D-RisQ

SOFTWARE SYSTEMS

Better, Compliant Software, Faster

"Working" with MOD
An SME Perspective

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"The function of good software is to make the complex appear to be simple"

Grady Booch

OVERVIEW OF D-RISQ LTD

What do we do?

Development of automatic Formal Methods based verification technologies

System Kapture   *Kapture*®   *Modelworks*®   *CLawZ*®   *FEVER*®

Use them to undertake our own projects and develop software for clients

Aerospace   Maritime   Defence   Automotive

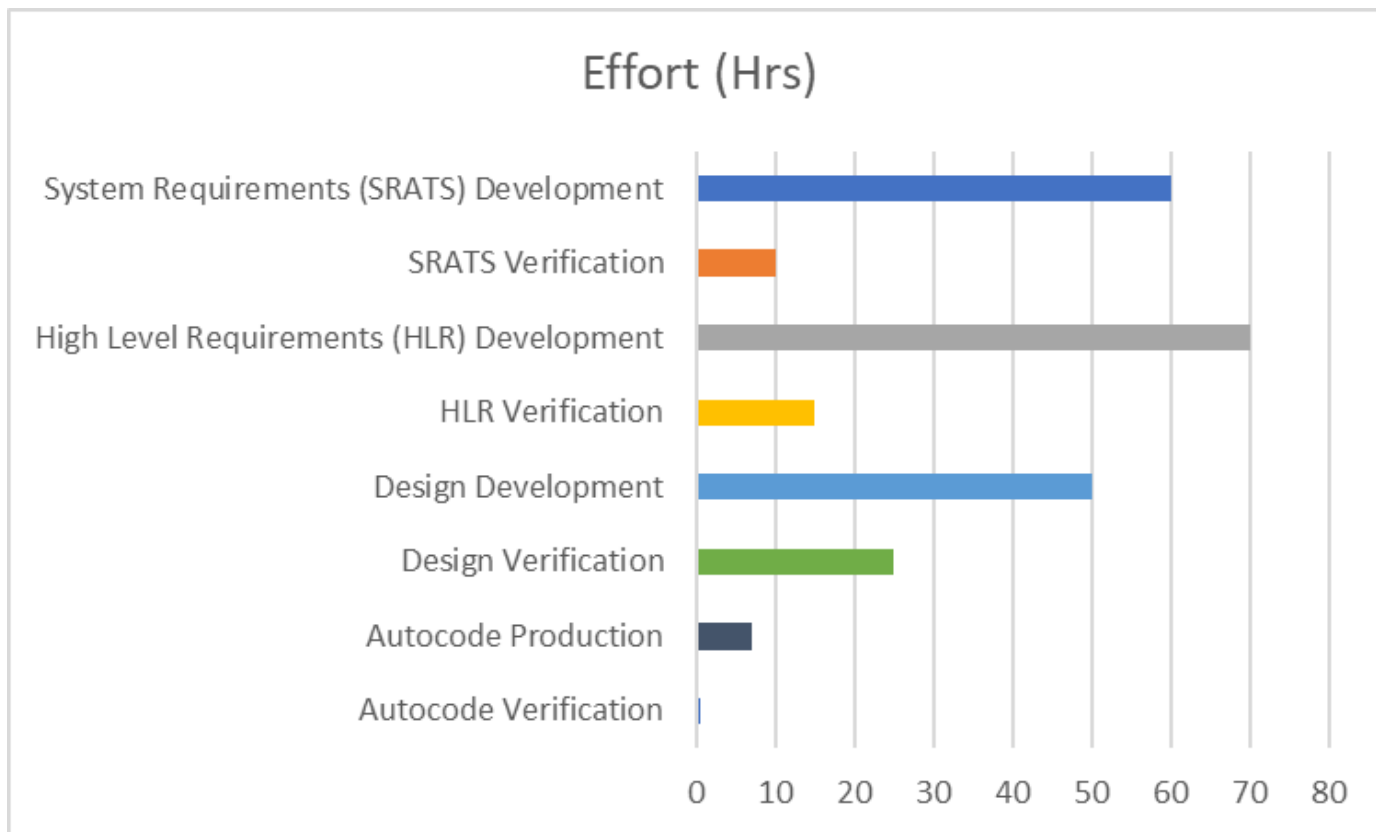Autonomous Systems   Cyber-security   Medical Devices   Nuclear Decommissioning

D-RisQ Vision

- Aim: Reduce the cost of software development by 80%
- How: Where appropriate, possible and practicable, use automatic proof instead of test or review
  - Use most appropriate tool for the job
- Desired outcomes:
  - Remove ambiguity
  - Speed up iterations ⬅ Get capability to market faster
  - Comply with regulations

80% is a big claim…can it be backed up?

Steam Boiler - Metrics

Effect (Hrs)

Chart categories (Effort in Hrs):
- System Requirements (SRATS) Development
- SRATS Verification
- High Level Requirements (HLR) Development
- HLR Verification
- Design Development
- Design Verification
- Autocode Production
- Autocode Verification

Axis: 0 10 20 30 40 50 60 70 80

Avionics/Embedded/Real-time Productivity ranges:
20-1000 LoC/month

[Depends on integrity level, competency, complexity, etc]

Gives productivity increase of
3.7x – 185x

Tokeneer: 38 LoC/Day…

…pick your own project metrics

A large prime: this would have been costed at >£750k

37 SRATS (and other declarations) transformed into 5577 lines of code (LoC) in 224.5 labour hours (~6 weeks) giving productivity of:
~186 LoC/Day, ~930 LoC/week or ~3,700 LoC/month

Use of the Tools

- A large energy technology developer...just started
- SMD: underwater autonomy
- Network Rail drone: Clearance given based upon our approach
- Medical device: Tools used by us in support of client; delivering requirements next week
- Automotive: H2 project, among others, being negotiated
- Aerospace: Electric drive project, being negotiated
- Newcastle University: Kapture introduced into MSc projects
- University of York: Kapture into at least 2 undergraduate modules; possibly as many as 4
- Nuclear: Study undertaken for Office for Nuclear Regulation
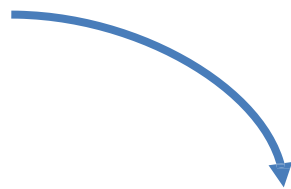- A large international prime...started early Nov

Curiously – not for MOD projects!...yet

Life as a Founder

Life as a Founder

On 3 Nov, I had to put £150 into the business in order to avoid breaking the limit

We have a **£30,000** overdraft limit

On 13 Nov that left us with £9.13 to the limit

Bank sent me a letter on 13 Nov reminding me of my **personal** liability for this

On 13 Nov, myself and my

fellow Founder had to put a further £3,000 into the business

1st time we have had to use the overdraft since June 2024

Pension payments of ~£3k due over weekend

On 20 Nov, PAYE of £14k due

We are currently owed over **£130,000** from 4 different entities; all are well overdue

Innovation

As presented in Nov 2024

- MOD states it wants 25% supply from SMEs
  - Currently misses this target
- Most of the SME engagement is 'manpower substitution'
  - Not delivering innovation - it's surge capacity (at best)
- SMEs don't tend to have cash or personnel reserves
  - There's no 'being on the bench' ➔ To be fair – no-one does these days

- MOD Ts&Cs and processes, plus Supply Chain Management 'requirements' are overly bureaucratic
- Risk [for MOD] re innovation has at least 2 dimensions:
  - New stuff is inherently risky…unknown unknowns?
  - SMEs will probably have to go through a prime…which are risk averse
- We often have to 'work at risk'…despite the official position

Spookily – no change or follow up since last year!

People who say it cannot be done, should not interrupt those who are doing it

Bernard Shaw

SUPPLIER LISTS

Supplier Lists

We have had....

....since 2018

Supplier Lists

- This was <u>just</u> the cyber ('computer') security questionnaire
  - [And someone needs to 'check' the spelling ☺]
- There are **no** questions about the <u>actual security</u>
- Note: We are a 12 person FTE company
- ...and we have Cyber Essentials
- It took a while to understand what was needed (and not all was 'understandable')
  - Then it took over a week to get someone on the phone to talk to
  - Once done, we passed there and then!....

Why is this scatology necessary?

What's Next ?

- The on-boarding process now requires some more questions about 'quality'…ie QA…
  - [Suggets they cheque there spelling!]
- This will take, we were told, another 6 weeks!
- Project is supposed to finish (ie money runs out) by Christmas

Is this a 'Denial of Service' attack?

Someone's Going to Mention JOSCAR

- We're on JOSCAR…

- Took many months to get 'approved'
  - Labour hours…days upon days upon days of effort

- No clue as to what is 'good enough' ➡ ✔

- The advert for JOSCAR is 2 fold:
  - Ease on-boarding when contracts are being let
  - Provide a shop window for the above contracts fulfilment

- Phone has not rung …yet…

This is 'Value Destruction'

"Everything is theoretically impossible until it is done."

Robert A. Heinlein

RISK

Risk

Arthur: If I asked you where the
hell we were, would I regret it?

Arthur: Oh good.

Ford: We're safe.

Ford: We're in a small galley cabin in one of the
spaceships of the Vogon Constructor Fleet.

Arthur: Ah, this is obviously some strange use of
the word *safe* that I wasn't previously aware of."

— Douglas Adams, The Hitchhiker's Guide to the Galaxy

Someone has to take the risk;
MOD is risk averse and demands the

same of the supply chain

Risk & Competence

- Skills, Knowledge, Experience [SQEP] in MOD is sadly lacking
- Used to be the case that there were specialists who knew what they were talking about
- Not sure this is the case now
- Taking (procurement) risks requires SQEP
- And they need to be around long enough to take the heat if it goes wrong

MOD Budget Black Hole

- Currently estimated at £2bn on £60bn, of which ~£25bn is equipment

- Let's just imagine (!) that some of this is because of late, non-compliant, software...

- If we can save even 30% on current costs for some of that software, anyone interested?

Defence Digital don't appear to be...

"The significant problems we face cannot be solved by the same level of thinking that created them"

Albert Einstein

LORDS REPORT

Science and Technology Growth Emergency

- House of Lords Science and Technology Committee
  - 2nd report of Session 2024-26
  - Bleeding to death: Science and Technology Growth Emergency
- The **UK House of Lords** has just delivered a wake-up call to every policymaker, investor and entrepreneur:
  - We've built a brilliant start-up machine but a broken scale-up system
  - In other words - we can start businesses but we just can't seem to grow them
- "Government as customer - Procurement should fuel innovation, not frustrate it"

"The most important property of a program is whether it accomplishes the intention of its user"

Pamela Zave

SUMMARY

CDLS Speech - DSEI

- Through life support must be baked in from the start of the acquisition life cycle
- From the earliest design stages, we must ask:
  - How will this capability be maintained, repaired and sustained?
  - How will it adapt over time?

  Software

  - How will it integrate upgrades and new technologies?
  - How can it be supported in war, not just in peace?
  - And how will it be disposed of or recycled
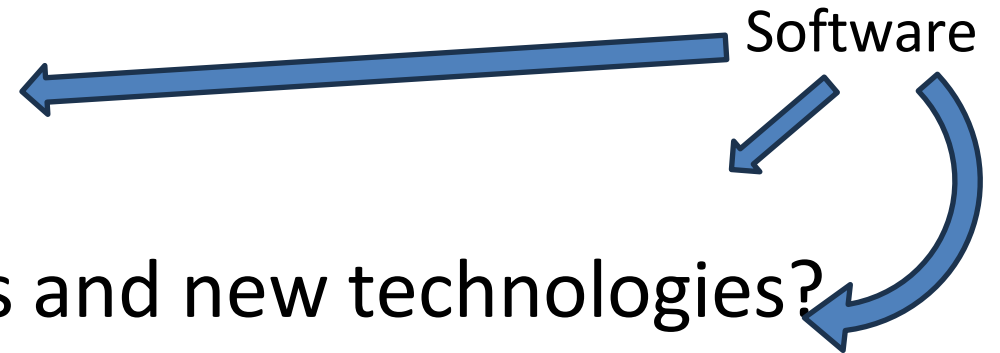
Summary

- Capability is [now] largely vested in software
- Software can be only be flexible if there are decent techniques and processes
  - Still have to show that it's safe/secure
- New highly robust, accessible techniques are available and being used ....just not to the benefit of the MOD
  - NB We get interns using the tools
- Demonstration of the effects has been done in 'nuclear' (and elsewhere)
  - Would <u>really</u> like to do same for the UK military
- But there seems to be a Denial...

Please champion British Innovation