Towards a framework for the testing of biometric systems:
- in procurement, design and operational use

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SCIENTIFIC DEVELOPMENT BRANCH
INTERNATIONAL BIOMETRIC PERFORMANCE CONFERENCE: Towards a framework for the testing of biometric systems: in procurement, design and operational use
SPEAKER Marek Rejman-Greene
Testing through an SE lens

- Systems Engineering approach to Testing
  - reduce distraction of novel technology and ‘apparent’ benefits
  - clear focus on stakeholder objectives
    - business benefits, user concerns, audit procedures, …
  - potential cost reduction
    - testing what’s needed, and when it’s needed ….  
    - input into modelling and simulation activities
    - reuse datasets through lifecycle?
Systems Engineering

- ‘An interdisciplinary approach and means to enable the realisation of successful systems…
- ‘it focuses on defining customer needs and required functionality early in the development lifecycle, documenting requirements, then proceeding with design synthesis and system validation while considering the whole problem…
- ‘Systems Engineering integrates all the disciplines and speciality groups into a team effort forming a structured development process that proceeds from concept to production to operation …
- ‘Systems Engineering considers both the business and technical needs of all customers with the goal of providing quality products that meet user needs’
- (International Council on Systems Engineering, INCOSE, 2006)
Application

– For complex projects in military, non-military governmental applications, and commercial operations
– *Approach* could be used for smaller systems as well
– Aim to reduce integration and interoperability risks as well as deliver applications that work first time at lowest cost
– Testing:
  – Verification – ‘building the service right’ – fulfilling requirements
  – Validation – ‘building the right service’ – fulfilling intended use
The “Vee” Diagram ("traditional" Systems Engineering)

1. Understand the problem space
   - Need
   - Requirements

2. Design
   - Specify

3. Detail design / Manufacture / Procure / Code
   - Assess system cost & risk

4. Assess system value
   - Validate
   - Operate

5. Technical reviews
   - Planning
   - Monitor & Control

6. Support
   - Decommission

7. Dispose

8. Integrate
   - Accept

9. Verify

10. Disposal


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Supplier context

- System integrator
- Specialist biometric integrator
- Biometric middleware supplier
- Matching software supplier
- Sensor supplier
- Specialist software supplier
- Mobile unit supplier
- Test house
Stakeholder context

- Operating Agency / Authority
- Enrolment Agency / Authority
- Subject
- Subject’s Interest Group (trade union, lobby organisation)
- Media
- Auditing Authority
- Regulator
The “Vee” Diagram ("traditional" Systems Engineering)

1. Understand the problem space
2. Assess system Value
3. Need
4. Verify
5. Validate
6. Operate
7. Decommission
8. Support
9. Dispose
10. Requirements
11. Integrate
12. Accept
13. Design
14. Detail design / Manufacture / Procure / Code
15. Specify
16. Technical reviews
17. Planning
18. Monitor & Control
19. Technical Support Processes

Initial review (1)

- Key performance indicators?
- Does the technology address this problem space?
  - Do you need biometrics? Why?
- If YES, relative maturity/performance/sourcing of modality/suppliers
- Seek technology / scenario / operational data in similar contexts
  - How different is the proposed application from reference context?
    - environment, demographics, throughput requirements, exception handling, expectations of stakeholders, …
  - How long ago was the testing done?
  - Who undertook it?
  - Testing and reporting in accordance with standards?
- Comparison with KPIs
- RFP
- How to validate that objectives met (9)?
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Requirements capture (2)

- Focus of SE approach
- Functional and non-functional requirements
- Relating application KPIs to biometric metrics
  - Environmental context
  - Error rates
  - Usability indices
  - Acceptability criteria
  - Throughput rates
  - Interface/Conformance
  - Security and safety
- Design for verification (8) and in-life testing (10)
  - Clarity of definitions (ISO vocabulary)
  - Reference implementation
Design and Specification (3 and 4)

- Work towards acceptance and integration testing (6 + 7)
  - What mix of technology, scenario and quasi-operational approaches?
  - Specially designed harnesses?
  - In parallel, option for modelling and simulation to examine trade-offs?
  - Agreement on datasets to be used in acceptance and integration testing?
    - How representative and challenging should these datasets be?
    - Who supplies?
- Off-the-shelf standards and interfaces?
  - May require application profiles and adaptation of interface specifications
- Dispute resolution procedures
  - Impact of change control if adjustments needed after delivery
Procurement, Design, Development (5)

- Testing of bidder’s claims during procurement
  - focussing on the unknowns and highest risks
  - alternatives
    - development of reference model + independent tests?
    - simulation or modelling – sensitivity analysis + spot checks?
    - benchmarking / assessment of reference deployments
- Demonstration of effectiveness of consortium working together
- Costs
  - Shared? Benefits to both parties
- Involvement of stakeholders other than Authority and Bidder?
- Proposals to adjust during design and development
  - based on internal testing and additional knowledge
  - how involved is the customer in change management?
1. Understand the problem space
   - Assess system cost & risk
2. Collect requirements
   - Analyze
   - Specify
   - Design
   - Develop requirements
3. Design and develop system
   - Specify
   - Develop requirements
4. Detail design / Manufacture / Procure / Code
5. Assess system cost & risk
6. Accept
7. Integrate
8. Support
9. Validate
10. Deploy


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Operational testing (10)

- Comparative performance
  - across time
  - across sites and terminals
  - as introduce upgrades
- Collect both Application KPIs and Biometric Metrics
- Aim:
  - assurance of performance
  - early warning of problems
  - support for continual improvement and cost reduction