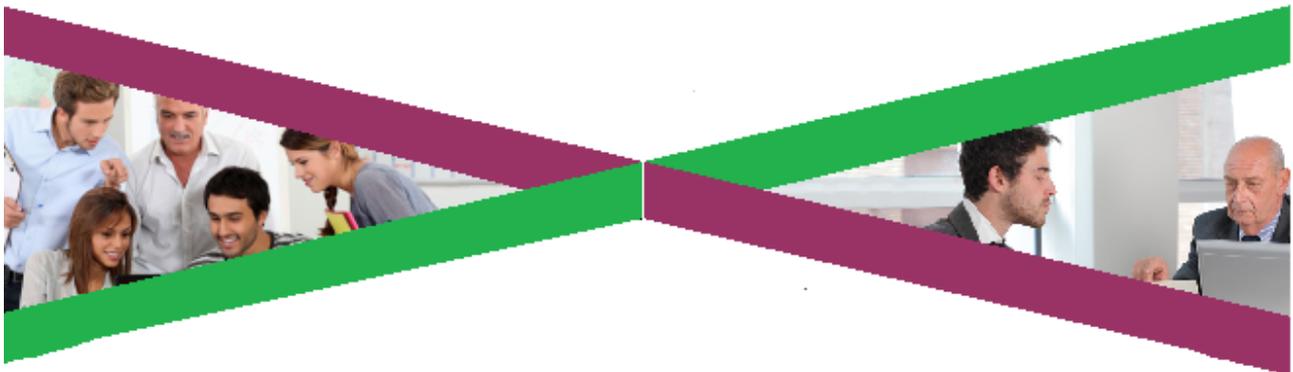**IntGen**

Intergeneration Mentoring

for Entrepreneurs

IO5
TESTING and Validation
of Entrepreneurial E-Learning
Principles and Planning

CONTENTS

COURSE VALIDATION AND TESTING

The underlying concept to which Testing and Validation contributes is quality assurance – establishing that the Learning Design and release will deliver a new or changed learning offering that is fit for purpose and fit for use. In this case, it is to ensure that the INTGEN e-learning is accessible for the learners, easily navigable and delivers as it is intended.

Testing is a vital area within Service Management and must be applied to learning design, validation and usability. If any services are not tested sufficiently then their introduction into the operational environment will bring a rise in:

- Learners dropping out of the course, as if there are problems and failures in service elements and mismatches between what was wanted and what was intended
- Services that are not functioning as intended are inherently less intuitive causing a higher mentor/facilitator support requirement
- Problems and errors in moodle or XERTE that are harder to diagnose in the live environment
- Services that are not used effectively by the users to deliver the desired learning outcomes.

GOAL AND OBJECTIVES

The purpose of the Validation and Testing process is to:

- Plan and implement a structured validation and test process that provides objective evidence that the new or changed service will support the learner's requirements
- Quality assure a release, its constituent service components, the resultant service and service capability delivered by a release
- Identify, assess and address issues, errors and risks

It is essential that the moodle e-learning course delivers the learning objectives as stated for the course to the best ability, providing the structure needed to allow the learner to concentrate on the learning requirements and the outcomes

- Validate that the course (topic) is 'fit for purpose' – it will deliver the required performance with desired constraints removed
- Assure a course or session is 'fit for use' – it meets certain specifications under the specified terms and conditions of use

QUALITY POLICY

The quality management, together with the project team, will define the meaning of service quality. Service Strategy discusses the quality perspectives that a learning resource provider needs to consider. In addition to normal service level metrics, service quality takes into account the positive impact of the service (the course and availability). Service Strategy outlines four quality perspectives:

- Level of excellence
- Value for money
- Conformance to specifications
- Meeting or exceeding expectations.

One or more, if not all four, perspectives are usually required to guide the measurement and control of the Learning Service processes. The dominant perspective will influence how services are measured and controlled, which in turn will influence how services are designed and operated. Understanding the quality perspective will influence the Service and Learning Design and the approach to validation and testing.

RISK POLICY

Different organizations have different attitudes to risk. In general, where an organization is an enthusiastic taker of business risk, testing will be looking to establish a lower degree of confidence than a safety critical or regulated organization might seek. The risk policy will influence control required through development and transition into the 'live' environment including the degree and level of validation and testing of service level requirements, utility and warranty, i.e. availability risks, security risks, continuity risks and capacity risks.

Availability and capacity are seen as the important elements in relation to the course provision; e-learning is expected to be available 24 hours per day, 365 days per year.

CHANGE MANAGEMENT POLICY

The use of change 'windows' can influence the testing that needs to be considered.

The testing policy will reflect the requirements from Service Strategy. Examples of policy statements include:

- Integrate testing into the project lifecycle. This helps to detect and remove functional and non-functional defects as soon as possible and reduces the incidents in learning delivery.
- Adopt a risk-based testing approach aimed at reducing risk to the learning service and the availability.
- Engage with stakeholders, users (learners and teachers/facilitators) and writing or service teams throughout the project and service lifecycle to enhance their testing skills and capture feedback on the quality of services.
- Establish test measurements and monitoring systems to improve the efficiency and effectiveness of Service (Course) Validation and Testing Continual Service Improvement.
- Where time to change is critical, e.g. if there are tight deadlines and a tendency to squeeze testing windows.

TEST STRATEGY

It is vital to work with Quality and Project Management and the team to ensure that:

- Appropriate test activities and resources are included in any Project Plans
- Appropriate time allocation for testing, translations and further testing
- Specialist testing resources (people, tools, licenses) are allocated if required
- The project understands the mandatory and optional testing deliverables
- The testing activities are managed, monitored and controlled.

The aspects to consider and document in developing the test strategy and related plans are shown below.

Some of the information may also be specified in the Project Plan, particularly in relation to the expected 'live' plan or other test plans and it is important to structure the plans so that there is minimal duplication.

TEST STRATEGY CONTENTS

- Purpose, goals and objectives of testing
- Context in the overall INTGEN project
- Applicable standards, legal and regulatory requirements
- Applicable personnel
- Learning Management policies, processes and standards
- Policies, processes and practices applicable to testing
- Resource provider team (who also make changes)
- Test team
- Learners and teachers/facilitators

Test process:

- Test management and control – recording, progress monitoring and reporting
- Test planning and estimation, including estimates for service planning, resources, scheduling
- Test preparation, e.g. site/environment preparation, installation prerequisites (desktop, operating system, browser etc.)
- Technical (Moodle) environment and languages as appropriate

Approach:

- Test approaches, e.g. modelling, simulation
- Degree of independence for performing, analyzing and evaluating tests
- Re-use – experience, expertise, knowledge and historical data
- Timing, e.g. focus on testing individual topics/sessions early vs testing later when the whole course is built
- Developing and re-using test designs, tools, scripts and data
- Error and change handling and control
- Pass/fail criteria
- Roles and responsibilities including approval/rejection
- Assigning and scheduling training and knowledge transfer
- Stakeholders – resource provider, suppliers, user (learner/teacher) involvement
- Test environments to be used, locations, organizational, technical
- User/teacher/trainer documentation

VALIDATION AND TESTING PERSPECTIVES

Effective validation and testing focuses on whether the learning service will deliver as required. This is based on the perspective of those who will use, deliver, deploy, manage and operate (host) the service. These will cover all aspects of the course provision from different perspectives including:

- Learning Design – functional, management and operational
- Technology design

- Documentation
- Skills and knowledge.

Service acceptance testing starts with the verification of the course requirements. For example, stakeholders who sign off the agreed course requirements will also sign off the Acceptance Criteria and acceptance test plan. The stakeholders include:

Users of the course, both learner's and tutors/facilitators within the organization who will use the new or changed course to assist them in delivering their work objectives and deliver learning to their customers

The user involvement in acceptance testing is central to its success, and is included in the testing and design package, enabling adequate resource planning.

From the organization's (or the project team) perspective this is important in order to:

- Have a defined and agreed means for measuring the acceptability of the course
- Understand and make available the appropriate level and capability of resource to undertake service acceptance

USER TESTING – APPLICATION, SYSTEM, SERVICE

Testing comprises tests to determine whether the service in the form of the course (learning resources) meets the functional and quality requirements of the end users by executing defined learning processes in an environment that, as closely as possible, simulates the live operational environment.

Full details of the scope and coverage will be defined in the user test and user acceptance test (UAT) plans. The end users will test the functional requirements, establishing to the agreed degree of confidence that the service will deliver as they require.

A key practice is to make sure that users participating in testing have their expectations clearly set and realize that this is a test and to expect that some things may not go well. There is a risk that they may form an opinion too early about the quality of the resources being tested and word may spread that the quality of the service is poor and should not be used.

TESTING APPROACHES AND TECHNIQUES

There are many approaches that can be combined to conduct validation activities and tests, depending on the constraints. Different approaches can be combined to the requirements for different types of service, learning model, risk profile, skill levels, test objectives and levels of testing. Examples include:

- Document review
- Standards compliance approach, e.g. international or national standards or industry specific standards
- Experience-based approach, e.g. using subject matter experts in the business, service or technical arenas to provide guidance on test coverage
- Simulation
- Scenario testing
- Role playing

- Prototyping
- Joint walkthrough/workshops
- Live pilot.(IO7 for example)

In order to optimize the testing resources, test activities must be allocated against importance, anticipated impact and risk. Impact analyses carried out during design for continuity management and availability purposes are often very relevant to establishing testing priorities and schedules and should be available, subject to confidentiality and security concerns.

Aspects that generally need to be considered in designing service tests include:

- **Finance** – Is the agreed budget adequate, has spending exceeded budget, have costs altered (e.g. software licenses (if appropriate), correct versions of software and add-ons, people resource)?
- **Documentation** – Is all necessary documentation available or scheduled for production, is it practicable (sufficiently intuitive for the intended audience, available in all required languages), in correct formats such as checklists, user guides, teacher guides?
- **Build** – Can the learning resources be built into a final course, translated, moodle in other languages and test environments?
- **Testable** – Is it testable with the resources, time and facilities available or obtainable?
- **Traceability** – What traceability is there back to the requirements (Scheme of Work or similar planning document)?
- **Where and when** could testing take place? Are there unusual conditions under which a course might need to run that should be tested?

Awareness of current technological environments for different types of organization, Learner home environment (minimum requirements), staff and user is essential to maintaining a valid test environment. The design of the test environments must consider the current and anticipated live environment when the course is due for operational handover and for the period of its expected operation. In practice, for many organizations, looking more than six to nine months into the technological future is about the practical limit.

In some sectors, however, much longer lead times require the need to predict further into the future, even to the extent of restricting technological innovation in the interests of thorough and expansive testing.

Designing the management and maintenance of test data needs to address relevant issues such as separation of test data from any live data (this is not really necessary in the case of testing the e-learning).

TYPES OF TESTING

The following types of test are used to verify that the service meets the user requirements. Care must be taken to establish the full range of likely users, and then to test all the aspects of the service, including support and reporting.

Functional testing will depend on the type of course. In the INTGEN case, this is blended learning, including workshops; the testing should include ensuring that the workshops relate to the e-learning as appropriate (and vice versa).

Functional testing is covered in many testing standards and best practices. These tests can be conducted at several test levels to help build up confidence in the product release. They include:

- Usability testing
- Accessibility testing
- Process and procedure testing (blended as above)
- Language testing
- Performance, capacity and resilience testing
- Volume, stress, load and scalability testing
- Availability testing
- Backup and recovery testing
- Compatibility testing

USABILITY – USERS AND MAINTAINERS

Usability testing is of increasing importance as more learning becomes available on the Internet and becomes widely used as a part of everyday life and ordinary business usage. Focusing on the intuitiveness of a service can significantly increase the efficiency and reduce the unit costs of both using and supporting a service.

User accessibility testing considers the restricted abilities of actual or potential users of a new or changed service and is commonly used for testing web services. Care must be taken to establish the types of likely users, e.g. hearing impaired users may be able to operate a PC-based service.

This testing might focus on usability for:

- Disabled users, e.g. visually or hearing impaired
- Sensory restricted users, e.g. colour-blind
- Users working in second language or based in a different culture.

CHALLENGES, CRITICAL SUCCESS FACTORS AND RISKS

Still the most frequent challenges to effective testing are based on lack of respect and understanding for the role of testing. Traditionally testing has been starved of funding, and this results in:

- Inability to maintain test environment and test data that matches the live environment
- Insufficient staff, skills and testing tools to deliver adequate testing coverage
- Projects overrunning and allocated testing time frames being squeezed to restore project go-live dates but at the cost of quality
- Projects estimating delivery dates inaccurately and causing delays in scheduling

Critical success factors include:

- Understanding the different stakeholder perspectives that underpin effective risk management for the change impact assessment and test activities
- Building a thorough understanding of risks that have impacted or may impact successful transition of courses
- Encouraging a risk management culture where people share information and take a pragmatic and measured approach to risk.
- Quality is built into every stage of the service lifecycle

- Issues are identified early in the service lifecycle
- Testing provides evidence that the courses have been built and implemented correctly in addition to what the customer needs
- Clear expectations/objectives
- Lack of understanding of the risks means that testing is not targeted at critical elements that need to be well controlled and therefore tested
- Resource shortages (e.g. users, support staff) introduce delays and have an impact on other work.