
Promoting innovation in agile methods: two case studies in interactive installation's development

Pedro Campos

University of Madeira,
Campus Universitário da Penteada,
9000-390 Funchal, Portugal
and
INESC-ID Lisbon,
R. Alves Redol, 9, 1000 Lisboa, Portugal
E-mail: pedro.campos@inesc-id.pt

Abstract: Software design and development has evolved significantly since the era of waterfall cycles. The agile movement gained momentum and is now one of the most popular ways of creating and delivery software. We argue that agile methods can be particularly effective when designing and developing interactive installations, as long as the agile methods are correctly tailored to this application domain. Based on significant experience, which was built upon ethnographic observation and participation in about a dozen industrial projects related to interactive installations' design and development, we present agile strategies which proved effective when dealing with the industry's typical tight production schedules, and we also provide the data from two case studies, discussions and conclusions. Using real world case studies such as these, researchers can obtain more insight into best practices that could be useful for promoting innovation during the agile process.

Keywords: agile development; interactive installations; extreme programming; XP; human-computer interaction; software engineering.

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Biographical notes: Pedro Campos is an Assistant Professor at the University of Madeira, Portugal, and an Invited Researcher at the Visualization and Intelligent Multimodal Interfaces Group, INESC ID, Lisbon. He is also the Program Director for the BSc in Computer Science and a Founding Member of the IFIP 13.6 Working Group on Human Work Interaction Design. His main research interests are agile software development, UML, tool support, interaction design and human-computer interaction.

1 Introduction

Agile software development (ASD) is a software engineering approach that has come to an age of relative maturity, while keeping itself open to integration or cross-pollination among approaches that previously represented sharply opposing postures (Ergdomus,

2007). On the other hand, the principles underlying the ASD movement, firstly advocated by a set of several practitioners, are based on concrete best practices, which were outlined through a large body of knowledge. That body of knowledge included essentially a vast amount of success and failure case studies and experiences with many software projects, in many different application domains. While each practitioner has an individual perspective about how to successfully approach software development, there were key factors, which seemed common to each and every project. These included tight collaboration between developers and business managers, face-to-face, informal collaborations as opposed to bureaucratic production of project documentation and formal modelling, frequent iterations and rapid deliveries of functional prototypes, embracing requirements' change as opposed to well-defined, fixed requirements right at the start of a project, as well as other principles that have become widely known by the general software engineering community (Fowler and Highsmith, 2001). Since the early Agile Manifesto days (Fowler and Highsmith, 2001), there has been a growing number of research papers around this theme, some of them focusing on the success factors brought by the agile practices, such as customer commitment derived from early and continuous delivery of valuable software, decision time, likely made within short timeframes, corporate culture [agile methodologies are not appropriate to bureaucratic organisations (Abrahamson et al., 2002)], and dynamism and uncertainty, i.e., being able to handle dynamism and the uncertainty built in it.

There are also many tailored approaches and variants of agile development. The most popular ones include extreme programming (XP) (Abrahamson et al., 2002; Abrahamson et al., 2002) SCRUM (Schwaber, 2004) and crystal methodologies (Cockburn, 2001).

However, there is currently a lack of agile strategies to designing a novel kind of software: software built to support interactive installations such as interactive floors, walls, multi-touch tables and – in general – software for novel interaction paradigms. This new kind of software is quite different from the traditional GUI-oriented software, which is essentially based in WIMP (Windows, icons, menus and pointing devices) (Want and Pering, 2005) user interfaces.

It is challenging to develop software for this new kind of interaction paradigms, for several reasons. Solutions have to mix innovation with practicability, and from the technical point of view, this means solutions must sense information from the real world natural interactions, in real time. Because of this difficulty, designing interactive installations is a task, which is particularly hard to describe to the clients – and because of the tight production schedules, companies are ready to explore agile development methods such as SCRUM (Schwaber, 2004) and XP (Hedin et al., 2003). Especially when dealing with demanding clients, having a higher degree of user participation is beneficial to the project's outcome.

Based on a significant experience, which was built upon ethnographic observation and participation in about a dozen industrial projects related to interactive installations' design and development, we present agile strategies which proved effective when dealing with the industry's typical tight production schedules, and we also provide the data from two case studies, discussions and conclusions.

Our contribution is two-fold:

- 1 We present the results from applied case studies, following the spirit of the agile movement – which was itself based on a practical experience body of knowledge – in a novel software development context that is becoming increasingly

important: multimodal user interfaces (Klein and Myers, 1999) sometimes also referred to as ubiquitous computing (Latoschik, 2005).

- 2 We describe a novel set of agile strategies aimed at supporting this development context in the tourism market. Both of these contributions are, to our knowledge, original, although several researchers have applied similar research methods to similar domains.

These domains include, for instance, the development of secure web applications (Ge et al., 2006), large distributed software projects for enterprise applications (Hildenbrand et al., 2008), real-time and embedded systems development (Douglass, 2009) and even for mixed-reality systems, where there is a close coupling of real world objects with computer generated information and functionality (Paelke and Nebe, 2008).

Therefore, this paper contributes to strategies applicable to companies, which seek to work together with architects, visual designers and interior designers, in order to create interactive installations in a fast-paced industry. We analyse the cultural differences in each of the actors typically involved in such projects, the roles between them and the communication issues that arise, while also providing insight on how to overcome the major obstacles, always inspired by the agile principles. Although the paper reflects the learning from many case studies, for brevity purposes we focused the analysis on two representative projects: a cultural interactive exhibition, and a tourism information office featuring several interactive installations.

The remaining of this paper is organised as follows: the next section describes the theoretical concepts underlying our research, focusing on agile methods, novel interaction paradigms and innovation processes. Section 3 briefly described the research method employed. Section 4 describes the two case studies, including a detailed discussion of the relevant issues, main challenges and innovation processes which were integrated into the agile process. Finally, Section 5 provides a discussion, conclusions and future work.

2 Theory and concepts

2.1 Agile methods

Agile methodologies fit nicely into the context of small software development companies, since they evolved as a reaction against the so-called ‘heavyweight’ methods, which are regarded as bureaucratic and slow, like the waterfall model. The main idea advocated by agile practitioners, is that short iterations turn the methods more responsive to changes in the environment – this is especially useful in the application domain this paper is focused on. In particular, artists and interior designers, who were stakeholders in the projects we will describe, have a particular work style, which is based on constant change as a way to create better results. It’s a cultural and professional issue that clashes against the more formal and compartmented software engineering process.

The agile approach quickly became mainstream in the software industry. The agile community is defined by a core set of beliefs and practices, in a “practice what you preach” philosophy. The Manifesto for Agile Software Development (2010), the most well-known conjugation of agile principles and beliefs, states:

“(...) we have come to value:

- individuals and interactions over processes and tools
- working software over comprehensive documentation
- customer collaboration over contract negotiation
- responding to change over following a plan.”

Agile methods pay significant attention to users and their needs. They bring users to the development process from the early stages, when the requirements are discovered, and give them an opportunity to speak up and say what they really need and want.

Perhaps the most famous “product” of the agile movement so far is the extreme programming approach (Cockburn, 2001), which comprises four values ↓ communication, simplicity, feedback, and courage ↓ and five basic principles ↓ rapid feedback, assume simplicity, incremental change, embracing change, and quality of work.

XP is an ASD process with the goal of delivering high-quality software on time. This is accomplished through different means: test driven development (employing unit tests), short iteration cycles, on-site customers, pair-programming, refactoring – the process of restructuring an existing body of code, changing its internal structure without changing its external behaviour – and user stories, where requirements are captured in short narrative stories.

There are some studies, such as Mitra and Gupta (2008), regarding how innovation can be brought to the XP and agile processes. However, little research is based on extensive experience and observations from real world case studies. Innovation and agility are essential factors to supporting the creation of value in a fast-paced global knowledge economy.

2.2 Novel interaction paradigms

Interactive installations based on novel interaction paradigms, such as gesture recognition or multi-touch surfaces are typically designed through user-centred approaches, the so-called UCD methods (Vredenburg et al., 2002). There are, however, many similarities between the XP practices and UCD. What XP argues as iterations, small increments, UCD advocates as prototyping. The XP “planning game” is very similar to the UCD concept of “focus groups”, which are essentially *focused discussions* where a moderator leads a group of participants through a set of questions on a particular topic (Dix et al., 2004). XP’s story cards, task cards and user stories are very alike to UCD’s scenarios, user roles and task models. The XP practice of having an on-site customer representative is analogous to the UCD notion of user-centred design, or user participation. The UCD equivalent of XP’s tests (or test stories) is the evaluation session or usability inspections. And finally, XP’s metaphors correspond to UCD’s conceptual and mental models (Dix et al., 2004).

In addition, and in a similar way, the agile modelling practices are very similar to UCD practices. “Prove it with code” practices are called “prototyping” in UCD. And the agile practice of “active stakeholder participation” Manifesto for Agile Software Development (2010) is similar to UCD’s user participation and focus groups (Dix et al., 2004).

Some practitioners such as Norman (2006) and Holzinger et al. (2005), have combined UCD and XP by varying approaches. However, experts pose serious doubts on whether the XP process can lead to true UCD (Hudson, 2005). Some of the issues that can prevent the integration of UCD techniques and tools into the XP process include: ad-hoc input, since the usability input is not provided in an ad-hoc manner but instead after significant periods of time; difference of cultures, since software engineers on the one hand and UCD experts on the other hand come from different domains with different approaches, backgrounds, attitudes and communication skills; the technical focus of XP, more specifically the focus on testing functionalities, also contributes to overlooking usability issues; and finally the fact that UCD clearly views customers as a necessary inclusion throughout the design and development, the Agile Software Development Manifesto (Manifesto for Agile Software Development, 2010) does not explicitly demand end-users as customers.

2.3 *Innovation processes*

Creativity support tools have the power to accelerate discovery and innovation (Shneiderman, 2007). The question is posed in terms of how can designers of programming interfaces, interactive tools, and rich social environments enable more people to be more creative more often (Shneiderman, 2007).

Ben Shneiderman, one of the most prominent leaders of the human-computer interaction field, advocates that Leonardo da Vinci could help as an inspirational muse for the new computing (Shneiderman, 2005). Shneiderman says his example could push designers to improve quality through scientific study and more elegant visual design. Leonardo's example can guide us to the new computing, which emphasises empowerment, creativity, and collaboration.

Shneiderman (2000) also proposes a four-stage framework for creativity that can assist designers in producing the right tools their users:

- 1 collect: learn from previous works stored in libraries, the web, etc.
- 2 relate, consult with peers and mentors at early, middle, and late stages
- 3 create: explore, compose, evaluate possible solutions
- 4 donate: disseminate the results and contribute to the libraries.

He also emphasises that "Education could expand from acquiring facts, studying existing knowledge, and developing critical thinking, to include more emphasis on creating novel artefacts, insights, or performances" (Shneiderman, 2000).

Some successful examples of creativity and innovation processes come from universities, especially examples where cross-disciplinary design research is involved. Ellen Yi-Luen Do and Mark Gross (2007) engaged their students in this line of action and describe parameters and principles that they found helpful in organising and conducting this kind of work. A variety of projects that have been developed in their group illustrated their parameters and principles. The focus is on making and they have come to see creativity as grounded in the ability to make things.

Innovation processes assume many shapes. Hohmann (2006) in his 2006 book, *Innovation Games: Creating Breakthrough Products Through Collaborative Play* proposed twelve games that can be used to uncover the customer's true, hidden, needs and desires. He also shows how to integrate the results into the product development

processes, helping focusing the efforts, reducing costs, accelerating time to market, and delivering the right solutions (Hohmann, 2006).

Warr and O'Neill (2005) understand and analyse design as a social activity, essentially. Presenting a theoretical account of why social creativity should, in principle, be more effective than individual creativity, they explain findings to the contrary in terms of three social influences to design: social blocking, evaluation apprehension and free riding.

Social blocking. This occurs when ideas are expressed verbally within a group. This could harm a group's creativity because if one member of the group is expressing her ideas, then other members of the group are simultaneously prohibited from expressing their ideas. To mitigate the effects of social blocking, researchers started using synchronous forms of expressing ideas, such as writing ideas and distributing them around the members of the group.

Evaluation apprehension. When members of a group fear criticism from other members, preventing them from expressing ideas and materialising their thoughts. This reduces the quantity of ideas in the group, which in turn reduces the overall creativity and innovation. An anonymous means of expressing ideas, by removing the individual's identification to the idea, could encourage people to express more ideas.

Free riding. Also known as social loafing, this is the result of a group's members becoming lazy and relying on other members in the group and therefore not contributing as many ideas as they could. Social stimulation – encouraging a higher motivational level by increasing accountability for individual performance – has been referred to as one means to decrease free riding.

Therefore, the authors suggest that research in supporting the innovative design process should focus on migrating the effects of these social influences to the creativity of whole design teams (Warr and O'Neill, 2005).

Other authors (Gallivan, 2003) examined the differences in software developers' creative style. They expected that innovators (i.e., more innovative employees) would demonstrate higher levels of job satisfaction and performance than adaptors (i.e., less innovative employees), and conducted a survey of 220 developers in two firms that had recently replaced mainframe-based software development with client/server development. The results interestingly demonstrated a pattern of relationships among employees' creative style, attitude to the innovation, job satisfaction, and performance.

3 Method

This research was mainly carried out in the company WowSystems, while the case studies we focus on happened at the World Expo Zaragoza 2008 (Spain), and at a cultural exhibition in Madeira (Portugal). WowSystems is specialised in new digital media, novel interaction paradigms and interactive installations. Because of the very nature of its core business, *innovation* and *agility* are main concerns of the company. Founded in early 2008, as a result of three years researching novel interaction paradigms at the University of Madeira, WowSystems' main focus has been to professionally create useful and usable interfaces that make people say "Wow!" Interestingly enough, innovative interfaces have been created regardless of the supporting display's size: it is a company's motto that creative interactivity can be added to entire buildings – on one extreme – or to tiny screens in mobile devices like the iPhone.

The company's core business has been focused into interactive, digital media surfaces. The company also designs and produces interactive objects (including clothes!). This flexible technology has been applied to a variety of contexts, such as advertising, museums, science centres and schools.

Some of the most innovative products developed by the company take the form of interactive installations that have been successfully applied to areas such as tourism, culture and heritage and advertising.

We followed an interpretive research approach (Walsham, 1995). Interpretive case studies can make a valuable contribution to information system (IS) theory and practice and the volume and range of such studies are limited. Some researchers (Walsham, 1995) agree that there is a need for more interpretive stances in the future in the IS field and software engineering as well.

This means that the analysis of data was based "on understanding a complex whole from preconceptions of about the independent meanings of its parts and their interrelationships" (Klein and Myers, 1999). We also followed in some way the spirit of ethnographic research, taking field observations and tracking artefacts such as post-it notes, desktop items, whiteboard collaborative writing sessions and similar ones. Ethnographic analysis is derived from anthropology. Field observations are taken at a site of a possible user. These observations also gather the sequence of work and interruptions that determine the user's typical day.

Our method included the gathering of data related to

- 1 participant observations, in an ethnographic study manner, over the course of the projects
- 2 semi-structured interviews to stakeholders
- 3 informal meetings and discussions.

The following are the time periods and projects the author participated, in order to conduct the research following the previously mentioned method:

- Cultural Interactive Exhibition: January to April 2008
- Portuguese Pavilion in Expo Zaragoza, Spain: April to September 2008.

The meetings involved a large assortment of professions: programmers, visual designers, project managers, interior architects, artists, government persons, marketing personnel and researchers. We took notes during the observation sessions, and audio-recorded some of the interviews. Photos were taken at relevant and/or interesting moments throughout the development. The authors were also able to participate in informal meetings.

Following the ethnographic research spirit, we also conducted several in-depth structured interviews with developers and engineers, project managers, and customer representatives, which included the professions mentioned before.

4 Case studies

WowSystems had chosen to follow agile development methods in all projects developed by the company, since it fitted very well into the tight schedules the clients demanded. There were, however, two major concerns expressed by the developers: how to achieve

innovative solutions and how to deal with the communication issues. These communication issues were derived not only from the background differences between artists and engineers but also from the very nature of interactive installations as “physical pieces” of software, sometimes even called as tangible user interfaces (Ishii, 2008).

We will begin by analysing the Cultural Interactive Exhibition, and afterwards we will describe the Tourism Information Office case study. At the end of each subsection, we provide a detailed discussion organised around the main challenges and processes; in particular we outline how agile processes should be tailored in order to be more effective when designing interactive installations like these.

4.1 Cultural interactive exhibition

In April 2008, WowSystems designed a set of sensor-based installations in a cultural exhibition organised by the Direction of Cultural Affairs, which aimed at showing the visitor the cultural richness that formed the streets of Funchal (Portugal). The concepts of the exhibition revolved around promoting awareness about, and foster a better understanding of, the cultural tourism that can be performed by simply walking through strategic streets and watching certain buildings, sites, and heritage. To better complement the exhibition’s traditional large-format printed panels, the organisers wanted to have the interactive factor as a means to add value to the visitor’s experience.

The final set of installations included:

- 1 a virtual encyclopaedia that could be browsed by simple page-flipping gestures performed in mid-air
- 2 an interactive floor that illustrated the evolution of the transportation means along the years
- 3 an interactive timeline using a touch-screen
- 4 a panel with projected images that would change through waving.

These installations are shown in Figure 1.

Figure 1 Innovation examples for cultural heritage and museums: the installations and interaction styles employed throughout the 2008 “Cultural Tourism” exhibition (a) page-flipping (b) walking over (c) waving (d) touching (see online version for colours)



Figure 1 Innovation examples for cultural heritage and museums: the installations and interaction styles employed throughout the 2008 “Cultural Tourism” exhibition (a) page-flipping (b) walking over (c) waving (d) touching (continued) (see online version for colours)



The use of sensor-based interactive installations, in particular installations involving infrared motion sensors as well as cameras coupled with real time video processing algorithms, have been receiving considerable interest both from industry and academia (Danks, et al., 2007; Hornecker and Stifter, 2006, Back et al., 2001). During the design and evaluation of interactive exhibitions, much can be learned about interaction design for public settings like these.

An important principle, upon which the agile methodologies are based, is the close relations between developers and users or customers. Being agile means giving priority to customer's satisfaction through early and continuous delivery of software where changes are appreciated. The main customers for this Culture Interactive Exhibition were architects, artists and designers who were interested in conceiving the best possible ways to provide an interesting exhibition. The design and development processes were therefore a collaborative effort between WowSystems' team and these user groups.

“Change was constant – and communication was a true challenge, since it was difficult for them to communicate us the whole point of. And when we moved from the laptop to an actual kiosk or projection, we noticed how different their opinion was regarding every aspect of the design and development.”
(Developer/Designer, WowSystems)

Another interesting observation was:

“They were completely focused on the MS PowerPoint model – they thought kiosks and interactive installations had to be designed as if they were PowerPoint presentations.” (Developer, WowSystems)

The experience of designing and evaluating an interactive exhibition featured four different interaction styles to control digital contents: touching, walking over, waving and page-flipping. The design approach was based on tailoring the interaction styles to the exhibition's contents and making a creative use of sensor-based technology, with the explicit goal of reducing the distance between visitors and cultural heritage.

While some of the more than fifty interactive installations already deployed were solely created as experiential activities, providing an increase in the level of learning by adding facts to an already well-formed conceptual model, others were designed to enact a reflective activity, thus supporting a restructuring learning where new conceptual

frameworks need to be built (Danks, et al., 2007; Hornecker and Stifter, 2006). Another issue that drives the development team is the observation of the visitors' and users' behaviours, particularly finding out how collaborative activities can be supported as feedback mechanisms to enhance engagement and learning motivation.

Generally, the observations were focused around four issues:

- 1 usability, how easy and intuitive it is to interact with the products?
- 2 interaction model, i.e., how did the interaction model was learned and reapplied
- 3 social interaction, which types of interaction triggered more collaborative activity and how did this activity affect the performance of the interaction
- 4 learning effectiveness, did visitors actually learn anything?

Whether it's for a museum, tourism or a brand, all these issues apply. If we're designing for a brand, the visitor should learn all about it and memorise it. If we're designing for tourism, then the destination itself is the brand. And if we're designing for a museum or a science park, learning is one of the most important goals to be attained by the product's usage.

Particularly important for designing for innovation is the interaction model and how it is learned and reapplied. If the interactive product is too innovative, then it could be difficult to learn at first hand. On the other hand, conventional, well-established models of interaction (e.g., touch-screen kiosk) aren't innovative and therefore we can conclude that there is, naturally, a dichotomy between the learning curve and innovation degree of an interactive product.

Main challenges. In a cross-disciplinary project like this, the main challenge was related to communication issues with the artistic direction of the exhibition. Traditionally, artists regard the engineers as mere functionality builders, and the engineers regard the artists as creators of impossible-to-implement products. Adding to the difficulty, there is the language barrier, which is full of jargon (both for artists and for engineers). Agile methodologies play an effective role, but must be adapted to designing interactive installations. One way of doing that adaptation is simply to establish as a principle that the installations will be the medium used for all discussions and meetings with clients and customer representatives. Since there are other variables involved, not just software issues have to be debated, but also issues like: lighting conditions and its daily variation, colour perceptions which vary according to a projector model, size of displays, furniture design, and the spatial layouts of several installations, just to mention a few.

Innovation process. The creative use of sensor-based technology was crucial to the success of the project. In practice, how was innovation promoted and how can this be better achieved? First of all, we observed that traditional techniques for fostering creativity still apply. Brainstorming is still very useful, practical and quick. Secondly we observed the importance of natural interaction: the virtual encyclopaedia can be used the same natural way one uses a real book: by simply flipping pages. The interaction style chosen should be naturally coherent with the content and message conveyed by the product.

Speed is always an issue that researchers usually don't have to concern about, but a crucial issue for companies. This implies that whichever innovation process we adapt and follow, it has to be an agile process, given the state of today's turbulent business environment. The ability to make changes quickly is also desirable. In this particular

exhibition, the client wasn't happy with the full contents of the interactive installations and continued asking for small additions or corrections almost until the first opening hour of the exhibition.

4.2 *Madeira tourism booth, Expo Zaragoza 2008*

Another similar innovation case study was the installation at the Portuguese Pavilion in Expo Zaragoza, Spain, in 2008. WowSystems was commissioned by the Tourism Board to design, develop and install an interactive floor of 5 m × 2 m at Expo Zaragoza, the world's largest exhibition, dedicated to "water and sustainable development". The installation was a recreation of the famous Madeira "Levadas", the name given to watercourses built by man in order to carry the water from the mountains down to the villages.

Figure 2 illustrates the final product: on the left, we can see a picture of a visitor walking over an interactive recreation – an interactive floor – that reacted to the user's steps or gestures. Innovation was once again present, and the team wanted to achieve something more significant, but very rapidly and in an agile way. Since the idea was to recreate the environment, and since that idea influenced the design process, the team added the true sounds of the forest's bird species, and even added a "scent projector" that spread the scents and aromas of the forest as well. This way, the visitor could really immerse herself into the scenery, in a multi-sensorial experience.

Figure 2 (a) The virtual walkway and (b) a screenshot from the initial projected animation (see online version for colours)



Main challenges. In a high-visibility project like this one, the main challenge was to grab the visitor's attention and to provide a sense of immersion, as if she were visiting the real touristic place. An implicit challenge was to convince clients and visitors (or users) that this wasn't too much innovation for the objective proposed. Apparently, small innovative companies have problems when the proposed product is too futuristic and therefore we feel that innovation should be put into practice with moderation, and holding an easy-to-measure return on investment.

Innovation process. The innovation process followed in this project was similar to the previous one. Like the previous project, one of the innovative ideas that were put into practice was the alignment of the interaction style to the message being conveyed by the

product: in this case, visitors of the pavilion get to know the “levadas” the same way they would as if they were visiting the real ones – by walking over the interactive “levada”. However, some significant differences occurred because the goal was to bring a little bit of life to the pavilion. The innovation process that was undertaken in this case, was to brainstorm about how to recreate a touristic site using technology. After two sessions, one member of the design team proposed to add sounds and scents to the installation, and this turned out to be an aspect that the end users and the client both appreciated, much more than expected.

5 Conclusions and future work

In this paper, we focused on describing the innovation aspects that occur using an agile development approach, when creating software products that employ novel user interaction paradigms. Using real world case studies such as these, one can obtain more insight into best practices that could be useful for promoting innovation during the agile process. Incubators, applied research centres, company’s R&D departments, and innovation centres in general: all these can benefit from learning other companies’ experiences and projects.

One of the most interesting conclusions is the importance of the interaction model and how it is learned and reapplied. If there is too much innovation put on a given interactive product, then that product could be difficult to learn at first hand. This implies that innovation comes with a price and this issue should be considered taking into account the real needs of users. There is, naturally, a dichotomy between usability and innovation degree of an interactive product.

Interactive, digital media projects are often conducted by multi-disciplinary teams that usually include programmers, software engineers, project managers, interior designers, architects, graphical artists, and a high-level of client involvement.

A great difficulty arises when the final product is actually deployed: interactive installations are difficult to prototype and many aspects are impossible to model and test by means of early prototypes. This doesn’t happen with, e.g., mobile applications, where the designer has full access to the end product look and feel anytime and anywhere. Since innovative products are much harder to propose to clients than conventional products, this difference between early prototypes and final product is a significant challenge for small companies, since it involves a large degree of imagination to describe.

Finally, many governmental programmes, which are aimed at sparking innovative companies and supporting creative entrepreneurs, entail a large degree of bureaucratic forms, laws, regulations and similar “red tape” that are easy creativity-killers. This is a major difficulty should be addressed. Facilitating or diminishing the amount of red tape in incentives programmes doesn’t necessarily diminishes the credibility and transparency of the programme.

One of the limitations of a study like this is related to measuring results: it is not easy, in a business context, to effectively measure innovation processes or even to explain exactly what went well and what went wrong during the agile process. Much of the practitioners’ knowledge is tacit, in the sense that they don’t know themselves how they accomplish their everyday tasks. Only through extensive observation in situ can researchers obtain a clearer picture on the innovation processes that companies and

research institutes follow and consequently how can software developers take appropriate measures in order to improve their competitiveness and efficiency. This is, however, a first step towards that goal.

Another limitation of our experience is that it considers only the perspective of an interactive digital media company. It would be very interesting to compare this experience to other businesses and to other research fields, since some conclusions can be transversal to the research field.

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