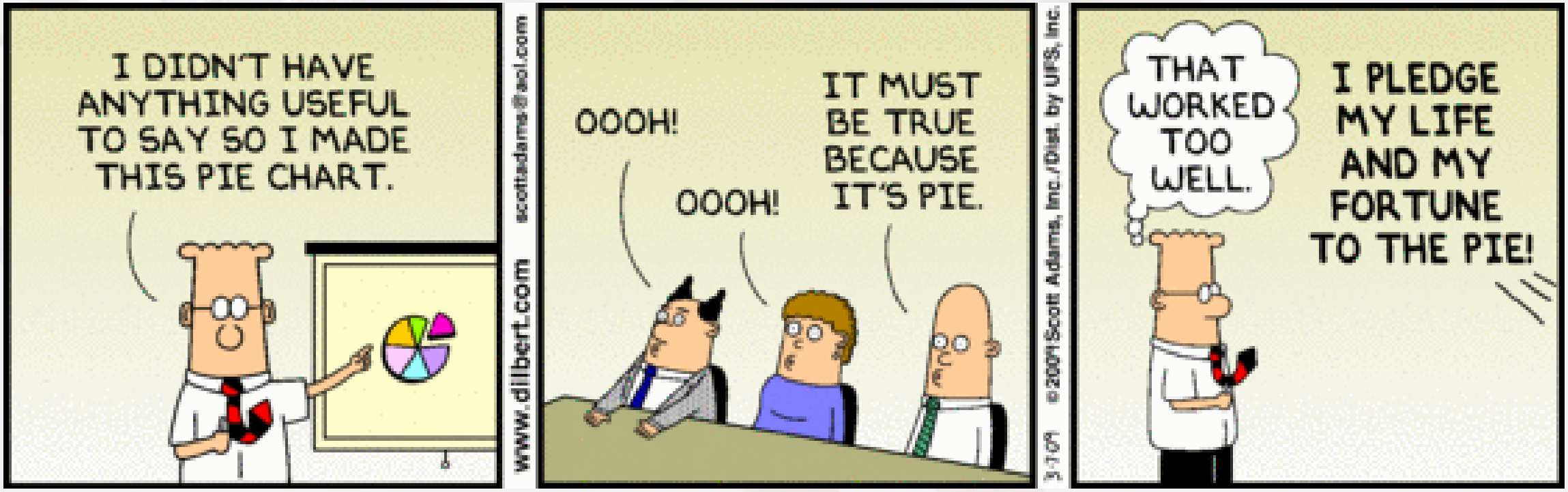
Om målinger & indikatorer

- *om indikatorer: Balka m.fl., Merry*
- *kvantifisering: Berman & Hirschman*

representasjoner, kategorier, data, indikatorer

representasjoner **re-presenterer** virkeligheten

og blir en del av virkeligheten



data som representasjoner

data er ikke noe man oppdager eller «plukker»: de produseres

(s. 126)

«The value of data explodes when it is integrated»

«the computer becomes an active question asking machine»

«There do not appear to be any humans in this view of data science. ... As we will show, human expertise intervenes between the raw data and the analysis, crucially shaping the data, the choice of analysis, and in some cases the truth claims»

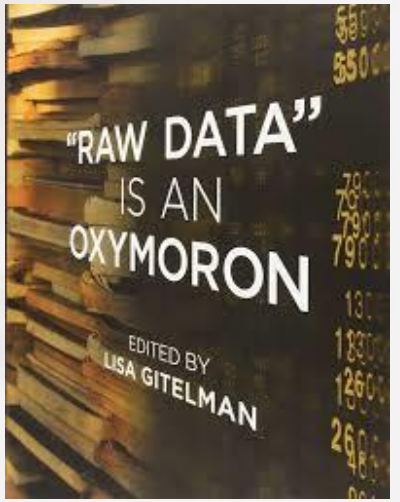
RESEARCH–ARTICLE

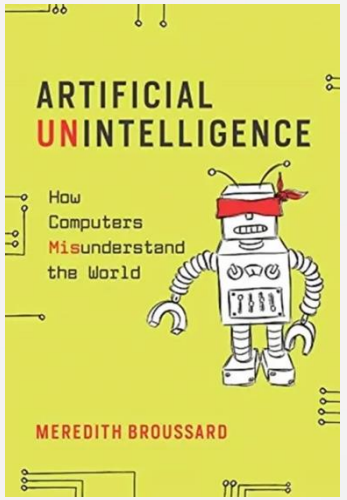
How Data Science Workers Work with Data: Discovery, Capture, Curation, Design, Creation

Authors: Michael Muller, Ingrid Lange, Dakuo Wang, David Piorkowski, Jason Tsay, Q. Vera Liao, Casey Dugan, Thomas Erickson Authors Info & Claims

CHI '19: Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems • May 2019 • Paper No.: 126 • Pages 1–15 • https://doi.org/10.1145/3290605.3300356

Online: 02 May 2019 Publication History





data som representasjoner



hva menes med «en representasjon»?

representasjon:

- det å være representant, være stedfortreder ...
  det å representere, være bilde, eksempel på

representere:

- fra latin *repraesentare*: vise seg på ny, vise fram
- opptre på vegne av, i stedet for ...
  være (typisk) eksempel på, tjene som

→

- noe som står i stedet for noe annet
- og som uttrykker viktige egenskaper ved dette
- og er tilstede i den aktuelle situasjonen

f.eks. en kjøpekontrakt med min signatur representerer meg



representasjoner er mer enn data

10

10

10

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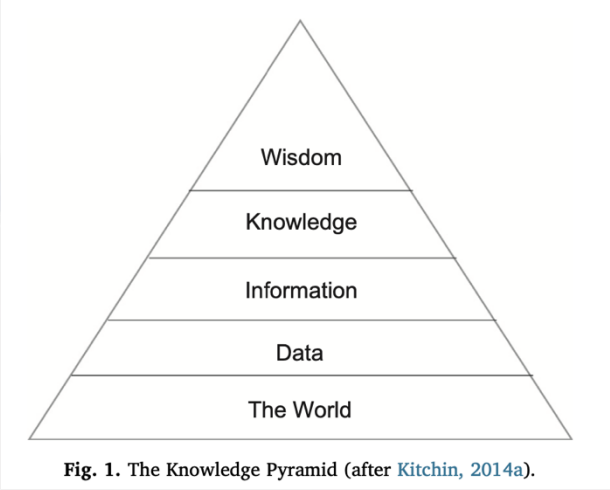


Fig. 1. The Knowledge Pyramid (after Kitchin, 2014a).

representasjoner er mer enn data

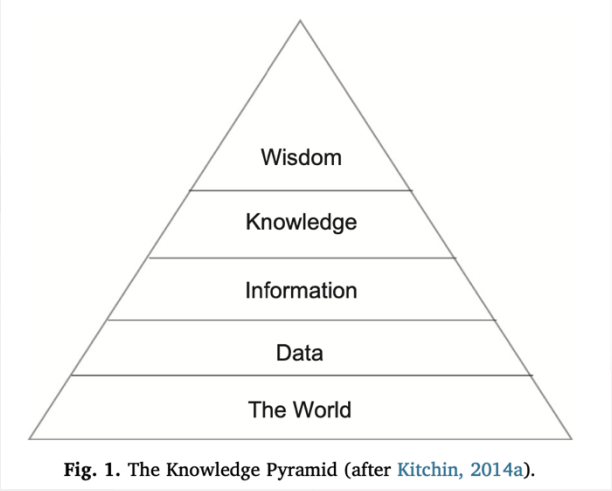
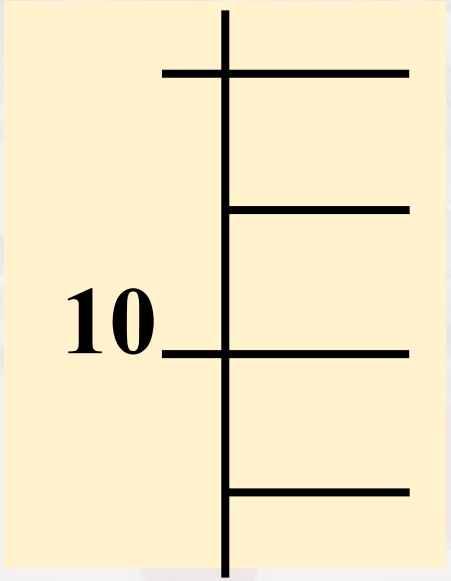


Fig. 1. The Knowledge Pyramid (after Kitchin, 2014a).





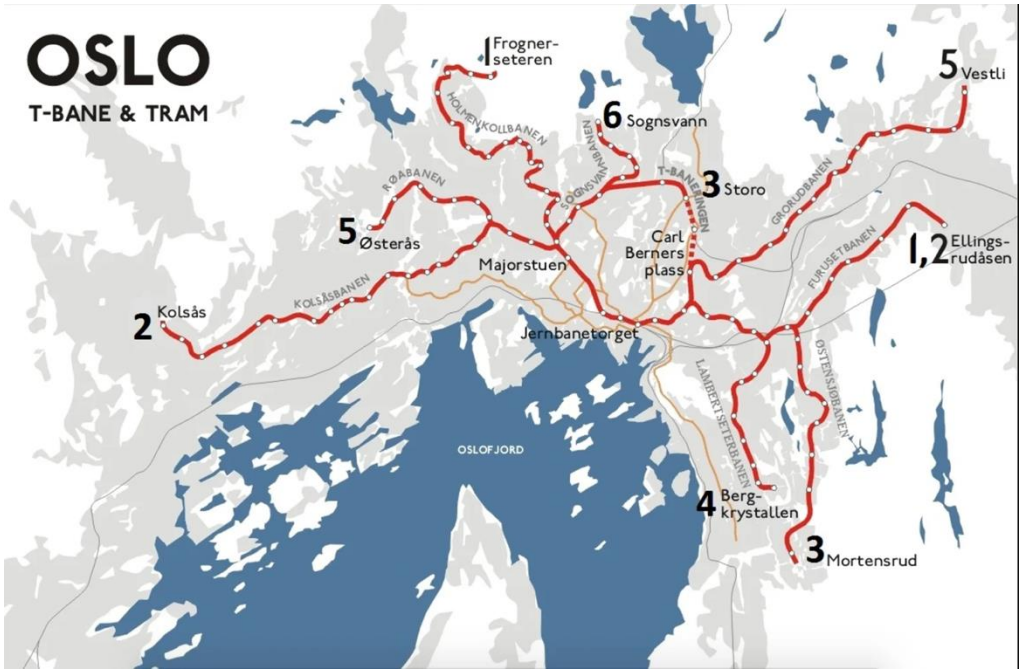




10



eks representasjon





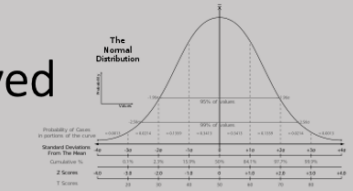
eks


Tube map
Plan your journey
Download the TfL Go app
24 hour travel information
0343 222 1234*
Check your travel
tfl.gov.uk/travel-tools
Check before you travel
Fares vary depending on the line used, the direction of travel, time of day and day of the week. To check your fare, visit tfl.gov.uk/farefinder
For more detailed accessibility information, please use the Step-free Tube guide by visiting tfl.gov.uk/tube-map
† Canada Water
No step-free access from street to ticket hall from Thursday 3 September until Spring 2027.
† Elizabeth line Heathrow Airport stations
Special fares apply on Elizabeth line services to/from Heathrow Airport.
† Hounslow West
Step-free access for manual wheelchairs only.
† Services or access at these stations are subject to variation.
To check before you travel, visit tfl.gov.uk/plan-a-journey
Key to lines
Bakerloo
Central
Circle
District
Hammersmith & City
Jubilee
Metropolitan
Northern
Piccadilly
Victoria
Waterloo & City
DLR
Elizabeth line
London Trams
London Cable Car
Special fares apply
Thameslink
District
Open at weekends and on some public holidays
London Overground
Liberty line
Lioness line
Mildmay line
Suffragette line
Weaver line
Windrush line
Air-conditioned trains
Key to symbols
Interchange stations
Internal interchange
Less than 10 minutes walk between stations
Step-free access from street to train
Step-free access from street to platform
National Rail interchange
Airport
Less than 10 minutes walk to River services interchange
More than 10 minutes walk to River services interchange
Victoria Coach Station
London Cable Car
Outside fare zones, Oyster not valid
Station in both fare zones
Outside fare zones
Outside fare zones, Oyster not valid
London Trams fare zone
UNDERGROUND
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Tillit til tall (Svein Hovdes notat)

om tallenes og tellingers betydning i samfunnet, dvs.

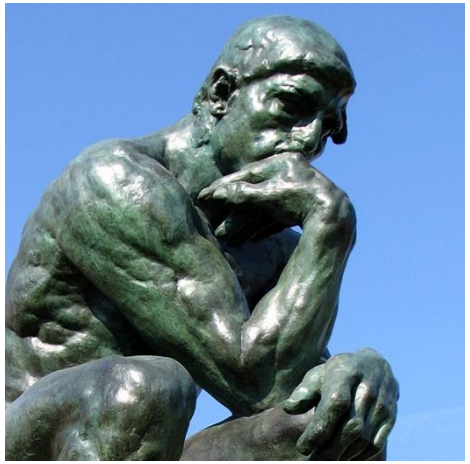
- om målesamfunnet (typiske fortettinger, forenklinger og abstraksjoner)
- om hva målinger gjør (performativitet)

- Kvalitet representeres ved 
- Terreng representeres ved 
- En hel, sammenhengende tekst representeres ved et «abstract»
- Menneskelige følelser og reaksjoner representeres ved 😮
- Store datamengder representeres ved 

kjente representasjoner:
det uttrykksfulle smilefjeset mm.

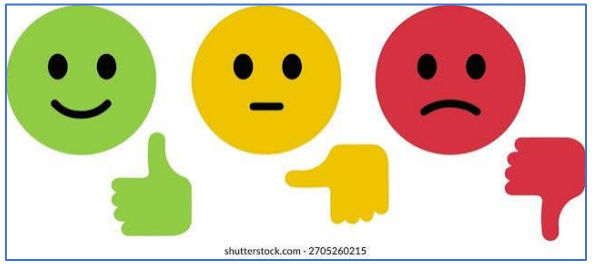


(«the thinking face)



August Rodin:
Tenkeren (1880)







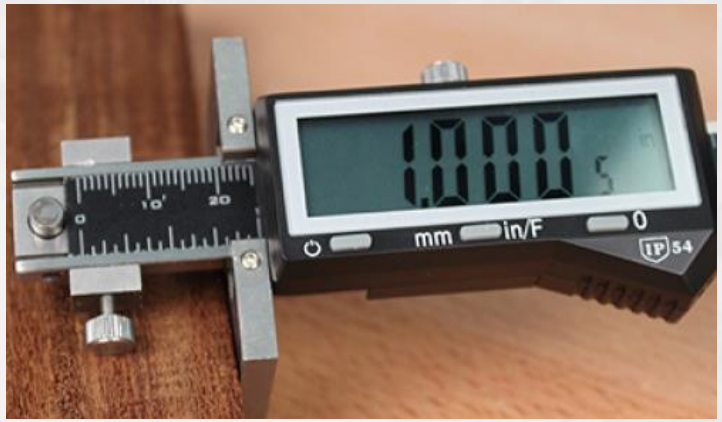




målesamfunnet

mitt digitale rissemål ... risser en strek på et emne (oftest av tre) i en avstand angitt med en hundredels millimeters nøyaktighet. Dette overgår betydelig hva som er mulig å oppfatte med det menneskelige øye og utføre ved hjelp av håndverkerens hender. ... I overskuelig framtid (for alltid?) er vi henvist til å oppleve oss selv som uperfekte og omtrentlige i en verden av finjusterte, finurlige og raffinerte måleinstrumenter.





Alle målestokker vi benytter oss av for å bedømme er historiske og kulturelle produkter s. 7


1. feb. 2022

SAMMEN MED TINGENE

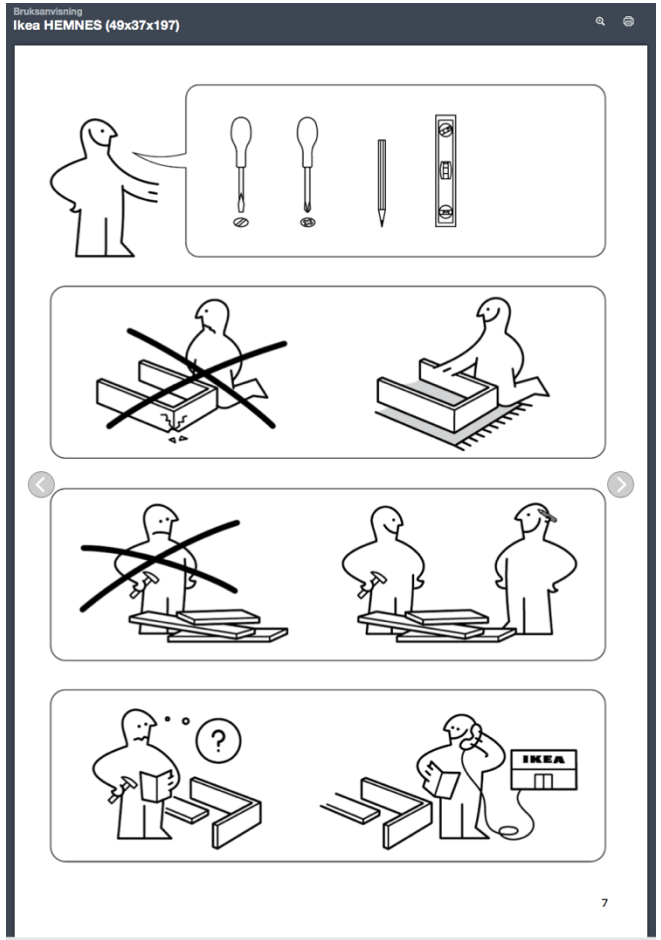
12. februar - 6. mars 2022

Elisa Helland-Hansen | keramikk
Bent Vinkler | pilefletting
Svein Hovde | 400 rissemål i prosjektrommet

Galleri Zink ønsker velkommen til utstillingen "Sammen med tingene", med keramiker Elisa Helland-Hansen og pilefletter Bent Vinkler i hovedrommet, og sosiolog Svein Hovde som viser 400 rissemål i prosjektrommet.

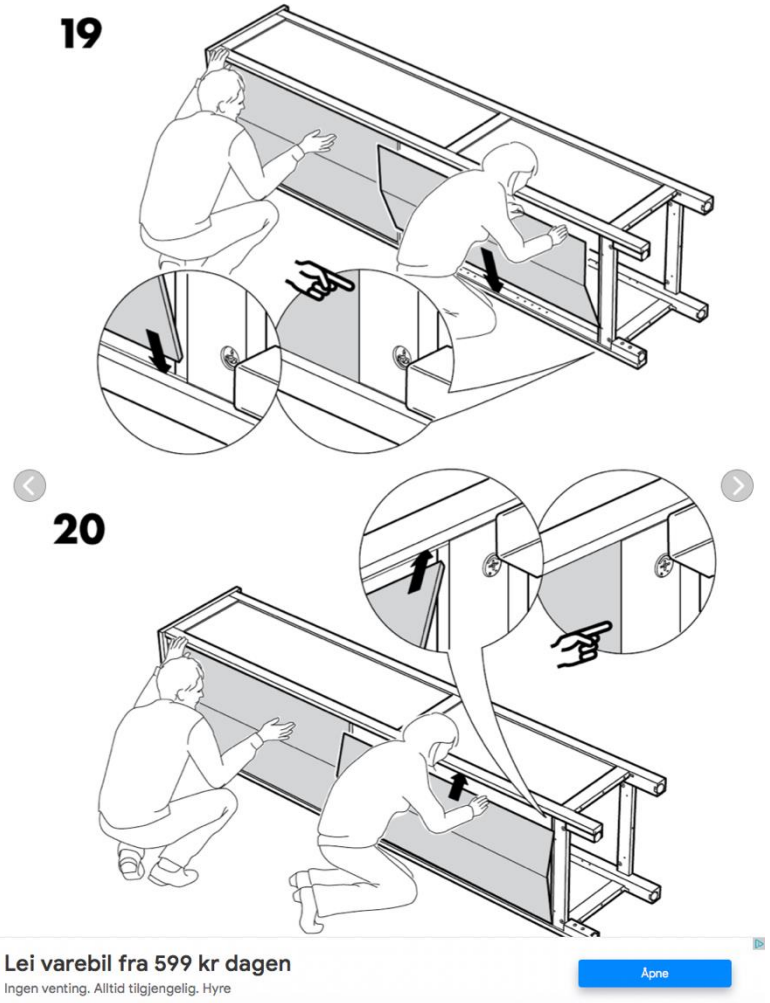


Bruks- og monteringsanvisninger fra IKEA som representasjon av arbeidsoperasjoner



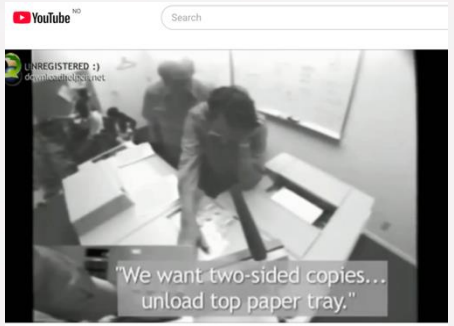
Før du starter:
Råd og advarsler

En god del seinere strever vi med bakveggen



- Suchmans bok illustrerer hvor vanskelig det er å lage gode og veiledende representasjoner for brukere i situasjoner der de interagerer med maskiner.
- Suchman skriver at vi foretar rasjonelle overveielser både før og etter en handlingssekvens i form av å se tilbake/gjøre opp status og å se framover og planlegge de neste trekk.
- Under selve utførelsen av en handling som forløper normalt er forløpet transparent og forståelig for oss
- Hun forbinder dette med Heideggers begrep om *tilhåndenhet (Zuhandenheit/ ready-to-hand*). Det utstyret eller den teknologien vi bruker forsvinner ut av vår bevissthet og vi går opp i oppgaven og opplever mestringsfølelse
- I motsetning til dette er opplevelser av *u-tilhåndenhet* (*Unzuhandenheit/ unready-to-hand)* situasjoner der det vi bruker blir uhåndterlig, forbigående eller varig ødelagt eller utilgjengelig.
- *The representations involved in managing problems in the use of equipment presuppose the very transparent practices that the problem renders noticeable or remarkable. Situated actions, in other words, is not made explicit by rules and procedures.* (Suchman 1987:54)

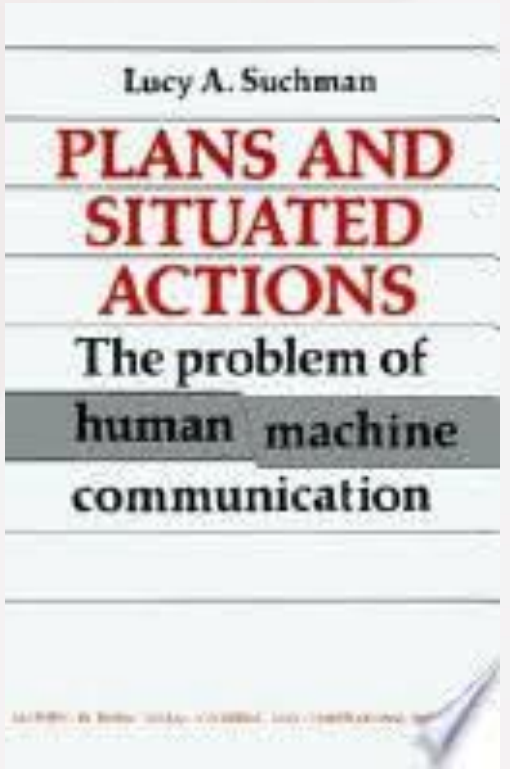




https://www.youtube.com/watch?v=cNJWafS-BA4

Representasjoner kan være vanskelige å forstå





https://www.youtube.com/watch?v=cNJWafS-BA4

formelle representasjoner





ELSEVIER

Information and Software Technology 41 (1999) 319–329

INFORMATION AND SOFTWARE TECHNOLOGY

Of maps and scripts
The status of formal constructs in cooperative work

Kjeld Schmidt*

Centre for Tele-Information, Technical University of Denmark, DK-2800 Lyngby, Denmark

Abstract

The received understanding of the status of formal organizational constructs in cooperative work is problematic. This paper shows that the empirical evidence is not as strong as we may have believed and that there is evidence from other studies that contradicts what we may have taken for granted for years. This indicates that the role of formal constructs is more differentiated than generally taken for granted. They not only serve as 'maps' but also as 'scripts'. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Cooperative work; Coordination; Coordinative artifacts; Formal constructs; Procedures

Thanks to impressive computer-supported cooperative work (CSCW) systems such as TeamWorkStation [1], GroupDesk [2], wOrlds [3], and TeamRoom [4], to name but a few, it is by now widely accepted that computer artifacts can provide effective support for cooperative work by offering a 'shared space' through which actors can interact directly, i.e., by means of generic competencies such as talking, gesturing, pointing, monitoring etc., without other restraints than the constraints of limited bandwidth and so on.

There is considerably less certainty and consensus, however, as to whether computer systems can be successfully designed to support cooperative work by providing representations of formal organizational constructs—procedures, workflows, process models, etc.—so as to regulate routine coordinative activities and thereby enable cooperative ensembles to perform more reliably and efficiently. In fact, there are strong concerns about the status of such formal constructs.

In a way CSCW can be said to have been born with these concerns. The office automation movement had already given way to disillusionment, and artificial intelligence was increasingly being confronted with unfulfilled promises. At the same time, a number of critical studies had demonstrated that the problems were deep rooted: office procedures were of a different nature than presumed by the protagonists of office automation (e.g. [5–7]). The general conclusion of these studies were that such constructs, instead of determining action causally, serve as 'maps' which responsible and competent actors may consult to accomplish their work ([8], p. 188 f.; [9], p. 114). Thus, Lucy Suchman's radical critique of cognitive science [8] and the "situated action" perspective she proposed has played a significant role in defining the CSCW agenda and has become a shared frame of reference to many, perhaps most, of us. For good reasons, then, designers of CSCW systems have been advised to treat them with great caution (cf. for example [10]).

Thus, the issue of how computer systems can be successfully used to regulate or govern routine coordinative activities has been surprisingly marginal on the CSCW agenda and one can detect a pronounced reluctance to design systems which regulate coordinative activities in the work of many eminent CSCW researchers who instead pursue different 'minimalist' design strategies (e.g. [11–14]). This is quite legitimate and reflects serious and well-founded concerns about the status of formal organizational constructs.

However, the role of formal constructs in cooperative work is still far from understood. Although Suchman explicitly submits the "situated action" perspective as a research approach ([8], p. 178 f.), it often seems as if the issue is presumed to have been settled. Only few CSCW researchers have attempted to address this issue [15,16].

Perhaps, therefore, it is not surprising that CSCW has had little influence on the development of workflow technologies [17]. These technologies have not benefited from CSCW insights (e.g., the crucial role of mutual awareness and shared artifacts) while CSCW has become similarly

* *E-mail address:* schmidt@tele.dtu.dk (K. Schmidt)

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1995

Let's Talk About Bugs!

Peter H. Carstensen
Risø National Laboratory, Denmark, phc@risoe.dk

Carsten Sørensen
Risø National Laboratory, Denmark, carsten@risoe.dk

Tuomo Tuikka
University of Oulu, ttu@rieska.oulu.fi

FIGURE 1. The bug form used at Foss Electric and the general procedure followed when using the forms for registering, diagnosing, and correcting bugs. CFM means 'central file manager' and PM is 'platform master'. The form is a sheet of A4 paper printed on both sides. The numbers indicate who fills in which information in the form

Initials: Instrument: Date: (1)	Report no: (2)
Description: (3)	
Classification: (4) 1) Catastrophic 2) Essential 3) Cosmetic	
Involved modules: (5) Responsible designer: Estimated time:	
Date of change: Time spend: Tested date: (6) ☐ Periodic error - presumed corrected	
Accepted by: Date: (7) To be: 1) Rejected 2) Postponed 3) Accepted Software classification (1-5): ___ Platform:	
Description of corrections: (8) Modified applications: Modified files:	

The actors fill (or add information) in:

The testers: (1), (2), (3), and (4)
The Spec-team: (3), (4), (5), and (7)
The designers: (6) and (8)

The procedure for handling bugs:

- A tester register and classifies a bug (field 1,2,3, and 4)
- The tester sends the form to the spec-team
- The spec-team diagnose and classify the bug (field 3, 4 and 7)
- The spec-team identifies the responsible designer (field 5)
- The spec-team estimates the correction time (field 5)
- The spec-team incorporates the correction work in the work plans
- The spec-team requests the designer to correct the problem
- The designer corrects the bug and fills in additional correction information (field 6 and 8)
- The designer sends the form to the central file
- The CFM sends the form to the PM and insert copy in central file
- The PM verifies the correction
- The PM returns the form to the central file

dagligdagse representasjoner

Ingredienser

1,5 kg hodekål

1,5 kg fårikålkjøtt

2 ts salt

4 ts hel pepper

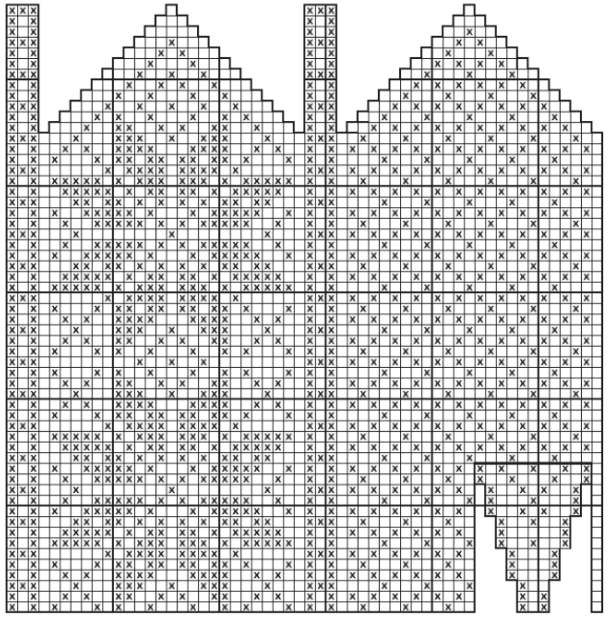
3 dl vann

Slik gjør du

- [ ] **1.** Del hodekålen i båter.
- [ ] **2.** Legg kjøtt og kål lagvis i en gryte (kjøtt nederst med fettsiden ned). Strø salt og pepper mellom lagene. Pepperkornene kan eventuelt legges i en spesiell pepperholder. (Noen liker også å jevne fårikålen. Strø da litt hvetemel, ca 1-2 ss per 4 porsjoner, mellom lagene.)
- [ ] **3.** Hell på vann. Kok opp, sett på lokk og senk varmen. La fårikålen trekke til kjøttet er mørt (til det løsner fra benet), ca. 2,5 timer.

Fårikålen serveres rykende varm med kokte poteter.

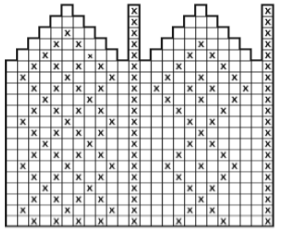
www.uelegant.net



Mønster:
Legg opp 44 m. Strikk vrangbord, 2r 2vr:
10 omg hvit, 2 sort, 2 hvit, 3 sort, 2 hvit, 2 sort og 6 hvit. Strikk en omg glattstrikk, øk 4 m jevnt. Strikk mønster etter diagrammet.

Ved streken i diagrammet settes de 11 tommelmaskene på en tråd. Legg opp 11 nye m. over tommelhullet på neste omg.

Når diagrammet er ferdig klipp garnet, trekk tråden gjennom de siste m og fest godt.



Tommel:
Sett de 11 m. fra tråden på p., strikk opp 11 m. bak tommelen og 1 m. i hver side. Strikk mønster og fell som diagrammet viser

Tadaa! En vott!

Strikk en til men reverser mønsteret så du får en venstrevott også.

formelle representasjoner i arbeidet

fra masteroppgaven til Frode Mo



Figure 20: Oslo Gardermoen tower, ground north position (Mo 2002: 28)



Figure 18: A paper-based flight strip board Oslo Approach at Røyken (Mo 2002: 82)

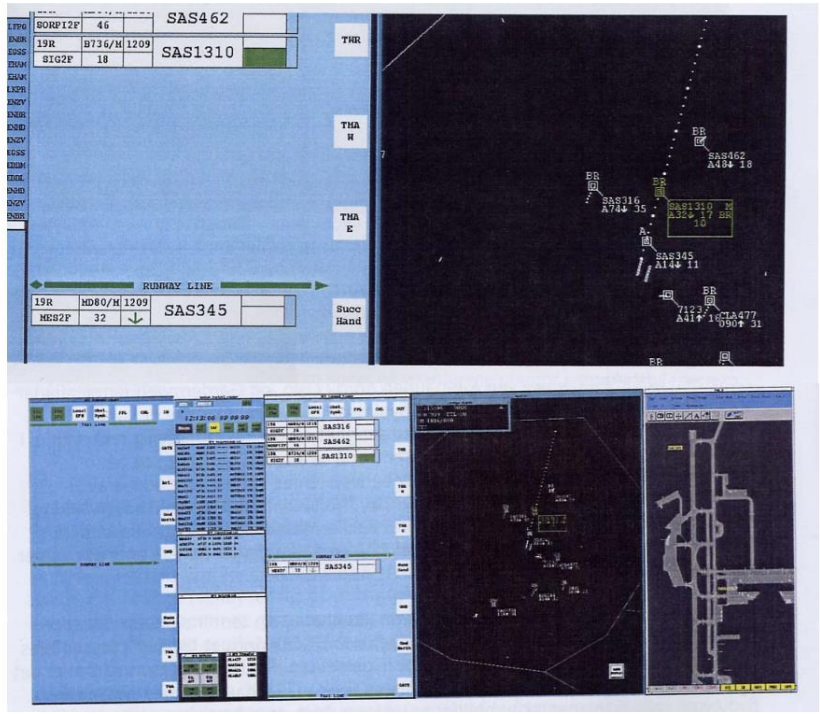


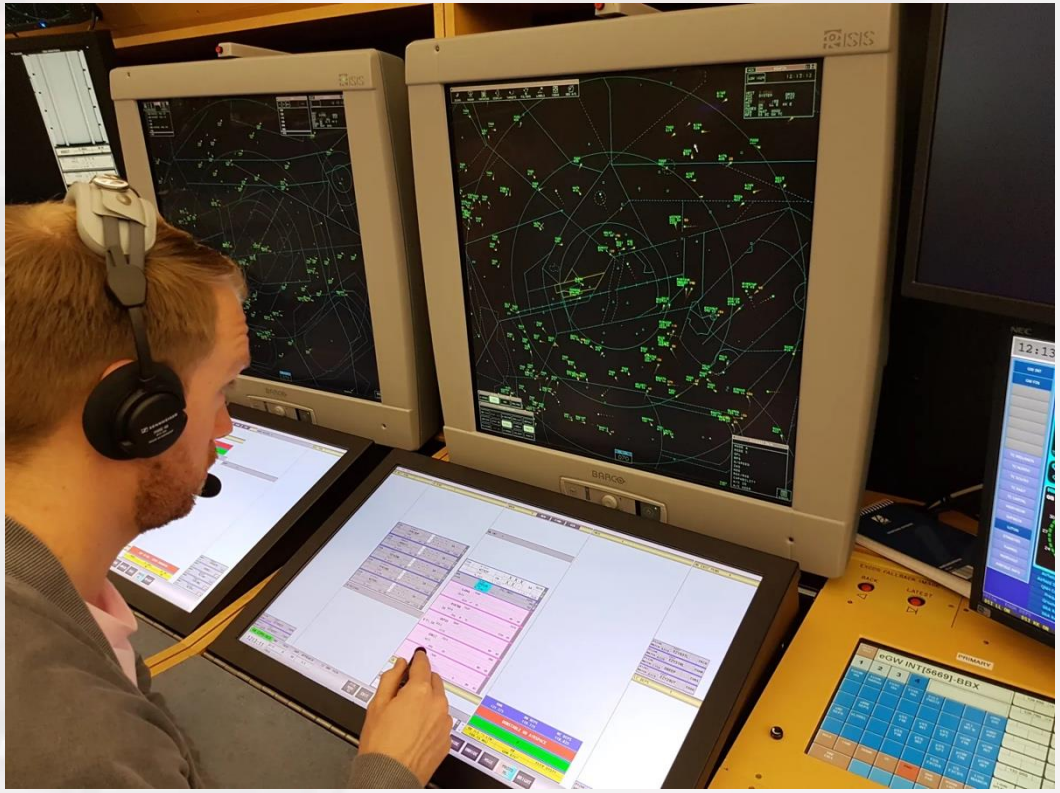
Figure 19: Electronic flight strips at Oslo Gardermoen tower (Mo 2002: 57 and 26)

formelle representasjoner i arbeid: flight strips





https://www.alamy.com/stock-photo/flight-strips.html?sortBy=relevant



https://nats.aero/blog/2017/08/making-paper-strips-digital/

fra papir til digitale representasjoner i arbeidet

fra masteroppgaven til Frode Mo



Figure 20: Oslo Gardermoen tower, ground north position (Mo 2002: 28)



Figure 18: A paper-based flight strip board Oslo Approach at Røyken (Mo 2002: 82)

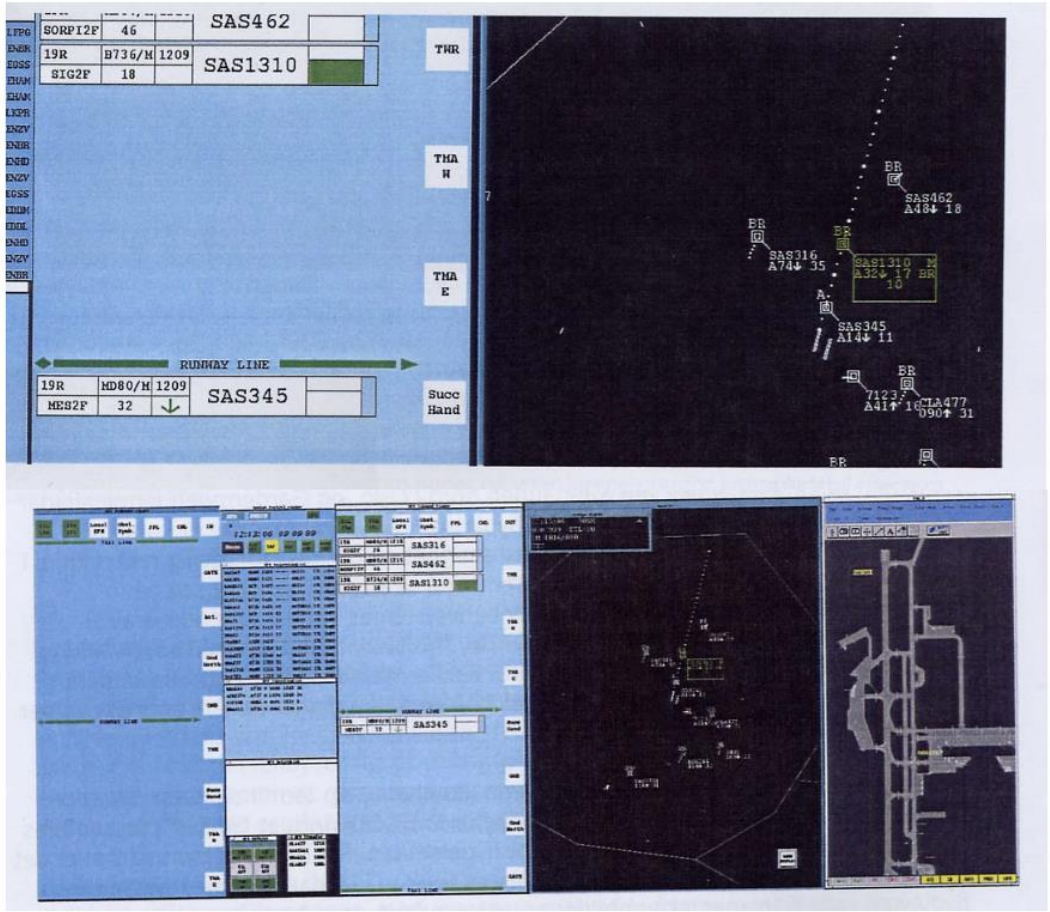


Figure 19: Electronic flight strips at Oslo Gardermoen tower (Mo 2002: 57 and 26)

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Information and Software Technology 41 (1999) 319–329

INFORMATION AND SOFTWARE TECHNOLOGY

Of maps and scripts
The status of formal constructs in cooperative work

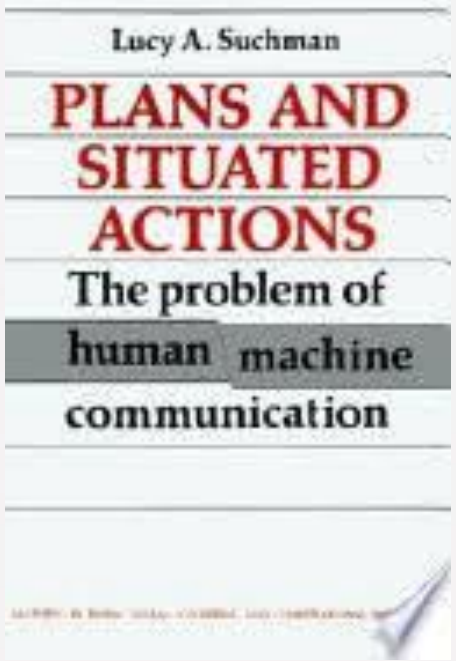
Kjeld Schmidt*

Centre for Tele-Information, Technical University of Denmark, DK-2800 Lyngby, Denmark

Abstract

The received understanding of the status of formal organizational constructs in cooperative work is problematic. This paper shows that the empirical evidence is not as strong as we may have believed and that there is evidence from other studies that contradicts what we may have

- *Just as it would seem absurd to claim that a map in some strong sense controlled the traveller's movements through the world, it is wrong to imagine plans as controlling actions. (Suchman sitert av Schmidt, s. 323)*
- Suchman sier at *«that the procedural structure of organizational activities is the product of the orderly work of the office rather than the reflection of some enduring structure that stands behind that work»* (s 323) tolket som at situerte handlinger er «løsrevet» fra planer og formelle strukturer
- *protocols play very different roles in cooperative work. They may ... play the weak role of the **'map'** of the traveller ... however, they may play the strong role of a **'script'** that offers a precomputation of interdependencies among activities (options, required actions, sequential and temporal constraints etc.) which at critical points provides instructions to actors of possible or required next steps. (s. 326)*



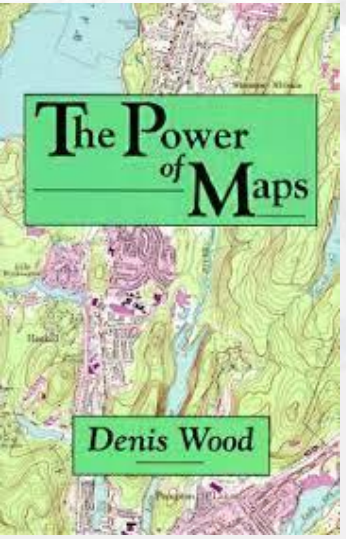
conclusion of these studies were that such constructs, instead of determining action causally, serve as 'maps'

little influence on the development of workflow technologies [17]. These technologies have not benefited from CSCW insights (e.g., the crucial role of mutual awareness and shared artifacts) while CSCW has become similarly

* *E-mail address:* schmidt@tele.dtu.dk (K. Schmidt)

Wood: Rethinking the power of maps

En kritikk av kart og kartproduksjon

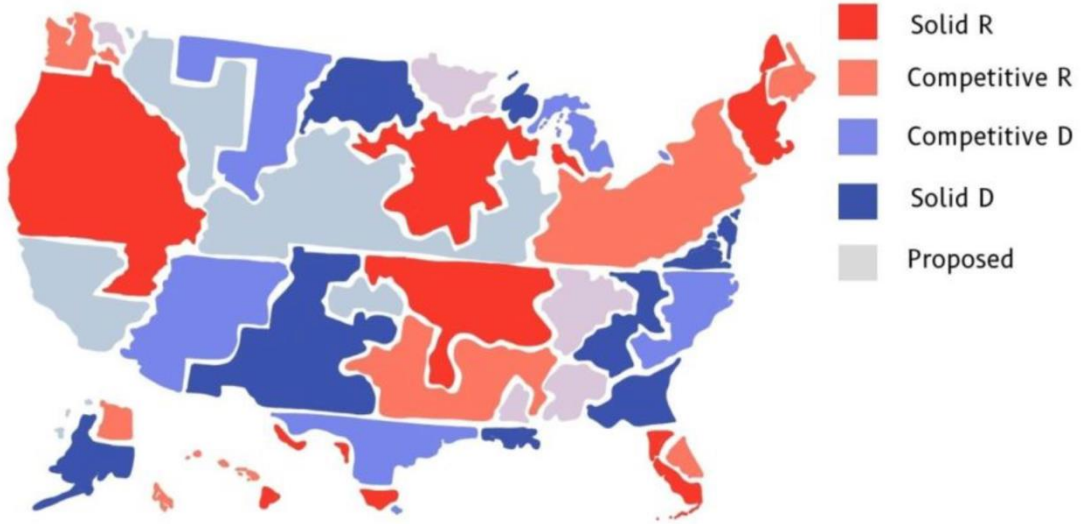


- *Maps convert social energy to social work by linking things in space*
- *The spatial linkages are selected by the cartographer to meet their own ends*
- *Maps are propositions (påstander som rommer en bedømmelse) devised to serve the interests of the state*
- *Maps are not merely representations of the world, but propositions with the power to alter it*

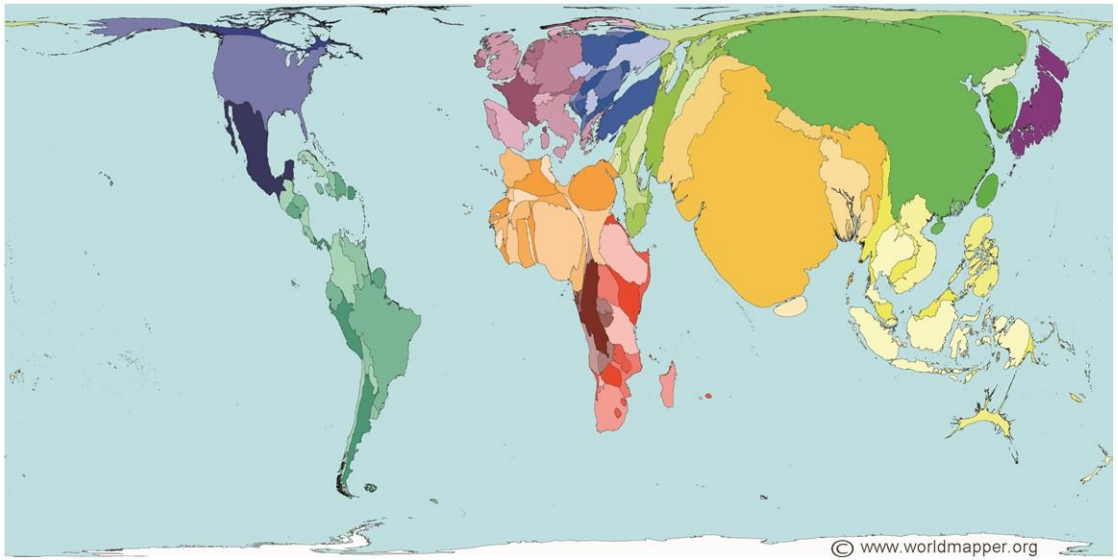
College Heights Herald

Gerrymandering: What is it and how does it affect voters?

Damon Stone, News reporter | October 19, 2022

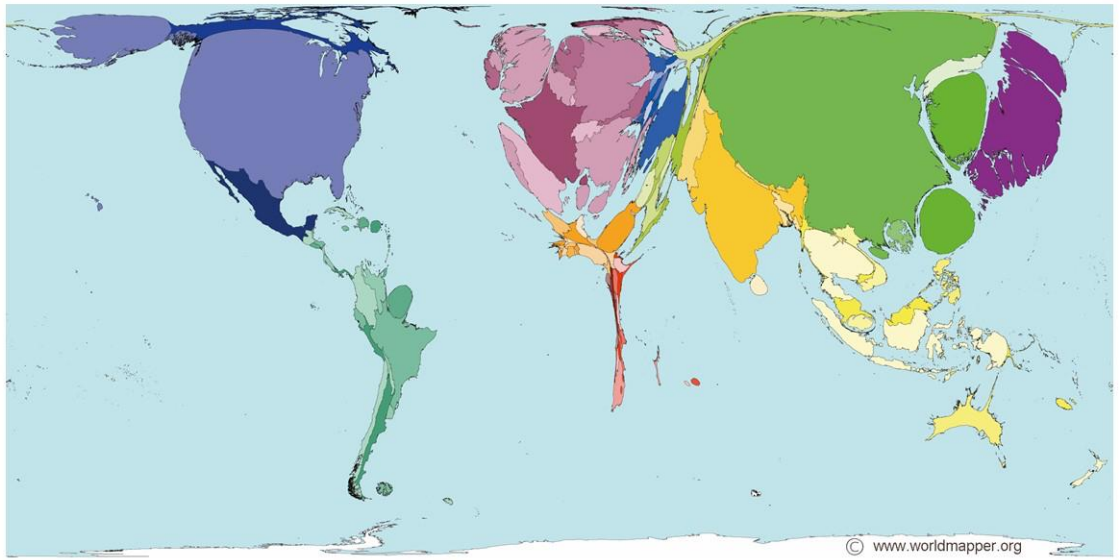


Population by Country (2015)

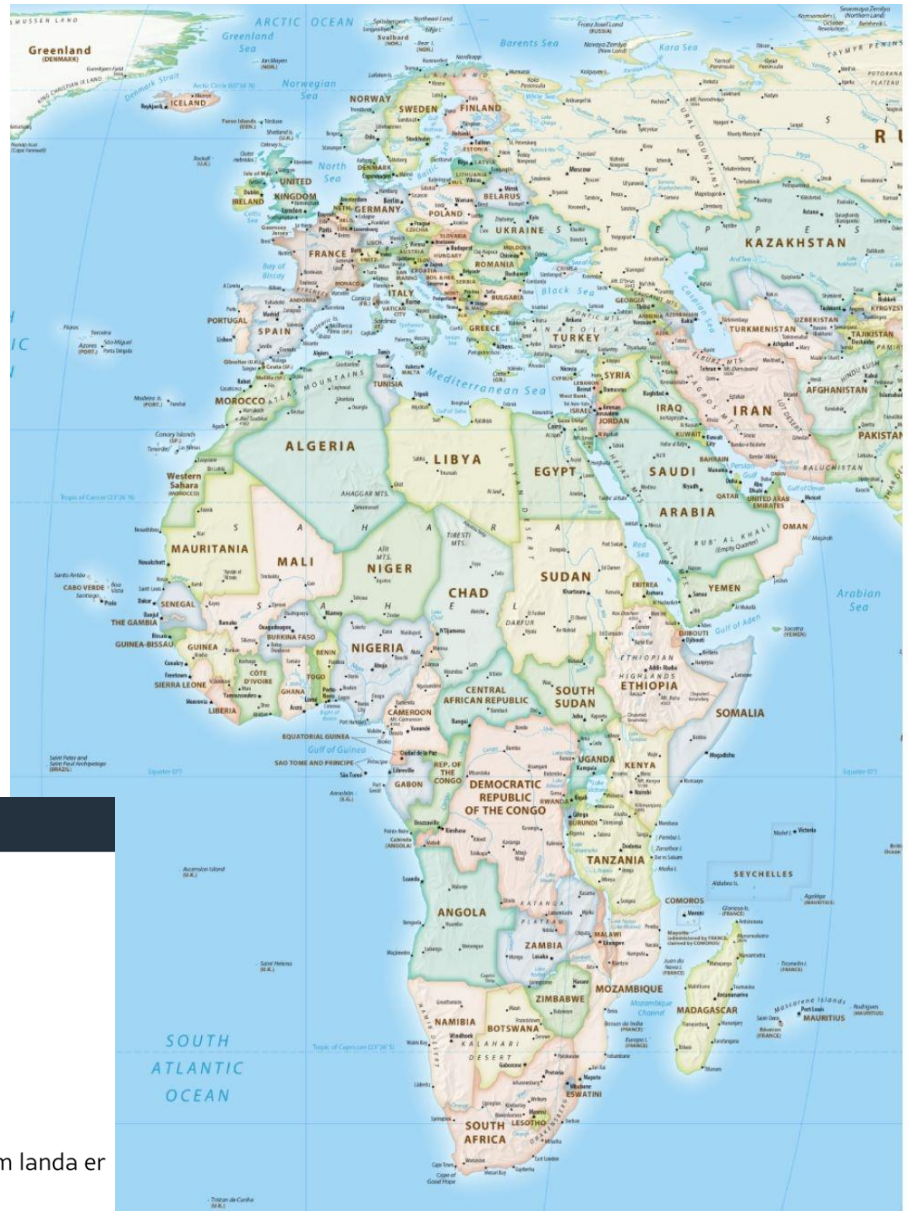


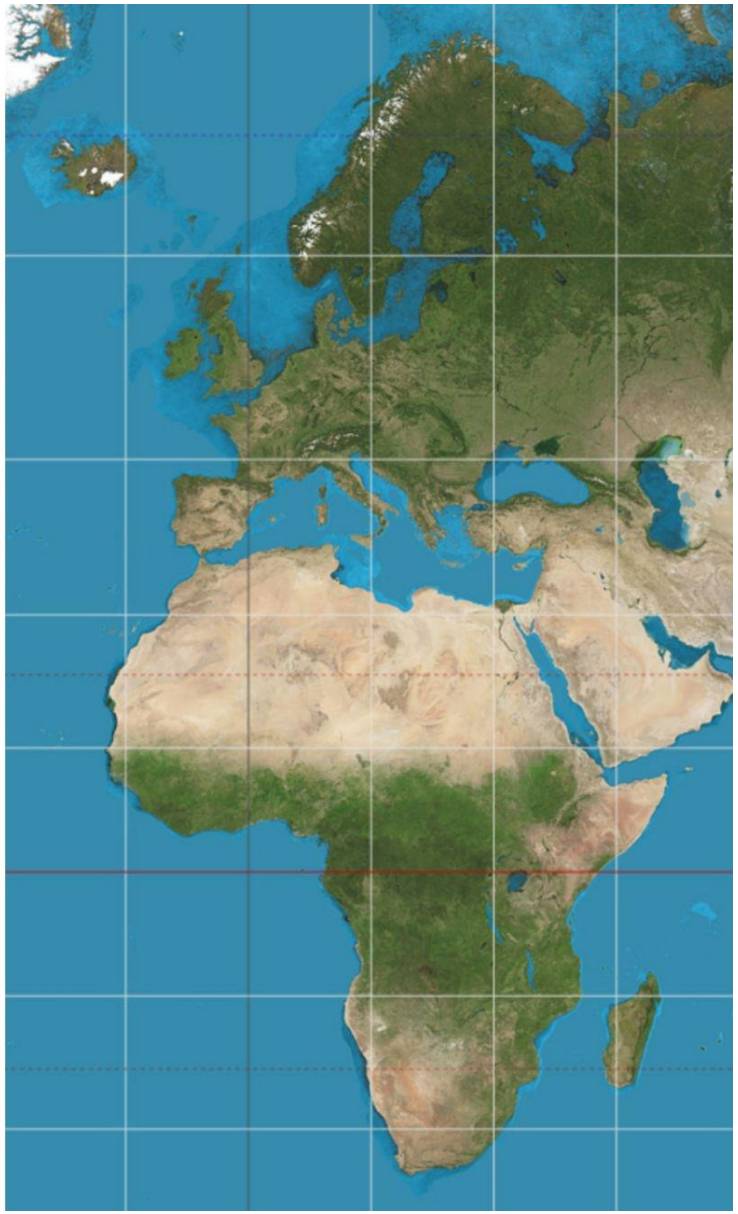
Lying with cartograms. Population total and wealth by country in 2015. Note how the size of countries on the map is not their actual area but instead proportional to the attribute being measured, population or wealth.

Wealth by Country (2015)



Kilde: Manson, S. M. (ed.) (2017). Mapping, Society, and Technology. University of Minnesota Libraries Publishing. http://z.umn.edu/mst





FRAM-TIDA | Nyhende- og debattavisa for unge

FN vil endre verdskartet

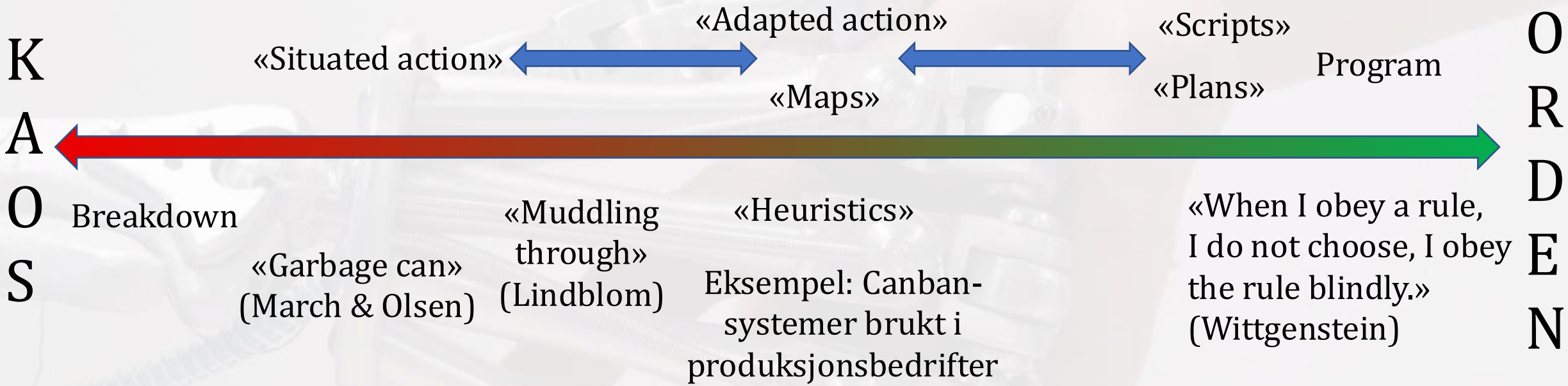
Det alternative kartet viser Afrika i «rett» storleik.



Eirik Dyrøy Lotsberg
Publisert 04.09.2026 12:09
Oppdatert 07.09.2026 13:09

FN røysta fredag for å ta i bruk eit nytt verdskart der forholda mellom landa er endra. På dette kartet er Afrika mykje større.

Mellom (full) orden og (totalt) kaos



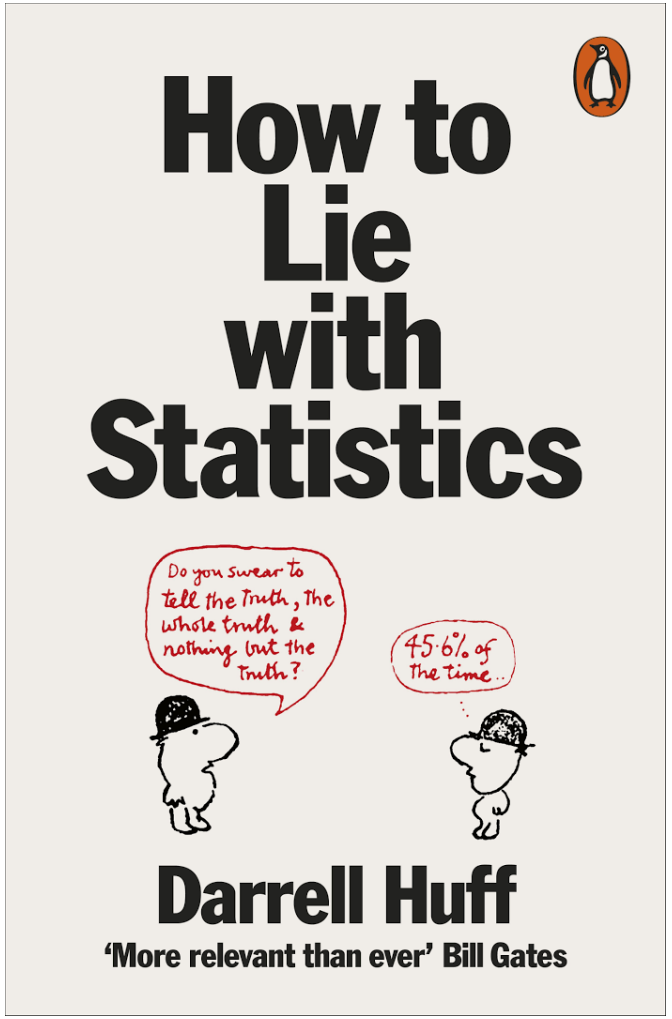
«There are good reasons to believe that formal constructs incorporated in computer artifacts may be quite helpful in reducing the complexity of coordinating cooperative activities and thus serve as genuine "resources for situated action" (Schmidt 1999, s. 327)

Hvordan lyve med statistikk?



On this truncated graph, however, it appears that profit is *rapidly* growing, because the empty space is gone:



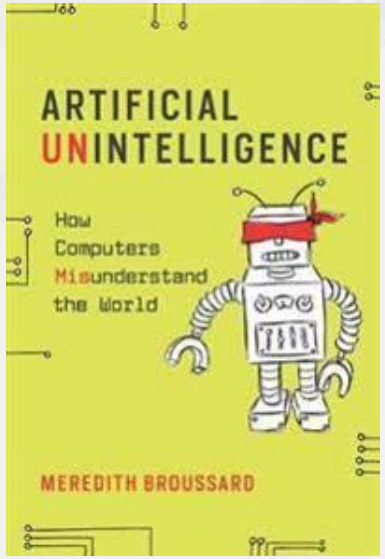


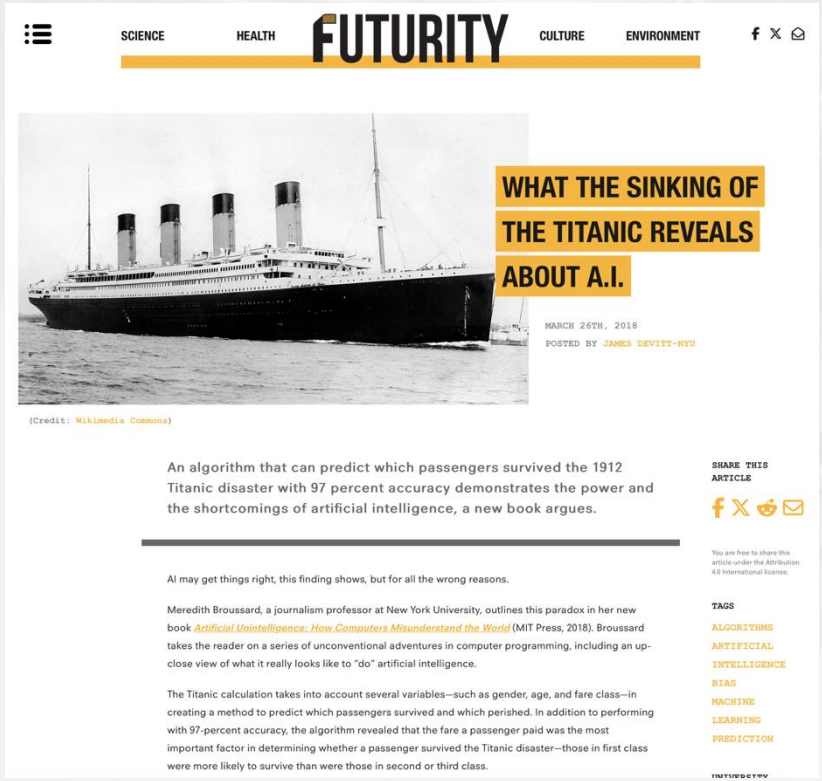


indikatorer

«variables linked to the variable (studied), which itself cannot be directly observed» *(Balka m.fl. 2006:46)*

- mye brukt i helsevesenet (måle feber, hvite blodceller, blodtrykk mm)
- tolkning av data



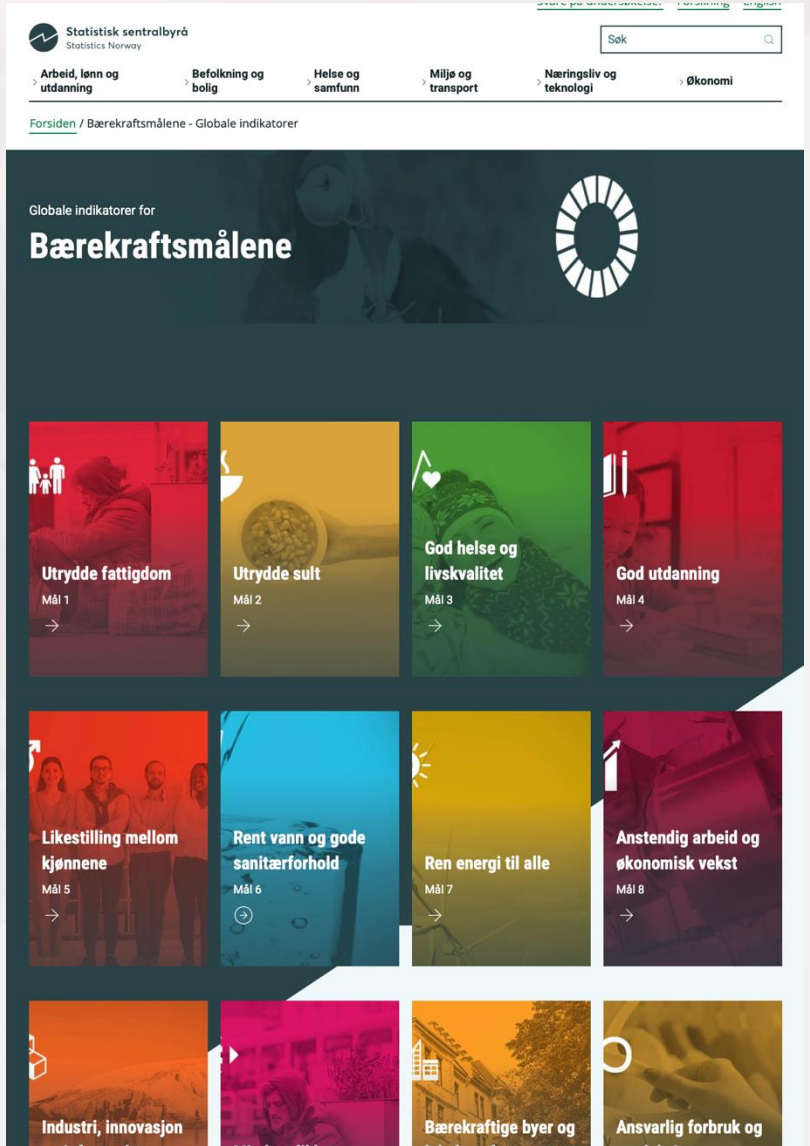


Original Articles

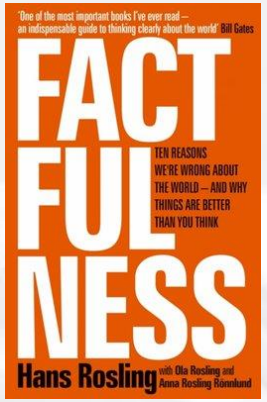
Indicators for all: including occupational health in indicators for a sustainable healthcare system

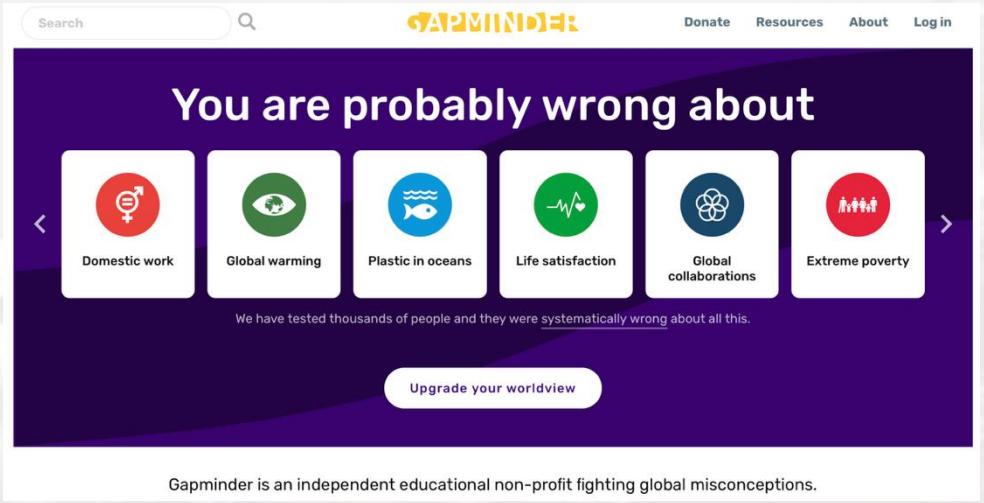
Ellen Balka, PhD , Karen Messing, PhD & Pat Armstrong, PhD

Pages 46-61 | Published online: 05 Jan 2016



indikatorer

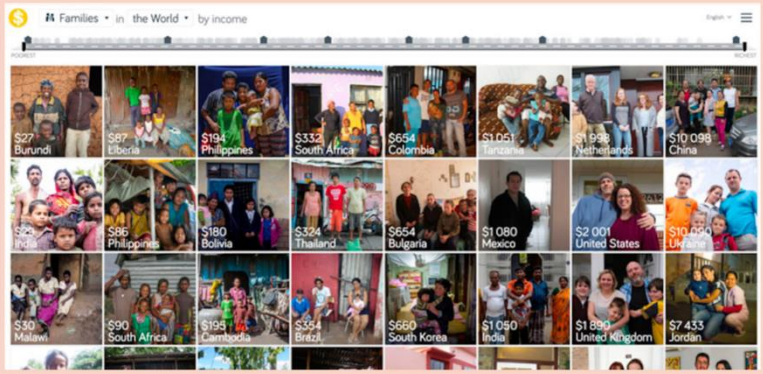


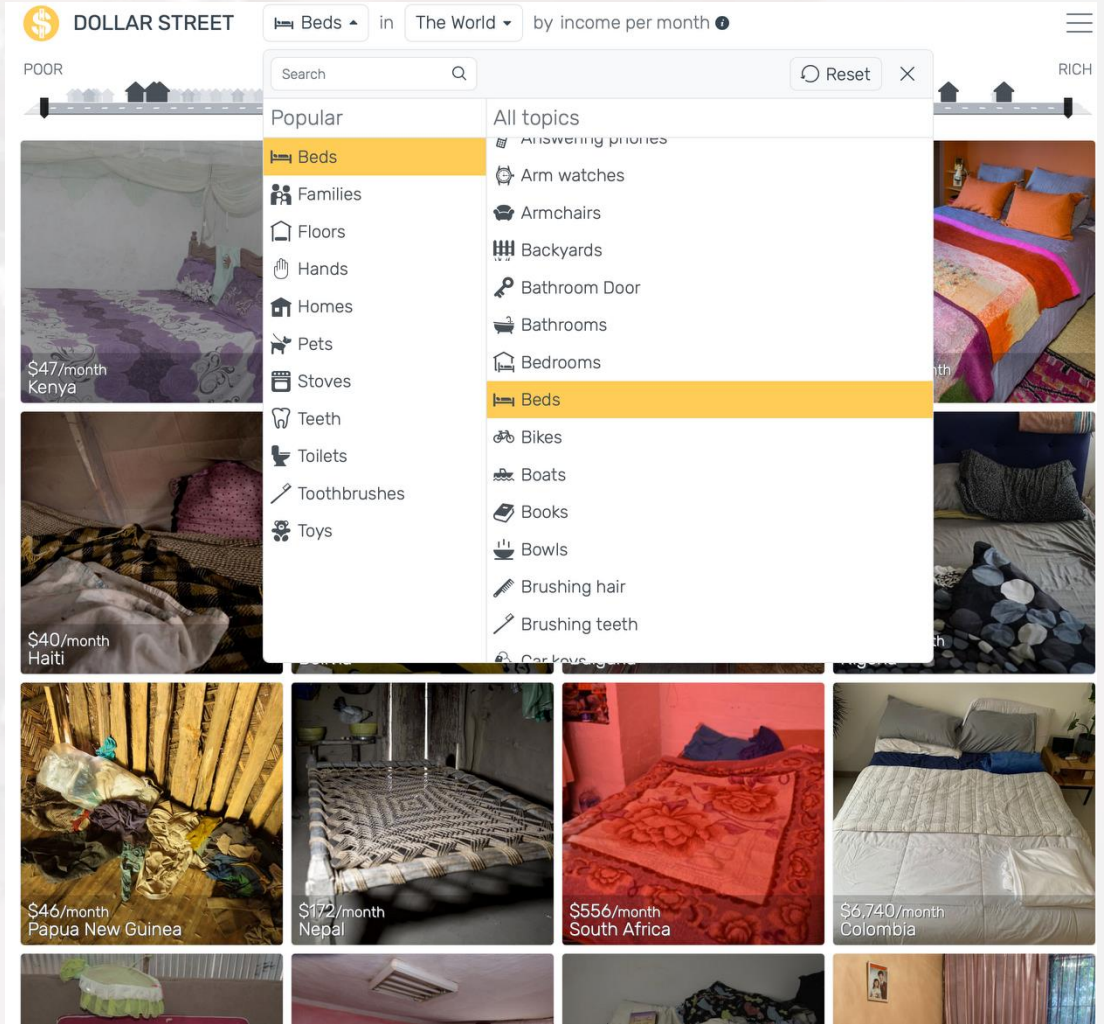


Dollar Street

Watch everyday life in hundreds of homes on all income levels across the world, to counteract the media's skewed selection of images of other places.

See the reality behind the data





representasjoner av arbeidet

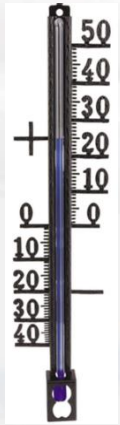


politiske/demokratisks representasjon av arbeidstakere/brukeres stemmer	representasjoner for å utvikle teknologi
det som representeres får en stemme	synliggjøre arbeid for å finne teknologimuligheter
representasjon av arbeidet viktig for å designe gode redskaper	brukere er informasjonskilder, og mottakere av teknologi
de som utfører arbeidet kan definere teknologien	representasjoner kan representerer brukerne
de som utfører arbeidet kan uttrykke sin stemme gjennom representasjonene	representasjoner kan manipuleres strategisk
video gir arbeidstakerne egen stemme	video gir fler muligheter for synliggjøring
video gir mulighet for mange visninger og tolkninger	forskerne kan ikke kontrollere andres tolkninger av videoopptakene
video kan brukes som bevis ved uenigheter	videoopptak overbeviser og lukker debatt
videoopptak formidler dynamikken i praksisen	video fryser aktivitet og tilbyr illusjon om erfaring
arbeidspraksis og –erfaringer kan bare delvis representeres	arbeidspraksis kan «fanges» og omformes til objektiv kunnskap
å gjøre arbeidet synlig betyr å representere hvordan det utføres i praksis	å gjøre arbeidet synlig representerer arbeidet som rasjonelt, som abstrakte funksjoner & prosesser
representasjoner kan brukes i forhandlinger med ledelsen	arbeid som er eksplisitt utsettes for rasjonalisering
representasjoner kan virke mot forenklet syn på automatisering	representasjoner gjør arbeidet utsatt for videre rasjonalisering og automatisering

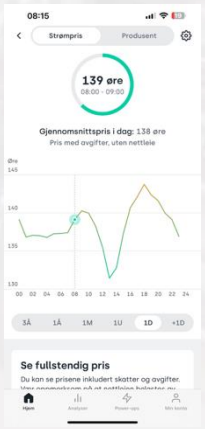
digitale representasjoner

digitale representasjoner

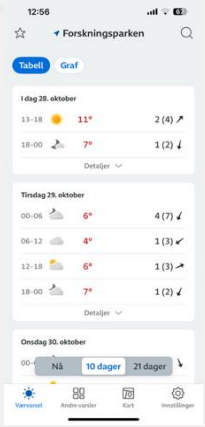
(digit = tall + elektronisk)









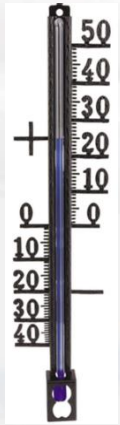




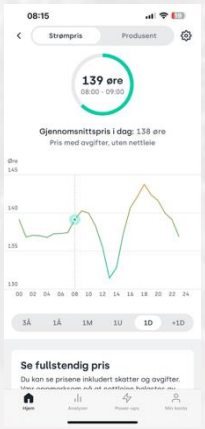
digitale representasjoner

digitale representasjoner

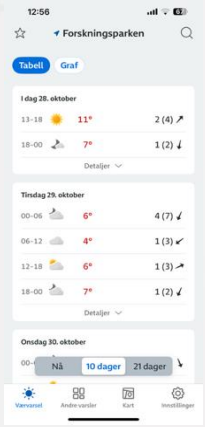
(digit = tall + elektronisk)





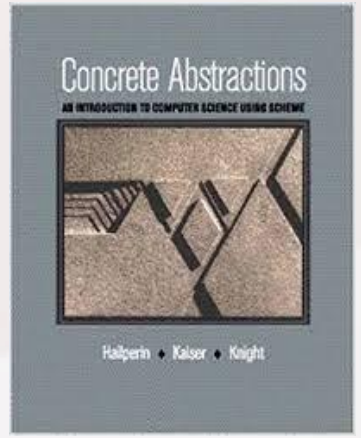












digitale representasjoner =
abstraksjoner av objekter / data

```
pick one element of the array (the "pivot").
partition the other elements into two groups:
   "little ones" that are less than the pivot value, and
   "big ones" that are greater than the pivot value.
recursively sort each group. (Kernighan and Pike 1999: 32)
```

og prosesser

Sende kommando til pin med digitalWrite()

digitalWrite() tar imot variabler om hvilken pin det skal sendes noe til (digitalRead() tar tilsvarende i mot variabler om hvilken pin som skal leses av)

HIGH sender strøm til pin ved å angi strømmen som på, tilsvarer 5 volt og true

LOW slår av strøm til pin ved å angi strømmen som av, tilsvarer 0 volt og false

delay() pauser programmet, tar imot variabel i antall millisekunder, 1 sek = 1000 ms

```
void setup() {
pinMode(LED_BUILTIN, OUTPUT);
}

void loop() {
digitalWrite(LED_BUILTIN, HIGH);
delay(1000);
digitalWrite(LED_BUILTIN, LOW);
delay(1000);
}
```

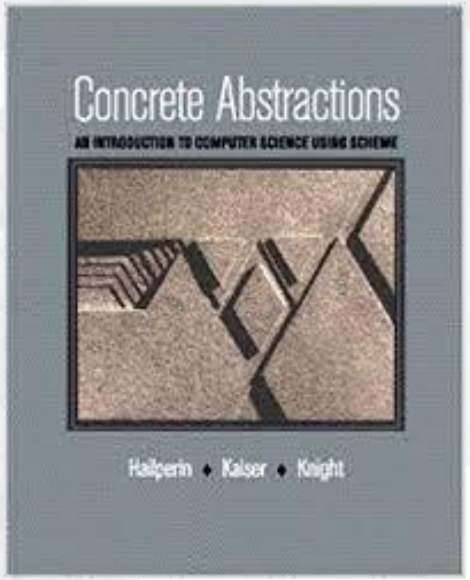
fra Heidi Bråthens lysark i in1060

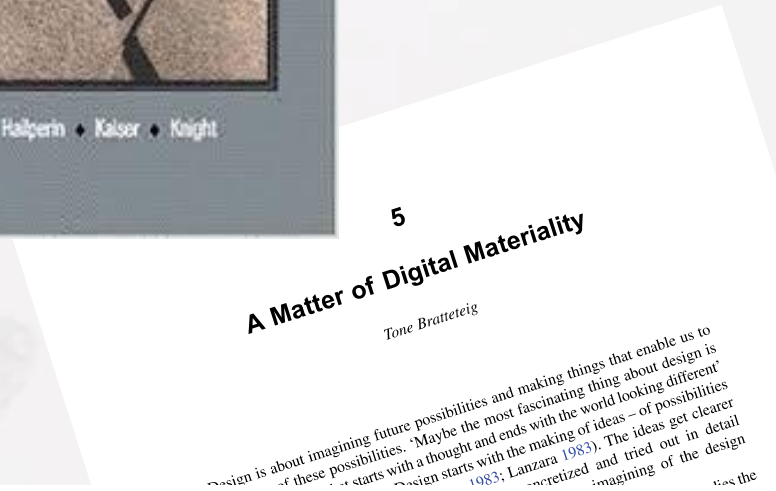
digitale representasjoner som designmateriale

- digitale representasjoner
  - abstraksjoner
  - symbolske re-presentasjoner
  - (struktur for) prosess

- konkrete abstraksjoner
  - prosedyre / metode = struktur for prosess
  - tilstand – prosess = sekvens av tilstander
  - data: hva & hvordan informasjon er representert

- designmateriale
  - materialer: substans, struktur, overflate, egenskaper

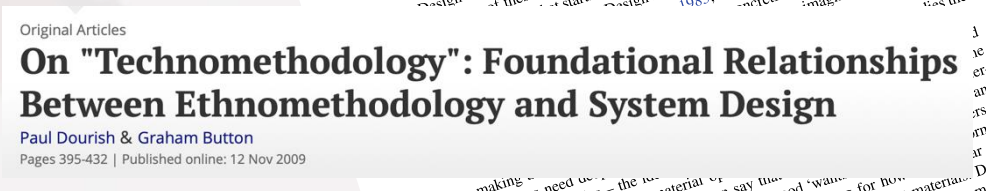



5

A Matter of Digital Materiality

Tone Bratteteig

Design is about imagining future possibilities and making things that enable us to

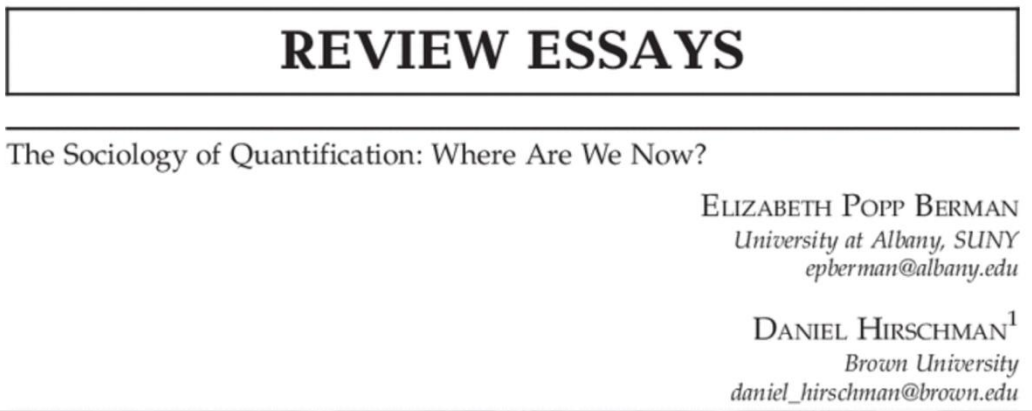

Original Articles

On "Technomethodology": Foundational Relationships Between Ethnomethodology and System Design

Paul Dourish & Graham Button

Pages 395-432 | Published online: 12 Nov 2009

mer om representasjoner i ekstra-litteraturen



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ELIZABETH POPP BERMAN
University at Albany, SUNY
epberman@albany.edu

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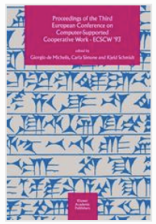
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Lucy Suchman