Challenges and Opportunities of Big Software-based Innovation

Jurgen J. Vinju

Centrum Wiskunde & Informatica
TU Eindhoven
INRIA Lille

Big Software Matchmaking Day
July 1st, 2015
Go Big Software!
The Software Medium

Printing Press  Erasmus  Book
The Software Medium

Computer  Dijkstra  Shortest-path
The Software Medium

Internet

Tim Berners-Lee

Web

http://www
The Software Medium

yesterday’s ICT inventions 
+ 
more and better software 
= 
tomorrow’s product/services
Software
The Innovation Engine

• from risky products to exploitable services
  • cost-of-development -> cost-of-ownership
  • big bang release -> incremental update
• from pricy consultants to valuable experts
  • outsourcing -> core business
• from quantity & complexity to quality & flexibility
  • constraining people -> supporting people
• data input -> data discovery
The Netherlands: a global leader in software and software engineering
Big Software

- Big Code
- Big Process
- Big Logs

Better Code
Better Process
Better Products

Complexity => Opportunity
Contextual Software Research

Wicked Problems

Seemingly intractable with chronic policy failure
Difficult to define

Interdependencies and multi-causal

Solutions can lead to unforeseen consequences

Sit astride organizational boundaries and responsibilities

Involve changing behavior

Socially complex

No solution

[http://comphacker.org/comp/engl338/2015/01/28/visuals-of-wicked-problems/]
Contextual Software Research

- Great software and software research is contextual, tailor-made
- Expert, local, domain knowledge is key to success
- "Premature [generalization] is the root of all evil"
- Focus on local urgency and local success factors

[Escher]
Contextual Software Research

• Building up general SE theory & methods as we go
  • The goal is incremental, but definite, improvement in SE

• Disruptive innovation is enabled by better software engineering
  • Back to common sense; stop following the hype

• Use yesterday’s and today’s assets and experience
  • time-to-market one month sooner?
  • 20% fewer bugs after initial release?
  • 50% of the unused features not even developed?
  • developers working on features, not bugs?
  • legacy code an asset instead of a risk?

what if? how? research!

[Jon Sullivan]
Cross-cutting Contexts

- Software Contexts are not silo’ed in industrial or public sectors
- Example: High-end Financial Services and Embedded Systems
  - High efficiency
  - High integration complexity (third-party)
  - High product/service variability
- Example: Distributed (Big) Data and Meta Programming Systems
  - Intermediate formats
  - Marshalling and transformation
  - Co-evolution of I/O formats and processors
Software for Software

• Research methods built as (re)usable software
  • automated data collection, analysis, reporting
  • code, process, trace analyses
  • questionnaires & monitors

• Proof-of-concepts built as software
  • analyzing, transforming, generating, visualizing
  • integrated into existing environments & processes

• There is no field like ours where knowledge transfer could be organized so directly and faithfully, in either direction
  • only if research has access to the real code, real processes and real logs
  • only if industry has access to full and automated methods and experiments
CWI SWAT

- Preventing and curing **software complexity** to enable higher quality software systems, using **automated software engineering** methods

- Know-how
  - language engineering
  - source-to-model
  - model-to-source
  - source-to-source
  - mining repositories
  - continuous delivery
  - distributed components

- Domains
  - embedded systems
  - administrative
  - financial
  - games
  - Connected & collaborative
    - research & education
    - industry & government

UvA/HvA/VU/CWI master software engineering

TU Eindhoven: “Automated Software Analysis”
Roadmap ICT

• Roadmap ICT draft has a first class software theme
  • “reliable & flexible software systems”
• Needs your voiced support
• Stake our claim that software is a leading factor
  • economically
  • socially
  • academically
• Contact to enlist support of CIO, CTO, CEO
SEN Symposium

- Yearly
- Inclusive
- Excellent speakers
- Topical posters
- Discussion
- Networking

Save the date
Thursday
December 3rd
Amsterdam
Big Software

a new start for long term collaboration

"NO!
Try not!
DO or DO NOT,
There is no try."

[George Lucas]