

# DESIGNING LEARNING OBJECTS FOR ITALIAN PUBLIC ADMINISTRATION: A CASE STUDY

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## Abstract

*This research aims at analyzing the effectiveness of SCORM-based e-learning material in introducing companies to innovative practices, specifically the use of Digital Signature and Certified Electronic emails. These two tools have recently become mandatory in the Italian Public Administration, thus forcing them to pursue innovation through dematerialization processes. This innovation involves millions of Italian citizens and companies that now have the opportunity to interact with public bodies in a more efficient and effective way. Nevertheless, neither the Public Administration nor most of the companies (especially Small and Medium-Sized Enterprises - SME) were ready for this radical change in the use of electronic communication. A significant training effort has been delivered to allow end-users to absorb the concepts, tools, methods and procedures that take advantage of citizen-to-government and business-to-government communication. Most of this effort relied on e-learning and virtual communities' tools and services, providing support to citizens and organizations facing this new technical and organizational challenge. The authors present the successful experience in the design, creation and delivery of the distance learning materials designed for these purposes, together with the best practices and lessons learned.*

**Key words:** e-learning, public administration, dematerialization, learning objects.

## Introduction

In 2005, many radical changes were introduced into Italian Public Administrations (PAs) by the Digital Administration Code (CAD), with the precise objective of changing processes through dematerialization and ICT innovation. This will have an impact on the processes of most Italian citizens and organizations dealing with PAs, not least because of the constant interaction with the PA itself for different reasons (from tax payments to requests to granting). This revolution in Italian society will also influence the way citizens and companies will exchange information in the future. Since 2005, the Italian Government has been working on the "Codice dell'Amministrazione Digitale" (CAD - Digital Administration Code) in order to modernize and digitalize the processes of Italian Public Administrations. Subsequently integrated and amended, the CAD is now operational and in December 2012, a new version with important novelties was issued. The CAD, which despite its name applies to both private and public bodies, sets out a completely new scenario for using ICT to make the PAs more efficient and reactive in their relationship with stakeholders. Among the many innovations, four are particularly important:

- a) use of the electronic signature for signing electronic documents;
- b) use of certified emails;
- c) use of a digital protocol to track in/out document movements;
- d) rules on digital preservation.

Moreover, since April 2015, any invoice sent to an Italian PA must be issued in the form of “electronic invoice” following a precise XML schema and sent through specific certified channels. Implementation will certainly not be instantaneous, but the many changes implied (organizational, technological and legislative) will have a tremendous impact on Italian society. Italian PAs are therefore moving in this direction, and the implementation of the digital signature and electronic certified emails has already made significant progresses, while the other two themes are taking off. In the future, administrative procedures will be managed exclusively through electronic transmission, and interaction with citizens and businesses will be moving even more in this direction. This will profoundly change Italian PAs, but will also have a deep impact on the lives of citizens and businesses. These elements radically change the scenario for ICT usage inside organizations in general and PAs in particular.

Besides the design, realization and re-engineering of information systems and applications to support the new methods, business processes and procedures will also have to be re-engineered. This re-engineering process could start directly from public servants who, while performing their manual duties, could contribute in the event of inefficiencies with their knowledge to improve application of the CAD provisions. These people are normally experts in their field, but are probably not so expert in the specific domain of the CAD. The main expertise is hidden and not shared, formalized or clarified. The PAs will have to extract this information from tacit knowledge and transform it into explicit knowledge. Finally, Italian legislation stimulates the sharing and reuse of any educational resource produced by/for the PAs, in order to optimize investments and maximize the uniformity of view regarding the topics.

In order to deal with this situation, millions of citizens, public and private employees and organizations must be trained. Companies are often reluctant to adopt innovative solutions, stopped by the cliché that new technologies can only lead to complex and critical processes, especially if the stimulus to innovation comes from a PA. The question can now no longer be seen in these terms: companies must adapt to the indirect requirements of the CAD, or they risk not only to be excluded from a modernization process which paradoxically involves and is generated by the PA, but which is also likely to have consequences in terms of fines and sanctions.

The real problems related to the impact of the CAD on Italian society have been clearly identified as a training issue. The organizational and technological solutions outlined by the CAD (e.g., the problems associated with, and technologies needed for, the qualified digital signature) have clearly demonstrated the backwardness of large digital layers of Italian society. Moreover, most of the organizations were convinced that this innovation process was part of the Italian habit of proposing innovation and then not implementing it. On the contrary, it is clear that the document dematerialisation process is irreversible and the best is yet to come.

One of the reference points in the relationship between the CAD and businesses is without doubt the Chamber of Commerce. When the CAD was mature and stable enough, the problem set in 2011 with the Trento Chamber of Commerce work group was simple. The research project wanted to help companies improving certain processes without distorting them, with advantages in terms of speed, efficiency and cost containment through application of the dictates of the CAD.

Before 2011, Trento Chamber of Commerce, together with trade associations and the Province of Trento, had used a number of tools to raise awareness on the topic: sending printed material and newsletters, organizing dedicated events, publishing articles in newspapers or magazines with dedicated spaces, creating specific spaces on the website and launching various initiatives and seminars. Over a two-year period, all these efforts had reached about 300 companies in our region. However, reaching a larger number of organizations on schedule for the CAD deadline was clearly impractical and thus e-learning naturally became the means to achieve:

- low cost and appropriate timing;
- a broad audience

according to what has been presented by Stoszowski, Collins and Olsson (2015), Colazzo, Molinari and Villa (2009), or Moore and Kearsley (2011). So, the objective of the joint research with the University of Trento has been to verify the effectiveness and the costs related with an extensive use of SCORM-based learning objects (IEEE Standard for Learning Object Metadata, 2002) in order to reach a wider audience of companies in the Trentino. These learning objects, and all the organization of groups of participants have been conducted through the virtual communities platform called “Online Communities” developed by our group and presented in Colazzo, Molinari and Villa (2011). The differences in previous knowledge about digital signature and electronic email were two elements to be evaluated, according to the different level of knowledge on ICTs available on the market. Another element of observation has been the habit of being trained through e-learning material: previous experiences on such a large scale (potentially more than 50.000 SMEs in the observed region) were not available in the area. The Chamber of Commerce supports all the companies in the area, of any size and of any market category. A third research question was related to the acceptance of innovation (both in the content and the vehicle of knowledge transfer) by different segments of the market. A last element of analysis was the composition of the virtual communities created for the training interactive sessions, in terms of composition, age and background knowledge.

### **Learning Solutions for Public Institutions**

The results presented in the European Digital Agenda (EDA) Scoreboard 2012 clearly demonstrate the needs of e-government in Europe, considering all the stakeholders involved. The target of the European Digital Agenda (EDA) is to increase regular Internet use to 75% of the population. The confident projections of last year’s scoreboard have been reviewed and the 75% target will probably be reached in 2014, rather than in 2013, although still ahead of the EDA target year of 2015.

Although e-Government usage by citizens is stable at 41% with some significant progress in smaller countries, the main reasons explaining the reluctance of citizens to use online public services are:

- a) lack of need;
- b) lack of trust;
- c) lack of skills.

The digital agenda is nevertheless pushing for the adoption of ICT-related procedures and process re-engineering. Citizens and firms will steadily increase the requirement for e-Government services (usage by firms has increased steadily from 76% in 2010 to 84% in 2011) and civil servants will be forced to adopt ICT not only for their ordinary work, but also to improve their processes according to ICT availability. This is a great effort, as the incomplete digitalisation of public services is an important barrier to increasing e-Government take-up.

The “EPSA Trends in Practice - Driving Public Sector Excellence to Shape Europe for 2020” initiative demonstrated the need for integration, contacts and networks to be established among those PAs able to showcase their achievements in terms of a) modernization, b) innovation c) smart solutions able to withstand budget constraints, increasing demands from citizens and improved service delivery. The milestone for this is availability of the EPSA learning platform.

Some market research has demonstrated that almost 90% of public sector Learning Departments plan to increase the use of e-learning technologies in order to meet the cost reduction targets set in the Comprehensive Spending Review (CSR). According to FLAG-Flexible Learning Advisory Group (2013), while at the beginning of 2009 only 50% of Learning Development managers expected to increase their use of e-learning, 88% currently anticipate an increase, and more trainers expect to use collaborative learning techniques, like highlighted by Ho and Kuo (2010). In this sense, the current economic period of austerity is clearly having a deep impact on these considerations, with little distinction between the private and public sectors.

This clearly emerges from the examples reported in market research. The City of Edinburgh Council Interactive Learning (CECiL) started four years ago, providing online learning for all employees and reducing training costs by more than £800,000. The conditions required to obtain these savings are well known: high volume training to be delivered in a short period of time.

Learning solutions for the public sector have been promoted in many different ways in the past, with results that did not meet expectations. During periods of recession such as the one we are experiencing today, Technology Enhanced Learning (TEL) has been indicated as a panacea for future learning, a sort of “killer” of classroom training. However, many times in its history TEL has not lived up to the hype. The public sector expects to use e-learning to improve the level of service delivered to organizations despite budget cuts. This seducing metaphor attracted the public sector, fitting in well with the drive towards e-government.

Despite this, the reality showed a different picture. A large number of research projects and application studies have been carried out into the use of TEL in the public sector, if we consider educational institutions from primary schools to master degrees as “public sector”. However, if this important category of use is excluded, the traditional Public Administrations have not been studied as a possible field of application for TEL-based training programs. Many examples of the use of TEL to train employees seem driven by the idea of cost saving, or of replacing missing educational paths (such as, for example, the requalification of civil servants without a degree in their curriculum).

Most use cases are concentrated in the period 2004-2010: Murty, Gilmore, Richards and Altilio (2012), Qiyun and Zhiping (2012), Stamatios and Tsihrintzis (2013) and Nisar (2004) are reporting these use cases, with different experiences coming from different countries and a different vision of the specific characteristics of the public sector. In terms of the state-of-the-art of TEL in the public sector, the situation is therefore not as clear as in the private sector, or the traditional educational system. Many studies have concentrated their attention on the application of TEL to institutional training, supporting traditional training with technologies, methodologies and tools. On the contrary, little attention has been devoted to TEL inside Public Administrations and their employees, with their specificity and needs.

Public Administrations, together with their employees, have been involved in TEL applications mainly for lifelong learning projects, considering public servants as people who will stay a long time in the same workplace and therefore an interesting case study for lifelong learning research and applications. Even if we exclude educational institutions from the field of application, the public sector is nevertheless a place where all the theories, methodologies and tools studied and implemented in Technology-enhanced Learning (TEL) could be profitably applied. Most of the new approaches and tendencies in TEL, like storytelling, MOOCs, gamification etc., could be applied to the large ecosystem of public stakeholders. Public Administrations are particularly interested in TEL:

- because they consider e-learning and web-based resources as fundamental elements of their training processes;
- because of TEL’s ability to deliver contents over the Internet anytime and anywhere at competitive costs.

Most of the well-known problems have now been overcome. It therefore seems that, given the disappearance of many technological barriers, the progress of TEL - always on the point of spreading extensively and then for some reason never quite succeeding - should no longer be hesitant. Other obstacles have also been cleared away, such as standardization and the reuse of learning material.

Almost all public institutions have at least considered using one of the different available approaches (blended or full online). The tools available today can guarantee the service level required from Public Administrations: platforms such as Learning Management Systems (LMS), technologies such as videoconferencing and standards for learning metadata or objects like SCORM (IEEE Standard for Learning Object Metadata, 2002).

Another effect of TEL's maturity for the public sector regards the large amount of educational material produced and now available in various forms. Various institutions have created several Learning Objects (LOs), mostly freely available. Together with reusability, cost reduction, time optimization and a more modern view of the PA, these elements have contributed to raising expectations about TEL in the public sector. In terms of the factors influencing the adoption of TEL in PAs, some studies conducted in PAs indicate that the opinion of civil servants regarding e-learning was significantly influenced by their satisfaction and this in turn was affected by:

- job relevance;
- expectation confirmation;
- perceived ease of use;
- perceived usefulness;
- computer self-efficacy.

Other studies show that adult learners perceive the effectiveness of e-learning in the workplace positively, as for example reported by Ifrim, Stănescu and Stefan (2010).

### **The Digital Agenda and the Italian Digital Act**

Preventing resource wasting is today a "must" for every PA and the digitalization of paper-based procedures represents an opportunity to contribute to this prevention. The need for process digitalization, especially in PAs, has been recognized since the 1980s and is one of the areas where ICT can produce evident advantages. In this field, the term "dematerialization" has been used to identify the progressive elimination of paper-based processes in favor of their digitization.

In this context, since 1997 the Italian PA has undertaken the complex task of creating a legal and normative framework that facilitates the digitalization of processes through the modernization of PA information systems. In 2005, the "Digital Administration Code", (CAD - Codice dell'Amministrazione Digitale, Legislative Decree no. 82 of 7.3.2005 as modified by Legislative Decree no. 23 of 30.12.2010) clearly and extensively defined what should be done in order to create a "digital Public Administration".

It sets out a completely new scenario for the use of ICT, thus allowing PAs to be more efficient in their relationship with stakeholders. The CAD came into force for all Italian PAs, but despite its name, it covers both private and public organizations and in practice all Italian citizens and organizations. The aim was to reestablish order, addressing and setting rules for every aspect of technological innovation introduced into Italian society. In the CAD, there is a strong commitment to dematerialization and this is the point where to intervene with the use case involving e-learning. More specifically, the CAD gives legal validity to the digital documents involved in processes and procedures conducted using ICT. Among the many innovations, four are particularly relevant:

- a) the use of electronic signatures for signing digital documents. This classifies the probation effectiveness of the different electronic signatures, specifically the "advanced electronic signature" that plays a leading role on the Italian market today in certifying the identity of a document's subscriber/s;
- b) the use of certified emails. The certified email (Italian acronym PEC) provides citizens and organizations with legally valid electronic documentation of the sending and delivery of electronic documents to certified receivers and conversely, receivers have legal evidence as to the sender of a certified email;
- c) the use of digital protocol to track in/out document movements, thus not only allowing certification of these movements through the Information System, but also providing a way to centralize the storage of documents officially sent and received by the organization;
- d) rules about the digital preservation of electronic documents. This is a specific

instance of the larger problem faced today by organizations worldwide. According to one of the many well-known definitions, digital preservation “combines policies, strategies and actions that ensure access to digital content over time”. In the Italian CAD, this problem regards every single organization that undertakes to comply with the provisions of the CAD. It is the logical and inevitable final item in the full, automated digital communication process. Nevertheless, it also introduces a great many technical issues that heavily impact the day-by-day activities of the organizations: ICT infrastructure to preserve contents, methods to search and retrieve digital objects etc., but most of all, competencies and people specifically devoted to and skilled in digital preservation.

These four elements are revolutionizing the processes of Italian Public Administrations, allowing new scenarios for the interaction between PAs (government-to-government), PAs and citizens (government-to-citizen), and PAs and companies (government-to-business). Specifically, these innovations have an enormous and unexplored (so far) potential in re-engineering the PAs processes, thus allowing obvious but crucial advantages, such as considerable savings, flexibility in managing processes and relationships, speed in fulfilling requests for services, transparency of procedures (especially towards citizens) and the possibility of measuring the performance of individuals and public organizations.

In addition to the design and realization of applications supporting such new methods, intensive personnel training must be performed in order to take advantage of the opportunities created by the CAD:

- new rules, new systems and new procedures must be acquired by all civil servants acting inside PAs;
- business processes and procedures will need re-engineering.

The problem for Italian PAs is not a lack of people able to optimize and improve processes, but that Italian PAs and citizens are unable to metabolize the innovations offered by digitization and dematerialization due to an endemic resistance to change. Table 1 presents the situation of PEC adoption in some of the most “efficient” Italian provinces, where the Autonomous Province of Trento occupies the top positions. This data are extracted from 2013 annual report of the Agency for Digital Italy (AgID - Agenzia per l’Italia Digitale).

**Table 1. Adoption of Italian certified emails among large corporations and SMEs.**

Chamber of Commerce	N. of Companies	With PEC	%
Cuneo	24.843	22.569	91
Sondrio	6.543	5.920	90
Bolzano	21.494	19.351	90
Forli	19.834	17.526	88
Trento	22.297	19.632	88
Pordenone	12.054	10.544	87
Prato	16.644	14.461	87
Bergamo	47.636	41.036	86
Belluno	6.992	6.023	86
Mantova	17.649	15.170	86

Against a national average of 74% adoption of certified email, in the Autonomous Province of Trento, 88% of organizations have formally adopted this tool. However, if companies are considered, the situation changes radically (Table 2).

Considering that most of the time enterprises correspond to citizens, it is clear that Italy has a serious problem in diffusion of the CAD digital agenda. Moreover, PEC is without doubt the easiest of the four elements promoted by the CAD, because of the similarities with traditional email box management.

Another interesting element of analysis, always from Ag ID, concerns the traffic of certified emails during the last six years. This clearly shows increasing adoption of the CAD and this could in turn indicate that while few organizations and individuals are adopting the CAD provisions, they are using them extensively and progressively. It is interesting to note that since 2007, PEC domains and mailboxes have increased respectively by 27 and 45 times, while the number of PEC messages has increased just four times. This is an evident effect of the compulsory nature of the CAD prescriptions, but does not represent intimate and convinced adoption.

**Table 2. Adoption of Italian certified emails among individual enterprises.**

Chamber of Commerce	Individual Enterprises	With PEC	%
Firenze	53.909	2.399	4.45
Prato	16.506	704	4.27
Livorno	18.458	781	4.23
Rimini	19.944	834	4.18
Teramo	21.643	853	3.94
Crotone	12.276	482	3.93
Ancona	26.885	1.047	3.89
Pistoia	18.227	699	3.83
L'Aquila	17.455	664	3.80
.....	.....	.....	.....
Trento/PAT → ranked #103	29.423	359	1.22

Italy now has the legal framework and ICT provides the technological tools for adoption of the CAD provisions to take off. The missing link is now an extensive initiative to train individual users and organizations in the tools introduced by the CAD. Promotion of this cultural growth in Italian citizens and organizations is clearly the responsibility of the PAs.

**Table 3. The diffusion of PEC domains, mailboxes and messages over the last six years.**

Year	Tot. Domains	Tot.Mailboxes	Tot.Messages
2007	42.369	618.165	116.376.864
2008	111.244	1.147.208	218.477.050
2009	295.220	3.943.160	253.098.716
2010	578.258	11.518.079	327.476.760
2011	840.404	17.797.879	324.125.539
2012	1.164.829	28.297.727	459.662.512
Grand Total	3.032.324	63.322.218	1.699.217.441

## Creating Learning Objects for the Italian PA: Methods and Results

Since 1998, the research group has developed extensive experience in e-learning applications, specifically in the Public Administration. The authors are currently delivering e-learning initiatives with many public and private partners, including the Autonomous Province of Trento (~12,000 employees), Trento Chamber of Commerce (~55,000 individuals and users in Small and Medium-Sized Enterprises), Trentino Development Agency (~1,000 users/companies), the Academy of Commerce and Tourism (~1,000 users/companies) and of course the University of Trento (~ 15,000 users). Through the experience of e-learning in PAs, authors have proven that excellent results can be obtained, not only using e-learning as a substitute for traditional classroom activities, but also involving and motivating the public servants directly in the creation of learning objects. These results can be obtained if the following elements are available during creation of the educational path:

- a) a common methodology for gathering, formalizing and delivering the required training, thus avoiding uncontrolled production;
- b) a different approach for traditional face-to-face interaction with teachers/experts, less formal and “boring” compared to PowerPoint-like presentations;
- c) a virtual place with a strong collaborative connotation in which to share ideas and results with other colleagues, in order to compare different views and interpretations of the process, especially from a legal point of view;
- d) the availability of consultants on legal topics able to provide straight-to-the-point advice: a teacher is needed, rather than a consultant;
- e) a way to see activities recognized and rewarded, at least in terms of reputation, a formal way to recognize the work done in e-learning material production.

Many learning packages and training initiatives have been started since the advent of the CAD, but no tangible results were clearly emerging. As direct experience, the decision was to specifically develop e-learning SCORM packages covering all the CAD topics. The working group produced 14 hours of learning objects explaining in detail the two tools mandatory for companies today, i.e., the digital signature and certified email. This initiative was launched in 2011 together with the Autonomous Province of Trento and involving various professional associations.

In the Autonomous Province of Trento, out of more than about 50,000 enterprises (large public and private corporations, SMEs, individual companies), approximately 700 participated in this joint initiative involving the Autonomous Province of Trento, the Chamber of Commerce and the University of Trento with the fruition of e-learning material completely free-of-charge. In order to interpret this data correctly, the authors considered how most public servants and professional associations used our e-learning platform. Then a different approach has been experimented. In the last months of 2012, the research group experimented an approach to content creation for some associations related with the local Chamber of Commerce, covering three processes:

- permits to open new hotels in tourist areas;
- registration of a new company in the Local Registry of Enterprises;
- cancellation of a company from the Local Registry of Enterprises.

This time, the domain experts created the material, but with intensive interaction with the public servants in charge of the above processes. A new paradigm for delivering training to public servants, citizens and companies has therefore been introduced, by changing the producer and the methods of production, sharing and using the e-learning material. It is nevertheless clear that the level of complexity in the re-engineering of processes as a result of the CAD can be managed by these “prosumers” when explicitly supported by experts acting as consultants rather than teachers.

The two themes of the “Digital Signature” and “Certified Electronic Mail” were treated separately, to provide different ways of adapting training needs to the pre-existing knowledge

or skills already present in the organization. For each item, three distinct levels of learning have been provided, adaptable to the needs and to specific questions. The material can, in fact, be accessed both by following either a sequential approach or an application-driven approach, allowing the user to immediately identify the topics of interest. These are the three levels:

- the “information” level, aimed at disseminating knowledge on the issues and then answering questions on the correct professional procedures to follow. This is obtained by clearly expressing the benefits and points of attention resulting from its use, as well as gathering the questions raised during the training sessions and telephone follow-up implemented by the Chamber of Commerce on a sample of 50 firms
- the “use” level, designed to provide practical tools for the two topics by means of tutorials guiding the user step-by-step through activation of the instrument, its use and verification of the correctness of the operations. At this level, recorded sessions of interaction with the software tools to digitally sign and send certified emails has been used;
- the “deep knowledge” level, devoted to users or potential users of the two instruments who wish to become more aware of the implications deriving from their usage, particularly in legislative terms. During design of the learning objects described above, the legislative aspects covered were, in fact, reduced.

The level of participation to the online courses was on voluntary base. Among the potential 50.000 companies involved, many of them had already different ways and supports to stand the novelty introduced by the CAD. Especially for the certified e-mail, a vast majority of them were already equipped with traditional e-mail, and some seminars delivered by the Chamber of Commerce have been sufficient to clarify the (few) differences between the usage of a traditional e-mail system and the one needed for the certified e-mail. Then, a second group of companies have not been involved as their relationships with the public administration are mediated by intermediary organizations, like associations, or accountant technicians that most of the time intermediate between the affiliated company and the public administration. This is not a positive aspect of Italian way to innovation, because companies tend to postpone the introduction of innovative tools inside the company, simply because somebody else is taking care of it. Innovation in this case is seen as something to delegate to external bodies, and plenty of services in Italy are available to follow the easy way of innovation.

Nevertheless, there is a third component of enterprises that are not supported, that are not equipped with the appropriate technologies and internal processes, and that have to face the new tools in order to communicate with the external world, especially with the public administration. Small medium enterprises, cooperative farms, small consultancy firms: this is another set of companies that needed to be trained, and that approximately represents the fifteen percent of the whole market in this region.

An informative campaign has been organized in order to promote the initiative of free, online-based training sessions, starting from 2012 till the beginning of the mandatory deadline, i.e., 6th of June, 2014. The results of courses followed by companies using the e-learning platform are represented in the following table 4.

**Table 4. Companies enrolled in on-line courses from 2012 to June 2014.**

Digital Signature and Certified email – Online Courses	
Year	Enrolled Companies
2012	165
2013	213
2014	63
Total	438

Due to the very positive feedback received both regarding the approach and the contents, the Chamber of Commerce decided to invest in e-learning for the creation of video lessons on the common practice of “balance sheet management” and the “Business Register”. The Chamber of Commerce is considering how to reuse the material produced for blended learning, which could further encourage companies to participate. The results of this further experimentation is interesting: this time the population involved was very limited and specialized (accountants and consultants involved in providing services for accounting and bookkeeping), and there were no legal obligation to be complied. The initiative of using e-learning material in a blended context to substitute the traditional face-to-face training delivered by the Chamber of Commerce was an autonomous decision of the Chamber of Commerce itself.

The blended approach implied for the participants to follow two or three face-to-face meeting, and all the rest of the course has been delivered online. The level of participation, considering the selected potential target, has been high, with 37 participants in 2013, and 95 in 2014.

## Discussion

Since 2011, more than 700 companies have benefited from the material made available on the platform and have progressively reported a need for other training covering other types of content, and among these, more than 400 followed courses available in the platform. For this reason, in 2012 the Chamber of Commerce decided to make some specific topics available to other communities, relating specifically to the aspects that gathered more questions or more errors.

Respect to the original research questions, the sample of companies that have used the online material is sufficient to draw some conclusions, corroborated by feedback received in public meetings, telephone calls and a short questionnaire. Companies that participated to the online courses were predominantly with limited or no background on the technologies that were the subject of the online courses. According to this homogeneous distribution, no significant differences have been noticed: most of the companies were SMEs with a consistent deficit of ICT knowledge, and therefore in great difficulties not only with the new technologies proposed by the CAD, but in general with the computer.

The preliminary results of the presented research clearly show that the changes in the approach and in the tools used to deliver technical topics to a large audience have been significantly appreciated by end-users. Especially the parts of materials directly produced, or produced with a direct interaction with the public servants, taking advantage of their expertise, have received specific appreciation, a sort of liberation from “traditional, boring slideshows” (as reported by some participants through the feedback questionnaire). After having tested other methods such as the creation of learning objects by academic experts, it is clear that learning objects created by internal people with a high reputation are much more appreciated and trusted.

As a general conclusion, surprisingly no clear evidence emerged respect to the different economic sector of the companies. A greater difficulty of companies coming from remote areas (Trentino is a mountain region in the middle of the Alps) and/or from primary sector with connected markets (like for example farm tourism) was expected, but again also this data has not been confirmed. No significant differences in terms of appreciation or dislike of the CAD innovation came from the different economic sectors. The real difference came from the age of the person that the company decided to enroll in the e-learning courses: specifically, younger people demonstrated much more appreciation both for the CAD innovation and for the innovation in the training methods.

Respect to the acceptance of innovation (both in the content and the vehicle of knowledge transfer), very few companies had a previous experience of e-learning courses attendance, although nobody have complained about this new modality. This element appears a little bit strange, considering the previous point i.e. the lack of a solid ICT knowledge. In any case,

although the overall judgment of the new training modality has not been negative, almost all the companies contacted after the course (online questionnaire and following direct telephone call in case of negative feedback) expressed their aversion to the novelty introduced by digitalization and dematerialization. Neither the pressing campaign of the Italian Government, nor the e-learning material convinced the most conservative component to jump into innovation.

The biggest problem, arising during the design phase when material provided by experts had to be converted into learning objects, involved both estimating the effort required from our development team and Trento Chamber of Commerce, specifically quantifying the remuneration for the authors of the material and learning objects. This is a typical case of the industrial production of learning objects where a “teacher” should be acknowledged a number of hours far superior to the total duration of the learning objects produced. This issue has been solved by adopting the cost for the creation of online learning objects presented in Casagrande, Colazzo and Molinari (2013)

As a set of side effects of this research, there have been clear indications about best practices to be used in conducting these experiments, and in building the respective learning objects for contexts otherwise unreachable:

- a) particular attention should be applied to the micro-design of the contents, scheduling single items in a very fine-grained way instead of providing non-specific, long sequences of concepts and contents;
- b) the use of a virtual community demonstrated to be a better container for e-learning tasks. This result is similar to other successful experiences, like Stoszowski, Collins and Olsson (2015), Donlan (2014), or Sannia, Ercoli and Leo (2009). The virtual community has been created for each edition of courses (50 companies at the time), so limiting the access to members and key stakeholders, in order to increase the quality of the final results. This means that a platform structurally designed to implement the idea of a virtual community is recommended outside traditional academic contexts, rather than simply managing a classroom or training event;
- c) the remuneration of the actors involved (teachers, content experts, e-tutors) had to be increased using a cost model specifically designed for e-learning by increasing the evaluation of the time spent in producing learning objects. The production of learning objects have encountered many resistances on the teachers’ side, especially those used to deliver courses on the subjects;
- d) a clear idea of lifelong learning context emerged as interesting global conclusion, in the sense of providing companies a perspective of permanent training helping them to follow the pace of innovation that the Italian Public Administration have started. In the questionnaires, companies clearly perceived and expressed the conviction that “like it or not”, the road has no way back, so an appreciation to a life-long learning path has been expressed as more than a desire. This means for the future, the need of designing a path that includes migration of many of the training, information and updating activities of Trento Chamber of Commerce towards e-learning materials, thus guaranteeing to companies the possibility of staying up-to-date. This demonstrated the benefits always professed by e-learning research, but which now seem even more indispensable for any Public Administration involved in digital modernization.

The authors are conducting further activities to raise the awareness of companies, including through evaluation of a partnership with the Association of Public Accountants, a reference point for many small and medium-sized entrepreneurs.

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