

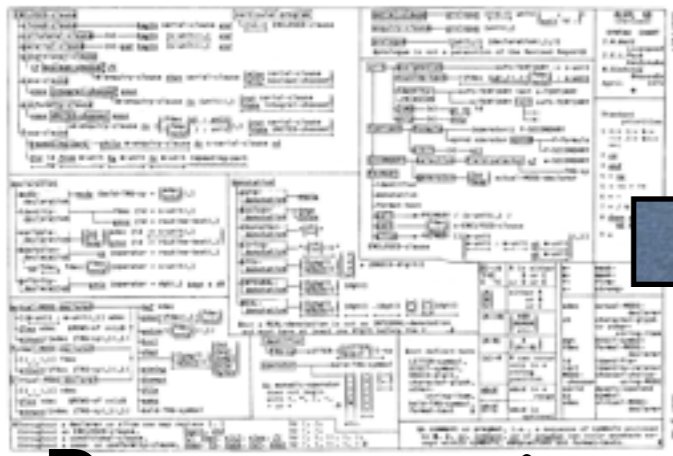
Public/Private Collaboration {in,for,with} Software Engineering

Jurgen J. Vinju

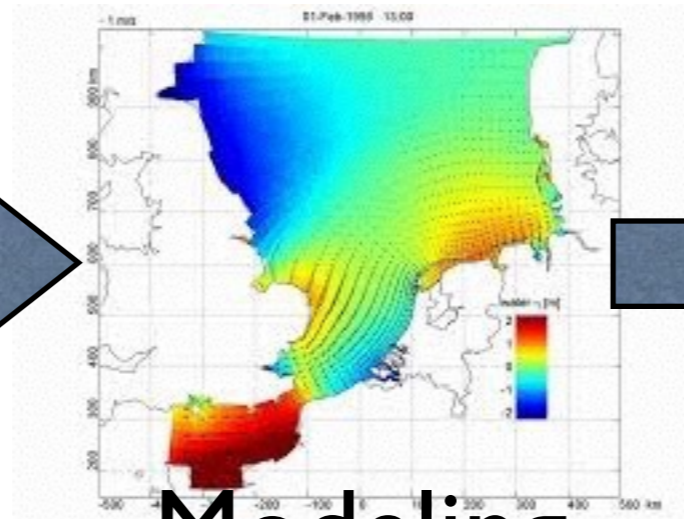
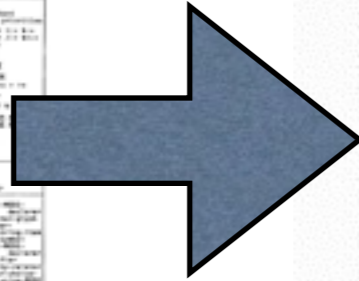
Centrum Wiskunde & Informatica (CWI)
Amsterdam, The Netherlands

TU Eindhoven, The Netherlands

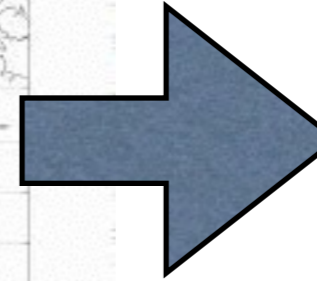
INRIA Lille, France



Programming (Software)



Modeling

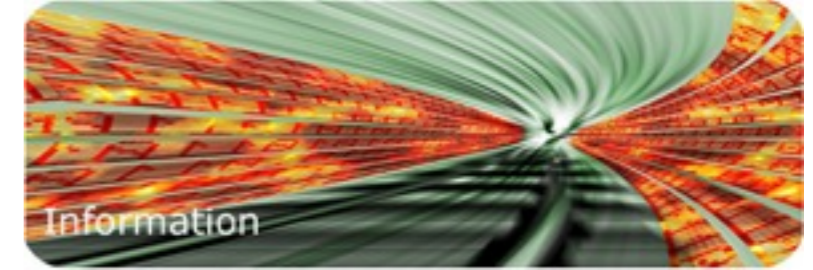
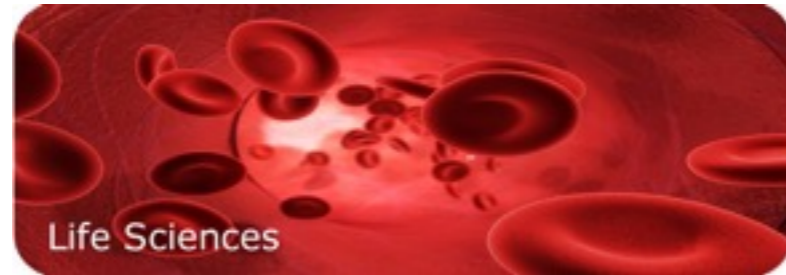


Construction

- CWI = fundamental research **applied** to societal challenges
 - First computers; ARRA [1] applied to ocean modeling for dykes, etc.
 - First programming languages; Algol, Python applied to everything
 - First connected Europe to the internet; applied to ... well everything :-)
 - Primary attitude driven by long term vision, high impact potential for the future
 - Balanced with skill and knowledge to apply now

[1] <https://www.youtube.com/watch?v=ph7KyzFafC4>

CWI research - organized



- Group x Theme matrix:
 - societal themes **reach out**: software, energy, logistics, information, life
 - research groups **specialize**: Algorithms and Complexity, Cryptology, Database Architectures, Distributed and Interactive Systems, Formal Methods, Information Access, Intelligent Systems, Life Sciences, Multiscale Dynamics, Networks and Optimization, Scientific Computing, *Software Analysis and Transformation*, Stochastics
- Collaborations
 - Networks: ERCIM, Informatics Europe, EIT ICT Labs, ...
 - Business & Government: Banks & Insurance companies, Tax offices, High-tech companies, Services, etc, **local, national & international**

Driver 1 - Money

- CWI staff & support funded permanently; for *stability*
- PhD students and post-doc researchers funded per (four year) project; for *flexibility*
- Project funding = first collaborations, then personal grants
- Researcher careers = first personal grants, then collaborations
- High failure rate **increases** the number of submitted proposals



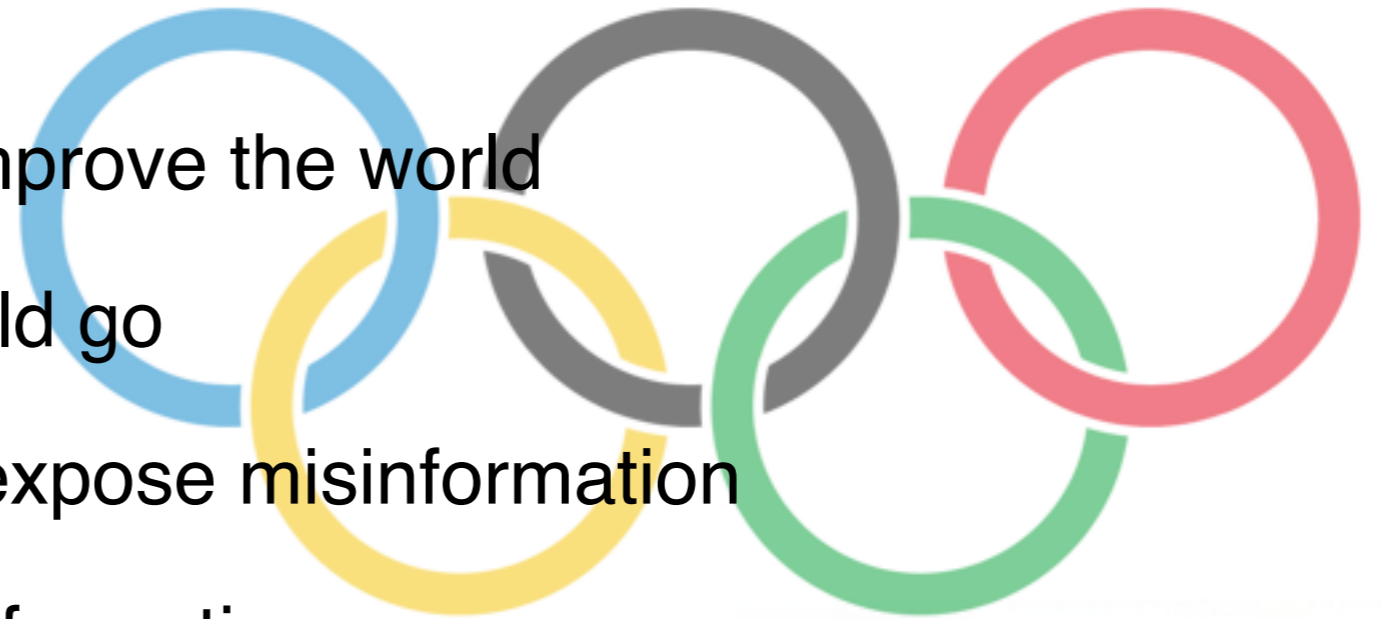
For a senior researcher the amount of acquired funding is used as a key performance indicator

Opportunity to understand and manage personal grant projects, matching collaborative projects

Smaller directly funded project skips the overhead and risk of government project acquisition

Driver 2 - Personality

- Ambition to have **impact**, to improve the world
- Vision to know where we should go
- Curiosity to find the truth and expose misinformation
- Wanting to educate, to send information
- Deep intrinsic motivation and enthusiasm
- Duty and responsibility for society



Ambition, morality and ethics are implicit drivers for researchers

Education is a key motivating factor in two-way collaboration

Driver 3 - Urgency

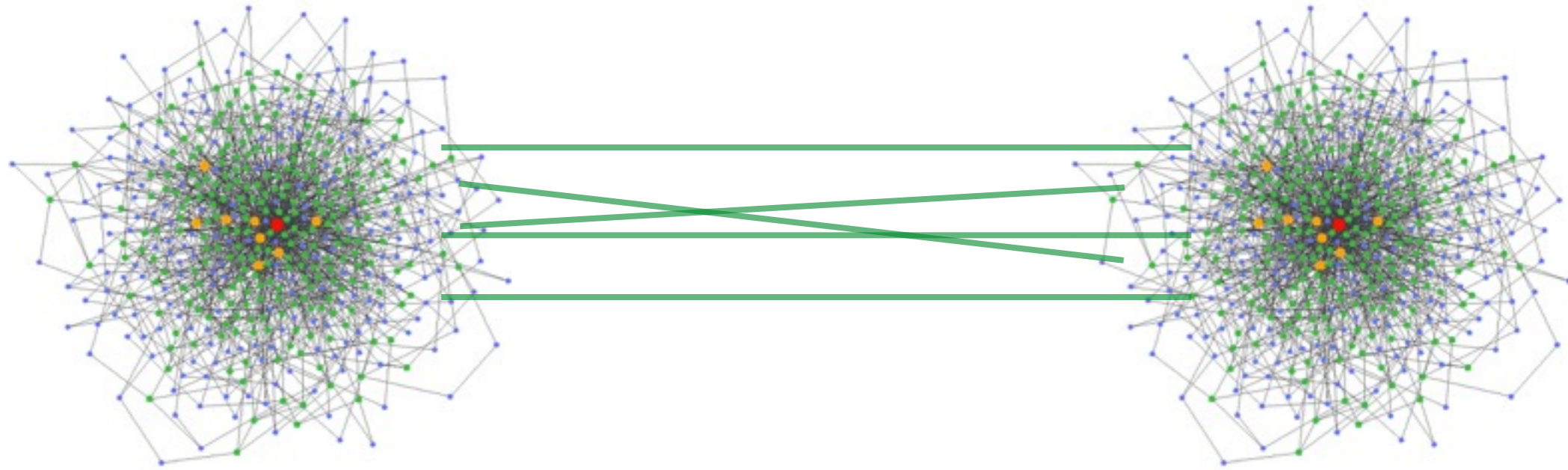
- Hard and urgent problems
 - Defending against the sea, safely and securely
 - Scheduling in a dense network (trains, ambulances, cars), optimally
 - Understanding and controlling big software and big data, for economy, privacy and security
 - Inventing more efficient ways of acquiring, distributing and using energy resources
 - Understanding processes related to terminal diseases
- Ad-hoc need for highly educated self-sufficient professionals
 - high-tech spin-off companies and start-ups
 - human resources in large companies
 - professors in universities

Can you help understanding, eliciting, the true urgency?



Can you help understanding, eliciting, the urgent human resources need?

Factor 1 - Network



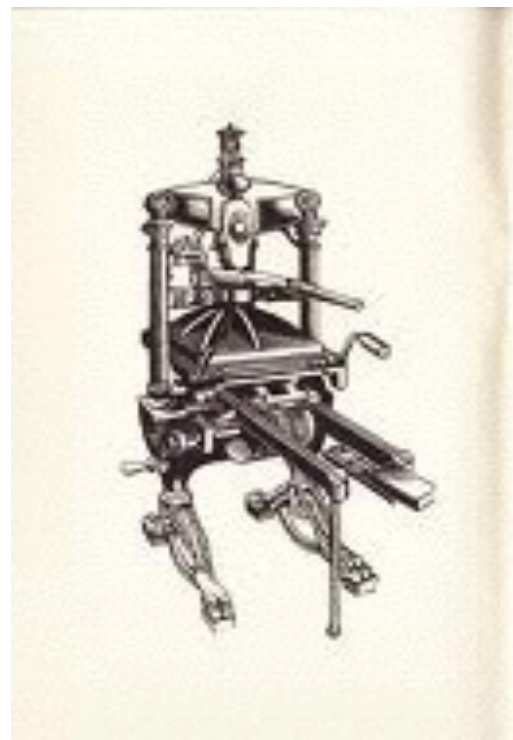
- Researchers have a tight, dynamic but stable, and effective network
- Industry has a tight, dynamic but stable, and effective network
- *Few and temporary, but effective, bridges between the two networks*
- **Are temporary “projects” the best form of organisation for public/private collaboration in research and development?**

Opportunity for better and more match-making and match-sharing

Opportunity for managing long term relationships

Collaboration Factor 2: Software

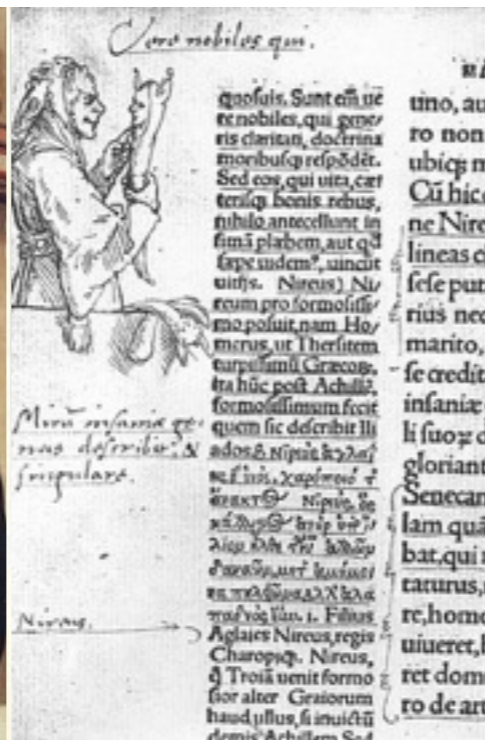
Software is a **new medium** made possible by ICT



Printing Press



Erasmus



Book

Internet



Tim
Berners-Lee



Web



Computer



Dijkstra



Software



Software
is
everywhere

Factor 2 - Software

- Software is a unique, weird and powerful *medium*
 - it drives product and service innovation; soon everything?
 - it is executable, transferable, evolvable knowledge + skill
 - it can be applied to itself!
- In software engineering research the same software is often:
 - both the research method and output to be published academically,
 - and the R&D prototype to be implemented in industry!
- *CWI “SWAT” has decades of experience; skill, attitude & knowledge*

Opportunity to scale up software as key transfer medium next to people & papers

More software prototypes as core research deliverable for projects

Make working software releases a research KPI