SERT Profile Project

Software•Engineering ReThought

Prof. Dr. Dr. Tony Gorschek
tony.gorschek@bth.se
background/introduction
(Tony Gorschek)

→ Engineer (first) / Problem Solver / Researcher
  • Professor, PhD (Tekn. Dr.) Software Engineering, M.Sc. Computer Science + B.Sc. Business Administration

  • 14 years in industry (6 start-ups, CTO, Senior Executive Consultant, Chief Architect, Technical Advisor, Developer, Product Manager/Business Analyst, Investor)

  • 12 years in research (Technology Product Management, Requirements Engineering, Quality Assurance, Process Assessment and Improvement, Lean Product development, Value based product development)
blekinge institute of technology

- Karlskrona/Blekinge/Sweden
- Pioneering software engineering education and research in Sweden
- 50+ researchers in software engineering
- BTH is ranked 6th in the world in the area of “systems and software engineering” (JSS-147-2019) 1st within EU
- Wide range of competences – 10+ nationalities (4+ Brazilians!) ;)
- Empirical research (in collaboration with industry)
- Ongoing projects with 30+ companies continuously
software engineering

“standards” HCI test cases specification algorithms documentation tools continuous delivery models automation DevOps “WAYS of WORKING” “lean” “agile” ISO test-driven machine learning specification value-based SOA implementation proposals methods visualization frameworks compliance

EFFECTIVE

EFFICIENT

SCALABLE

requirements engineering portfolio development architecture
coding

technology analysis governance planning & leading maintenance & evolution human factors

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(pic: Paranay/Wallgren)
Challenges
when we create or use products and services
challenges software based products and services

6 Macro-challenges in software engineering

→ Size and Complexity (CH1)
→ Product Development and Release Speed (CH2)
→ Product Emergent Properties (CH3)
→ Product Lifespan (CH4)
→ Product Non-functional Aspects (CH5)
→ Product and Process Value (CH6)

→ Future SW = MORE → defects, requirements, systems, size, complexity, technical debt, coordination and communication, challenges, security, compliance, threats, maintenance, complex development organizations, larger teams, more dependencies between organizations…
We need to change the way we engineer Software in a radical way to meet the challenges of the next 20y
research agenda
preparing the solutions for tomorrow
(first three directions...)
human and user based software development

- Use **massive** user and system to system **data** (interaction, measurement, behaviour, activity, telemetrics) **to guide**:
  - Feature **SELECTION**
  - Quality **NEEDS**
  - Define **VALUES** (priority)
- Continuous experimentation and learning (next gen. continuous delivery)
- Establish **VALUE based testing** (move from code to value focus in testing)
- Requirements **AUTOMATION** (verification and validation)
- **STANDARDS/COMPLIANCE** automation and **VALUE** measurement
- Feature **REMOVAL** strategies and acceptance
- Preventive planning for product evolution and total cost of ownership including **asset VALUE** (Technical debt management)
scalable and value based engineering

→ Quantify and qualify VALUEs
  • Ability to TEST both INTERNAL and EXTERNAL Value types
→ Value based testing and AUTOMATION (selection and prioritization of WHAT to test based on VALUE impact)
→ Develop ACCEPTANCE CRITERIA for:
  • Learning systems with emergent properties
  • Un-planned massive systems interaction
  • Complex requirements – SAFETY/SECURITY/COMPLIANCE
→ Automate testing for complex requirements
→ Human – Automation interface (assuring new techniques for trust, human understandability in complex systems development and development automation)
→ Analysis tools for Automation (test) results
→ Human-Machine/Automation symbiosis in engineering
elastic lean engineering

→ **CONTEXT AWARE** Agile/LEAN/DevOps/SAFe (next generation of flexible management of engineering)

→ Active and continuous WASTE identification and removal
  - Waste metrics
  - Separate Waste from *Overhead*
  - Waste warning automation
  - Waste based process change (*evidence based*)

→ **ASSET Value control** (measure, control and correct “technical debt” during product evolution)

→ Total cost of ownership (TCO)

→ **Human based** engineering (productivity of engineers)

→ END – to – END software engineering

→ Organization – Team – System architecture optimization to manage interfaces and interface overhead

→ **LeaGile 2.0… SCALABILITY**

→ What works over ”cook-book” recepie
"SERT = Software Engineering ReThought"
... so... what are we “rethinking”
SERT Profile

SUB-PROJECTS – Concrete start...
Challenges for the Next Generation Software Engineering

State-of-art

Support
Confirn

Challenges

Summarize
Collect

Partner Company
Needs

Based on
Solved by

Human Focused
Software Engineering

SP1: Augmented
Automated Testing

SP4: Cognitive Software
engineering models

SP2: Heterogeneous
Requirements Engineering

SP0: Multi-vocal
co-production

SP5: LeaGile teams
and organizations

SP3: Value-oriented
waste minimization

SP6: Requirements
verification and conformance

Data Focused
Software Engineering

Value Focused
Software Engineering

CATALYSTS
Software Engineering is an applied engineering science and needs to adapt to solve future challenges.

**CATALYSTS**

**Value Focused SE**
- Value/Waste
- Business Economy
- Measurement
- Lean
- VBSE
- Non-functional asp.

**Human Focused SE**
- Cognition
- Psychology
- Org./Team
- Arch. vs Org.
- Non-functional asp.

**Data Focused SE**
- Application of ML on SE challenges
- Data-driven
- Continuous
- Evidence based
(initial) Sub-projects


Meaningful automation
Automation ROI
Human-Automation optimization

SP2: Heterogeneous multi-source continuous requirements engineering.

ML/AI based harvesting of req./data/ intelligence irt product development

SP3: Value-Oriented Strategy to Detect and Minimize Waste. [BASE]

WASTE identification, Real Lean
Technical debt / Asset degradation mgmt

SP4: Cognitive software engineering development models. [BASE]

Maximize human potential in engineering
Human – machine symbiosis

SP5: Study and Improve LeaGile handling of organizational and team interfaces.

Real™ LeaGile! WASTE – VALUE – OH SCALABILITY // VALUE BASE // Tech/org...

SP6: Verification of Software Requirements in Dynamic, Complex and Regulated Markets.

Applied human augmentation through meaningful automation (applied compliance...)
(selected) planned new projects start 2018


High-level test and automation of the same. Possibilities to automate in the case of “value based” testing, i.e. how to actually test the “value”/”benefit” of a feature vs. today’s “is it there” and “does it work as intended”...

How do we ensure that the the right thing is automated in the right way to maximize the developer’s potential?

SP2: Heterogeneous multi-source continuous requirements engineering.

How do we ensure that we use DATA-driven (less subjective) interpretations of requirements and needs with regard to a product or service? How do we perform a scalable analysis that actually yields useful information about WHAT to do/deliver in a product/service with regard to many data sources that look different, how can this be ”automated” and which parts need to be manual, as well as addressing interfaces between automation and human...

Meaningful automation
Automation ROI
Human-Automation optimization
ML/AI based harvesting of req./data/intelligence irt product development
SP3: Value-Oriented Strategy to Handle Software Asset Degradation

Technical debt or, for a better concept, “management of assets/results”, is a fundamental problem. Everything, from code to test cases, to competence, knowledge, and organisation, as assets/resources. How should these be constructed, which should be maintained and when, when is it ok that they degenerate considering the product lifecycle... How can this be measured and how can hidden degradation be avoided...

SP4: Cognitive software engineering processes

The human (developer) is extremely capable in certain areas (analysis, context, interpreting needs/meaning) but not very capable at tasks that cognitively taxing (repetitiveness, large amounts, etc). We must take the next step in tools, HCI, automation, where we take this into account and scale away things that humans are not good at in order to free resources for things where humans perform well!

WASTE identification, Real Lean
Technical debt / Asset degradation mngmt
Maxmize human potential in engineering
Human – machine symbiosis
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**SP5**: Study and Improve LeaGile handling of organizational and team interfaces. **Real™ LeaGile! WASTE – VALUE – OH SCALABILITY // VALUE BASE // Tech/org...**

Many good initiatives and thinking around ”agile” (e.g. devops, safe)... but there are fundamental challenges that no-one has solved regarding scalability and having ”agility” at the whole organisation level (from CEO to support of a technical module). The solution lies in not only considering organisation and ways of working, but also architecture, technical and virtual APIs – we need to proceed to the next scalable generation of ”agile” ...

**SP6**: Verification of Software Requirements in Dynamic, Complex and Regulated Markets **Applied human augmentation through meaningful automation (applied compliance...)**

How can we handle quality assurance in complex environments where it is central to follow laws/regulations/standards/etc without overloading developers and analysts with large manual effort. To what extent can we scale away and provide decisions support and automation for concepts like ”compliance”
"Software Engineering ReThought"
... what are we “rethinking” PART II
(how we do research) 3rd gen empirical SE

1. Problem/issue
2. Industry
3. Problem formulation
4. Validation in academia
5. Static validation
6. Dynamic validation
7. Release solution

Academia

Study state of the art
Candidate solution
RESEARCH PROFILE consisting of individual sub-projects that run and adapt over time...

By running, 12 industrial partners
want to hear more?

Currently we are looking for people to join our TEAM. *(now and over a 5y period)*

PhD Students (5y, great salary and benefits)

PostDocs (1-3y, 80% research)

Junior Associates (tenure track)

Senior Associates (tenure)

If interested send me an email: *tgo@bth.se*