Availability: Education and Training for Service Resilience

Background

Much of the current focus in IT education and training is on new systems eg software development. The new operational paradigm is:

- IT is now a utility that is central to the economy and society
- Yet, IT systems are based on software which fails unpredictably.
- So, the IT Profession needs to understand how to increase the resilience of IT based systems –
    - better anticipation and
    - better mitigation (recovery).

The implications for education and training include:

- Advancing new system design where possible while better assuring reliability of legacy systems;
- Better knowledge and skills in the procurement and use of external (3rd party) software and services;
- Importantly for economic productivity today, employing operational measures and tools (including testing) that improve the availability of systems that deliver services to users today.

This paper first contains a gap analysis of SfIA[1] in relation to these capabilities, as SfIA is the basis for the BCS Chartered Institute of IT Professionals qualification and provides a useful framework for defining the new requirements. It then summarises four avenues for developing and delivering education and training which can contribute to improving resilience of operational systems, based on the work of the Availability/Service Resilience Working Group[2], with recommendations for actions by ITLF and other parts of BCS.

[1] https://sfia-online.org/en/sfia-9/sfia-9

[2] In this text and others in the series of ITLF Availability Papers, "we" refers to the Availability/Service Resilience Working Group of the IT Leaders Forum of the BCS – the Chartered Institute for IT, and our extended network of BCS and wider colleagues.

SFIA: Skills by category

Background

Following on from the work of the BCS Service Resilience Working Group[3], we have been asked – what are the implications of the findings for the education, training and qualification of IT professionals?

The analysis below attempts to identify how including knowledge of the increasing damage to the economy and society from IT failures might lead to new or extended SFIA descriptions.

It is based on the Guidance Notes as in SFIA 9[4]. It also incorporates the understanding of the new operational paradigm for IT professionals, as

- Most IT Professionals are not creating new systems
- Most systems are in 24/7 operation
- Extensive complex supply chains with typically 100's of suppliers
- Legacy internal components
- Importance of externally sourced (3d party) software and services
- Tightly coupled systems with unpredictable failures.

As a general comment, it is worth noting that many of the skill Guidance Notes refer to elements of the SFIA framework e.g. "implementing to business requirements". It is a finding of the Working Group that the senior management in organisations are often unaware of the threat to the business finances and/or reputation from IT failure, so that IT Professionals need to find a language for effectively sharing perceptions of risk with these managers. This may suggest that the role definitions in several sections need to be revised to include a more pro-active role for IT Professionals in communicating to managers on sources and impacts of risk.

Finally, throughout, we note a lack of reference to services to users – we have noted this is endemic. Organisations are increasingly likely to be asked by regulators and/or customers to publish the impact of their IT failures on users,

[3] See for instance Ringland, Gill and Ed Steinmueller, *Resilience of Services: reducing the impact of IT failures,* https://londonpublishingpartnership.co.uk/books/resilience-of-services-reducing-the-impact-of-it-failures/

[4] https://sfia-online.org/en/sfia-9/sfia-9

eg in terms of lost user hours, loss of data integrity, risk to health or life, financial damage[5].

SfIA heading: Strategy and architecture

Solution Architecture: add "resilience and availability" to

- considering requirements for security, privacy and testing of solutions

Measurement: add "services to users" to

Measurement can be applied to organisations, projects, processes and work products.

Risk Management: add "and services to users" to

Risk management can be applied to many enterprise functions as well as technical and engineering specialisms, such as, but not limited to, information and technology systems, operations, environmental, information and cyber-security, safety, energy supply[6].

SfIA heading: Change and transformation

User acceptance testing: add

- ensuring testing can safely co-exist with ongoing operational systems

Development and implementation

Systems design: add

- Designing systems able to meet the resilience and availability needs of the organisation

Functional testing: add

- Ensuring testing of new or upgraded components does not impact on operational service delivery

Non-functional testing: this is essential in new operational paradigm

Process testing: this could be extended to refer to key business objectives e.g. defining Important Business Services and impact tolerances[7]

User experience analysis: add "including tolerable impact of service outages" to

- analysing and prioritising user experience needs with stakeholders

[5] https://ico.org.uk/for-organisations/the-guide-to-nis/what-is-nis/

[6] See for instance https://www.theirm.org/media/7237/irm-cyber-risk-resources-for-practitioners.pdf

[7] https://www.handbook.fca.org.uk/handbook/glossary/G3505i.html?date=2022-03-31

SfIA Heading: Delivery and operation

Technology service management: add “resilience and availability” to

- managing the performance of systems and services in terms of their contribution to business outcomes, financial costs and sustainability

Infrastructure operations: add “resilience and availability” to

- monitoring infrastructure performance and its impact on efficiency, performance, security posture and sustainability using containerisation technologies to enhance application deployment and scalability.

Release management: add “resilience and availability” to

- ensuring releases meet quality, security and compliance standards

Deployment: add “resilience and availability” to

- considering supplier-controlled deployments and their impact on the organisation's environment.

Service level management: add “resilience and availability” to

- identifying future trends and their impact on service delivery, for example, technical, market, industrial, socioeconomic, legislative or sustainability targets.

Availability Management: add “including those for user impact” to

- defining and agreeing availability targets

add “to users” to

- maintaining and improving the availability of services *[This is emerging as a central role of IT Professionals, and needs fleshing out in a skills map]*

Continuity Management: add “in terms of financial, reputational and user impact” to

- identifying potential threats and assessing their business impact

Problem management: [the bullets below are at a very high level and describe complex and ongoing tasks which require systems thinking, forensic failure analysis and testing within the new operational paradigm, see “New skills” section below]

- eliminate recurring incidents
- minimise the impact of incidents that cannot be prevented.

Vulnerability assessment: add “in terms of user, financial and reputational impact” to

- business impact assessment

Penetration testing: add

- work with Availability and Continuity management to ensure on resilience after penetration.

SfIA Heading: People and skills

Organisational facilitation: add

- manage the interface between employees and contractors and associated security and policy concerns
- manage staffing and support for 24/7 operation

SfIA Heading: Relationship and engagement

Supplier management: add “including those for resilience and availability”

- managing performance and risks across multiple suppliers (internal and external) using a set of agreed metrics

Contract management: add “resilience and availability” to

- integrating sustainability and ethical considerations into contract management

Customer service support: add

- ensuring data on the user impact of IT failures is collected, analysed and acted upon.

Skills not apparent in SFIA 9 and needed for the new operational paradigm

- Systems thinking: this applies under Systems Design, Technology Service Management and Availability Management
- Forensic Failure Analysis: this applies under Availability Management and depends on the collection and analysis of failure data
- Testing within the new operational paradigm: this applies under Technology Service Management and is a new Skill definition.
- Cooperative working across the organisation with other functions e.g. risk managers, customer service: this could appear under Relationship and Engagement

Recommendations

BCS education and training

The recent Round Table[8] highlighted a number of areas of training needs. Further analysis suggested that technical training for IT professionals is being supplied by a range of training and service suppliers, but that there is a role for BCS in getting Availability/Service Resilience on the agenda of other professionals and senior managers, and business stakeholders. This could build on the business analysis training. It could also use the simulation methods we explored in 2023[9]. Potential partners are ISACA[10], Resilience First[11] and the UK Cyber Security Council[12]. This could be based on

- Management and operational challenges in new business environment
- Organisational leadership for IT professionals: engaging stakeholders, communication within and outside the organisation

Recommendation: ITLF with BCS Education and Training should work with Training Providers and thought leaders as above.

Apprenticeships

BCS has made significant contributions to several Apprenticeship Trailblazers that are responsible for developing apprenticeship standards and assessment plans. BCS is also a government approved End-Point Assessment Organisation, regulated by Ofqual.

In formulating a new Apprenticeship Standard, including the relevant Knowledge, Skills and Behaviours, BCS staff and its (volunteer) Members can play a key part in defining the necessary occupational competence for the role.

However the development of a new Apprenticeship route requires a Trailblazer Group[13] of employers and experts, and ITLF and CIO-Net Members should lead in

[8] https://www.bcs.org/media/ctlfyno5/availability-bcs-itlf-round-table-090125.pdf
[9] https://www.conducttr.com/
[10] https://isaca.org
[11] https://resiliencefirst.org/
[12] https://www.ukcybersecuritycouncil.org.uk/about-the-council/
[13] Trailblazer

seeking to establish a new degree level speciality Availability Engineer to the list for Digital and technology solutions professional (Level 6)[14].

Work in Progress

While Skills England has recently replaced IfATE (Institute for Apprenticeships and Technical Education), the organisation is still in transition mode. New policy has signalled significant changes to apprenticeships for example

- "Apprenticeship Assessment" replaces EPA.
- Minimum training duration can reduce to 8 months from 12.
- Off-the-job-training hours calculated per apprenticeship standard (not per apprentice).
- English and maths not compulsory for those aged 19 plus.

As yet Skills England hasn't published a comprehensive road map for implementing all of the changes, but the plan is to review all assessment plans to bring them in line with new 'apprenticeship assessment' policy (Ofqual is currently consulting on the detail).

It is also unknown if Skills England will continue with the same model of Trailblazers, however, employers will continue to be at the heart of apprenticeship development, but training providers and assessment organisations will also be involved much more moving forward.

Recommendation: ITLF with CIO-Net should continue to consult with BCS Apprentice Policy and work with Skills England[15] on next steps.

CITP – Chartered IT Professional

BCS has recently developed a CITP Speciality for Availability and Resilience Management. We will promote this at the ITLF Annual Conference in September.

Recommendation: ITLF with CIO-Net should work with BCS Marketing to promote the new CITP speciality.

[14] https://findapprenticeshiptraining.apprenticeships.education.gov.uk/courses/25?location=Leicester,%20Leicestershire

[15] https://www.gov.uk/government/organisations/skills-england/about/our-governance

University undergraduate, masters or post-experience education/training

Computer science departments rarely teach resilience as part of their focus on systems development. Management schools in the UK are hard hit by current visa regulations affecting foreign students. Our main approach to Universities will be through the lens of the Apprenticeship scheme.

Recommendation: ITLF to work with the BCS VP – Chair Academy Board to discuss next steps, including presentation at the Academy Board in October.