

Software Testing Innovation Alliance

– the SHIP project –

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Abstract. The SHIP project is an Erasmus+ Knowledge Alliance whose main goal is to strengthen the knowledge triangle between universities, Small and Medium Sized Enterprises (SMEs) and innovation support organizations. The project entails to set-up of 4 Innovation Alliances in 5 countries (Ireland + UK, Germany, Spain, Romania). The goal of these alliances is to consolidate cooperation as a key feature of the knowledge economy, reshaping traditional roles by multiplying outlets for universities to generate direct economic impact from their work, and breaking down barriers so that SMEs of all shapes and sizes can actively implement academic-based innovation to boost their own competitiveness, and that of the wider economy. One of the alliances is the Spanish Software Testing Innovation Alliance, it is this alliance that is mostly described in this showcase. The objective of this Alliance is to bring together key actors in Spain on software testing in order to work together to improve innovation support and technology transfer from universities to companies in the area of software testing. The goal is to execute micro-projects, based on *mutual needs*, that induce *small-step change* having an *impact* in research, in practice, in business or in education. The final results being better software quality.

Keywords: Innovation, Software Testing, Technology Transfer, Small and Medium Sized Enterprises

1 Information about the SHIP project

The SHIP project is an Erasmus+ Knowledge Alliance whose main goal is to strengthen the knowledge triangle between universities, SMEs and innovation support organizations. In the following table we summarize the basic information about the project:

Acronym	SHIP
Name	SME and Higher education institutes in Innovation Partnerships
Source of funding	Erasmus+ Knowledge Alliance reference 554187-EPP-1-2014-1-IE-EPPKA2-KA
Total funded budget	563.362 euros
Duration	December 2014 - December 2016
Website	http://www.innovationalliance.eu/

The project integrates seven key partners from six countries into the following consortium.

- Louth County Council, Ireland (coordinator)
- Newry and Mourne Cooperative , United Kingdom
- Mindshare Consulting, France
- Canice Consulting, Ireland
- The University Industry Innovation Network, The Netherlands
- Universitat Politècnica de Valencia, Spain
- Universitatea Politehnică din București, Romania
- Univations, Germany

The consortium has been formed strategically to bring together all those competencies and experiences needed to exploit the full value of the innovation alliances across Europe.

2 Objectives and expected outcomes of the project

The SHIP project will strengthen the knowledge triangle, by building sustainable collaborative relationships between universities, Small and Medium Sized Enterprises (SMEs) and innovation support organizations. The goal is to build synergistic relationships between key stakeholders in the field of higher education and small enterprise to create a new culture of collaboration in innovation support.

This way, the project responds to the problem of increasing fragmentation in the field of innovation promotion, especially the dislocation between those who generate knowledge that could spur innovation (universities), and those who can translate that knowledge into marketable strategies and use it to produce economic growth (SMEs). The so-called notorious gap between university and industry.

Few if any would dispute that successful transfer from academic results into industry is important. On the one hand, academic research activities should be guided more towards the challenges companies face and solutions to their immediate problems. On the other hand, industrialist should help academics to validate their research results within a real industrial context. Academia and industry obviously need each other and collaboration should be improved. For decades, many regional, national and international initiatives exist to try to

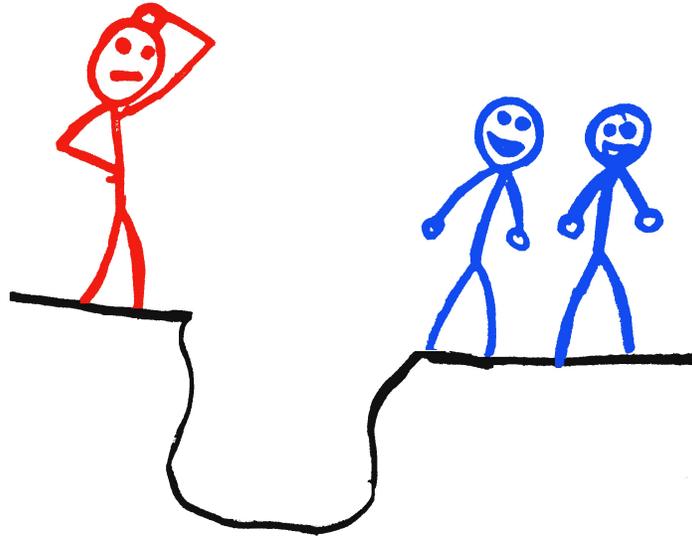


Fig. 1. An illustration of the gap between universities and industry

close the gap. However, in the current days, successful collaboration still seems to be difficult to achieve and success stories are still something rare instead of something normal. We keep talking about the gap (Fig 1) with industry on one side and academia on the other. But we seem to be unable to even narrow it.

The SHIP project also focusses on this the gap with the objective narrow it. The project, however, takes a more pragmatic approach and entails, amongst others, to set-up of 4 Innovation Alliances in 5 countries (Ireland + UK, Germany, Spain, Romania) The goal of these alliances is to consolidate cooperation as a key feature of the knowledge economy, reshaping traditional roles by multiplying outlets for universities to generate direct economic impact from their work, and breaking down barriers so that SMEs of all shapes and sizes can actively implement academic-based innovation to boost their own competitiveness, and that of the wider economy. The following alliances are being set-up:

1. The Regional Alliance in the Halle German region combines all important stakeholder groups in connection with innovation and technology transfer to create an action plan help to coordinate efforts and projects and creates synergies in the region.
2. The Cross-Border Alliance(Ireland-UK) is aimed at establishing how SMEs can access research and training from universities to benefit in their business.
3. The Romanian Innovation Alliance whose goal is to foster green energy and sustainable products and services.
4. The 4th alliance is the Spanish Software Testing Innovation Alliance. Software testing is a prominent part of software development, and its efficient

automation is fundamental for any software company. In today's digitized world, software applications are mission-critical assets through which companies carry out their business.

Trends such as globalisation, standardisation and shorter life-cycles place great demands on the flexibility of the software industry. In order to compete and cooperate on an international scale, a constantly decreasing time to market and an increasing level of quality are essential. Testing is at the moment the most important and mostly used quality assurance technique applied in industry. However, the complexity of software and hence of their development amount is increasing. Modern systems get larger and more complex, as they connect large amounts of components that interact in many different ways and have constantly changing and different types of requirements (functionality, dependability, security, etc.). Data processing that impacts all aspects of our life is increasingly distributed over clouds and devices. This leads to new concerns to emerge, such as availability, security, and privacy. Consequently, the development of cost-effective and high-quality systems opens new challenges for industry that cannot be faced only with traditional testing approaches. New techniques for systematization and automation of testing throughout the software and system life-cycle are being researched by universities. We need to guarantee that these are successfully transferred to industry such that they can keep up with the increasing quality requirements.

The rest of this paper will go into more depth about the status and results of this alliance.

3 The Software Testing Innovation Alliance

The objective of this Alliance is to bring together key actors in Spain on software testing in order to work together to improve innovation support and technology transfer from universities to companies in the area of software testing. This way we want to solve software testing problems, tackle challenges and remove barriers. The goal is to do this by executing micro projects based on *mutual needs* that induce *small-step change* that has *impact* in research, in practice, in business or in education. The final results being better software quality.

3.1 Mutual needs

Another emphasized aspect here is *mutual needs*. The alliance organizes events in Spain where Spanish academia and industry are brought together to brainstorm and discuss how cooperation can improve innovation in software testing in Spain. Universities can elevator-pitch their R&D results on software testing indicating: what they have, how it can help companies and who has already used it successfully. SMEs on the other hand get a short time slot to explain their current practice on software testing and the problems, challenges and needs they have.

After the presentations, speed-dating sessions are done such that every university representative meets up with each SME present.

After its launch in June 2015, the Spanish Software Testing Innovation Alliance has organized 4 successful events in 4 different regions in Spain: Valencia, Andalusia, Aragon and Basque country.

3.2 Small-step change

Another of the emphasized aspects here is *small-step*. We do not pretend to have a silver bullet, nor to finally close the gap between industry and university. During and through the meetings, we aim to detect the opportunity to do a micro (or even pico) initiatives that can start the collaboration and technology transfer immediately. Universities get the opportunity to evaluate their results in practice and companies get to try out something that might help them solve a problem or improve testing!

One of the success factors of this pragmatic approach is that these projects are executed immediately within the context of the SHIP project. Consequently, barriers of looking for pre-financing are overcome and a short project is immediately executed to show the company whether the research results are worth anything to their practices or not. Then after this the company can better decide whether continuing with this university collaboration is something they would be willing to pay for.

During the 4 meetings we have compiled a list containing 15 micro-initiatives between 3 Spanish universities (Universidad Politecnica de Valencia, Universidad de Oviedo y Universidad de Sevilla) and 8 Spanish SMEs, 1 Spanish large company and 1 Dutch large company. At the moment 7 of these initiatives are executing, and the remaining 8 are in a very initial “there is a will and interest to do it but we are not sure”-planning phase.

3.3 Impact! Whatever happens gives impact.

The last emphasis we put on *impact* in research, in practice, in business or in education. The good news about the described approach is that whatever happens we can count on impact. If we successfully transfer an university R&D results to a company, we have *practice* impact and even after a while *business* impact because quality of software products in the companies might have improved because of the improved testing processes. For the universities a successful transfer gives data that can be used to persuade others that the solution is worth trying. Even if the transfer is not successful and it cannot be used in the company or does not show to improve anything, we still have impact on *research*. Researchers have learned from the experience and might have more insight in: which parts of their solutions need more working; what directions need their research effort to go to solve the problems or challenges encountered in the transfer. Finally, establishing contacts with companies interested in trying out the prototype tools of the universities, we have the chance to create interesting industrial projects for

students (for example when needing to write their master thesis). This created impact in *education*.

3.4 Participants

The alliance is open to many different types of organisations:

- SMEs: the core of the alliance and main benefit of the adoption of innovation testing methods and technologies in practice. To date we have 32 Spanish SMEs that are interested in the alliance, 8 of them are involved in micro-initiatives with a Spanish university.
- Academics: Software testing is a prominent part of software engineering research. Effective and efficient software testing is fundamental. In today's digitized world, software applications are mission-critical assets through which companies carry out their business, so research is needed in tools and techniques that can overcome the challenges. At this moment we have the following Spanish universities involved (the table also lists the transferable testing technology they have).

Universidad Politécnica de Valencia	TESTAR Automated Testing at the User Interface Level	[8]
	TUNE-UP Agile testing tool	[5]
Universidad de Oviedo	SQLRules	[6]
	SQLTest	[7]
Universidad de Sevilla	Early Testing Methodologies	[3]
Universidade Da Coruña	Property Based Testing	[1]
Universidad del País Vasco	Software Testing Data Analysis	[2]
Universidad de Málaga	Search-based software testing	[4]

- Large enterprises: have testing needs in order to develop and deploy dependable and secure critical software and may be users of different testing solutions of the community.
- Developers of testing methods and tools: developers and researchers will have access to different testing platforms and may share their knowledge and advancements in the community.
- Public administrations: innovative testing solutions could lower the integration, testing and maintenance costs of systems such as ones for managing healthcare, social and environmental policies. In some specific domains, i.e. logistics / dangerous goods transportation, there are regulations at local, regional and national level. They may be involved to automatically generate tests that reduces bureaucracy.
- Standardization bodies: to establish international standards in different topics.
- Policy-makers: With the spreading of the digital economy on the Internet of Services and Things that will involve all aspects of the citizens everyday lives,

the dependability and security of services will become a must. We will raise the awareness of the policy makers and evaluate the need or opportunity of specific regulations concerning testability and testing.

4 Expected outcomes of the project

During the execution of the project the micro-initiatives will be executed and the impacts will be evaluated at the end of the project. Then after the project we will have the following results:

- A (virtual) community where news, events and general information may be shared among its members
- A repository of software testing results from academia which may be adopted by industry
- A set of use cases where testing solutions have been transferred into industry in practice
- Lessons learned from transferring technologies from academia to industry.
- A set of national contact points in order to promote face-to-face meetings in different countries

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