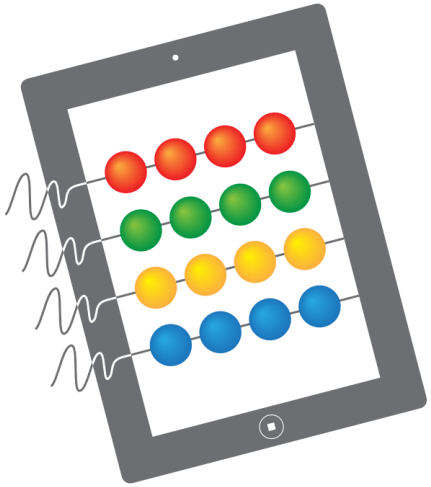
FP7 ICT STREP Project



LEARN PAD

Deliverable D8.1 - Addendum

User Perspective and Project Evaluation Strategies

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Abstract

The goal of this document is to answer specific requests made by the project reviewers in the first year review report. In particular the consortium reports here the results of the activities put in place in the past few months in order to:

- clarify the needs and expectation of the Learn PAd users
- clarify the strategies for evaluation of project achievements that will be conducted at the two PAs partners (Marche Region and Unicam)

This document is the result of further investigations conducted by the consortium as a whole to address both aims. For both cases, related literature has been scrutinized in detail to derive suggestions from experts. Moreover a questionnaire has been defined and submitted to more than one hundred PA employees in order to gather further requirements from final users. The answers to the questionnaire have been successively analysed to define further interesting indications on different aspects of the Learn PAd platform. In addition the consortium analysed the results of those projects, selected on a complete list of EU projects funded under FP7 or FP6 frameworks in the area of Technology Enhanced Learning, that have been considered the most relevant since focused on aspects more closely related to Learn PAd. It is worth noting that the results reported in this document are in some case only partial, and the consortium intends to reflect further on the collected information in the next months to check if interesting correlation in the answers provided by the employees could lead to the discovery of interesting requirements/needs.

Keyword List

Fostering User Engagement, Learn PAd Achievements Evaluation Strategy, Learn PAd Users Needs, Learn PAd Users Context, Review of Related Work

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Glossary, acronyms & abbreviations

Item	Description
BP	Business Process
BPMN	Business Process Modeling Notation
CMMN	Case-Management Model and Notation
DoW	Description of Work
ICT	Information and Communication Technologies
EC	European Commission
ECAAD	The Evidence Centered Activity and Assessment Design
KAOS	Knowledge Acquisition in Automated Specification
KPI	Key Performance Indicator
PA	Public Administration
PAB	Project Advisory Board
PDCA	Plan-Do-Check-Act
R&D	Research and Development
RE	Requirements Engineering
ROE	Return on Expectation
ROI	Return on Investment
TEL	Technology Enhanced Learning
WP	Work Package
WPL	Work Package Leader
XWiki	XWiki is a Wiki environment

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1 Introduction

The Learn PAd project aims at introducing a novel model-based approach to collaborative learning for the civil servants of PA. Towards such goal the project is developing a platform that provides users with several different ways to learn, share knowledge, consult with each other, assess learners progress and related tasks.

Work Package 8 is devoted to evaluate project results in terms of their applicability, acceptance and effectiveness by means of two demonstrators. The WP has produced so far the models related to the two demonstrators and reported them into D8.1 [1] delivered at M12.

At the annual review, the reviewers noticed however that during the first year the work in WP8 has focused too much on technical and modeling aspects, whereas low attention has been devoted to the users perspective and needs. The Consortium has been urged to identify a realistic picture of Learn PAd potential users and to find ways to engage them into the learning approach proposed.

A more detailed report of the reviewers comments is provided below in Section 1.1, while the contents of this deliverable is outlined in Section 1.2.

1.1. Purpose of this deliverable

This deliverable intends to address those weaknesses identified by the project reviewers in the work performed in the first year by the Learn PAd consortium. In particular the “Quality of the results” section in the technical review report states that:

> The design of the modelling dimensions for the “platform”, Business Processing models that have been developed and the formalisation into meta models work is of good quality reflecting the expertise of core partners. These represent an accurate and detailed picture of the business processes within the two implementation sites.
>
> However, the work is far from what might be described as an “innovative holistic e-learning platform for Public Administrations that enables process-driven learning and fosters cooperation and knowledge-sharing.” The models have not been built with sufficient deep understanding of the users and in particular, knowledge of what has been learned over several decades about the application of technology within workplace learning.
>
> Moreover, there is no representation of a pedagogical strategy or anything that aligns the models with competency frameworks which have been the subject of significant EU development for portable sharing of information about competence. These could offer possibilities for weaving in future extensions. The proposed approaches to learning (using simulation and learning by doing) lack clear pedagogical basis and show no evidence of the need for user engagement. The ideas linking learning to simulation and learning content is interesting but need to draw much more of the many years of work, not least on past and current EU TEL projects.
>
> It is as yet quite unclear about how the evaluation of the implementation at the two sites will be carried out and this needs urgently to be addressed as it is essential the consortium

undertake a whole project perspective on the evaluation: in other words, examine the overall achievements of the project in the light of the overall impact aims of the project.

The consortium has a very strong expertise in modelling and business process and their focus and interest in the technology development aspects of the project is strong. However, this has resulted in a project mainly driven by industry/research partners with a lack of deep understanding of users and user context and the user representatives in the project need to have a stronger role to ensure a much more user focussed involvement.

Overall, the following have been insufficiently addressed to date: deep understanding of the needs and expectations of users, questions of access (which encompass access to both the opportunity to learn and to the technology at work), users' pre-existing experience of business processes maps and learning through working and through simulations as well as learning through collaborative reflective processes. There is also a need for a more thorough examination of the physical environments and contexts in which PA users will work. These all need more examination by those that directly carry out research and development in the project to ensure and to maximize user engagement. There also needs to be a clearer vision of what the future for the platform holds – to show e.g. that it is realistic and recognises what has and will be addressed by the project, as well as clarifying what is not addressed by the project but which will need to be addressed if the R&D investment is to be exploited.

The consortium has carefully reflected on the remarks made by the reviewers and for each unsatisfactory aspect performed a set of corrective actions that are shortly described in the following, and fully detailed in the successive parts of the deliverable. In particular with reference to specific remarks the following countermeasures have been put in place:

- **A deeper understanding of user needs is required** - In this respect the consortium have invested a relevant effort defining a response composed of three main activities:

  1) the consortium decided to develop a questionnaire that has been successively submitted to civil servants, with different responsibilities and expertise, trying to better understand how the Learn PAd approach could work in practice, and to ascertain if it is necessary to revise some of the directions already taken. Chapter 2 reports details on the questionnaire, the analysis of the retrieved data and then the corresponding impact on the project
  2) representatives of the consortium had a meeting with PAB member Rosaria Conte (`http://www.istc.cnr.it/it/people/rosaria-conte`). In the meeting the Learn PAd approach and ideas have been described. Dr. Conte provided many useful remarks and research directions needing further exploration. Starting from Dr. Conte's suggestions, the consortium performed a literature review the results of which are reported in Chapter 3. This activity allowed us to better characterize and shape the Learn PAd approach taking into account relevant aspects from e-learning experts
  3) the consortium performed a survey of completed or running projects in the area of Technology Enhanced Learing (TEL) financed under the 6^{th} and 7^{th} Framework Programmes. The results of the survey and possible impacts on the Learn PAd project are reported in Chapter 4. Considered projects have been included depending on the fact that they cover aspects relevant for Learn PAd. In particular projects related to the following aspects have been considered:
     - learning in the workplace
     - competency models management
     - usage of simulation based approaches to engage learners

- **It is as yet quite unclear about how the evaluation of the implementation at the two sites will be carried out** - in this case a clear evaluation strategy has been defined and reported in Chapter

5. The reported strategy has been defined after a careful consideration of possible applicable approaches. The decision has also been supported by suggestions coming from a state-of-art review on the topic.

1.2. Structure of this deliverable

This deliverable is organised in three parts according to different objectives.

The first part describes the activities and related outcomes with respect to the need of introducing in the project more consciousness on the expectations of the learners. In particular Chapter 2 reports the activities that the consortium put in place to define a questionnaire that has been submitted to civil servants. The chapter also reports the questionnaire itself as well as the initial results on the analysis of the collected answers. Successively Chapter 3 reports the results of a literature review on learning theory and cognitive aspects started as a result of interaction with experts in those domains. Finally the last chapter of this part (Chapter 4) reports the results from a study of related EU projects and their potential impact on Learn PAd.

The second part of the deliverable contains a chapter (Chapter 5) that describes the refined vision on the final evaluation strategy.

The deliverable is closed by the last part in which Chapter 6 reports some conclusion and summarizes the work done to address to reviewers' comments.

Part I

Learn PAd Users Needs, Expectations and Context

2 Gathering needs/expectations/context from users' point of views

The project reviewers acknowledged that the Learn PAd consortium has made in the first year considerable progress with respect to modeling and technical aspects. Nevertheless the point of view of the learner needs to be reconsidered and would require much more attention. The Learn PAd platform addresses many heterogeneous users with different needs. In particular the list that follows reports the most typical roles that we envisage will interact with the Learn PAd platform, independently from the specific characteristics of their organization (clearly one person cannot take more than one role):

- **Modelers**: in this case the users access the platform in order to produce models, according to precise meta-models defined by Learn PAd, describing different aspects of a process and/or of an organization. The access point for these users is represented by the modeling tool installed in the Learn PAd platform. The main objective for users playing this role is the definition of models of high quality correctly representing the reality to model and useful for the following learning activities
- **Office/BP responsibles**: this role refers to those users that are interested in including in the learning platform useful materials associated to the models imported in the collaborative component. The main objective of this kind of users is to increase the competencies and capabilities of civil servants acting within business process enactments. Users playing this role can use different mechanisms in order to include in the platform useful learning materials and tools. For instance they can decide to enable or not simulation mechanisms.
- **Learners**: this role includes all those users accessing the platform in order to learn different aspects of an organization or of a process. Learners typically access the platform in order to learn what to do in their daily work, in order to respond to requests from citizens. In such a way their objective is to continuously improve their competencies so to provide high quality services to citizens. The typical access point to the Learn PAd platform for this kind of users is the collaborative component. In using the platform the learner can access to different functionality in order to acquire the needed knowledge, and they can also provide comments in order to improve the available learning material (see deliverable D2.1 for an overview of the architecture and components included in the platform [25]).

This chapter reports the activities that have been defined in order to bring in the project a clearer perception of the final user needs. With respect to the list above, Learn PAd focused on further investigations with respect to the needs of the **Office/BP responsibles** and of the **learners**. In particular such needs have been identified based on the analysis of the answers to a questionnaire defined for the purpose and filled by civil servants.

This chapter reports the approach followed to derive the questionnaire as well as the findings coming from the analysis of the collected answers.

2.1. Applied methodology

The definition of a questionnaire to further discover needs and expectations is not an easy task. Clearly the questions included influence and constraint the possible discoveries that can be done. The inclusion of open questions permits to have more uncertainty and then give the possibility to investigate aspects that were not thought at the beginning. On the other hand, the inclusion of many open questions is not recommended since the person answering in general does not want to spend too much time in filling a questionnaire, and then after a while he/she can start to provide not thoughtful answers, often useless. At the same time open questions are much more difficult to analyse, in particular when many people are involved. In defining a questionnaire it is therefore important to find a balance between open and closed questions.

From another viewpoint, so to cover a wide spectrum, as for the case of Learn PAd functionality, the questionnaire should include questions related to the different objectives and functionality provided by the project itself. In order to derive a meaningful questionnaire the consortium started a task force involving almost all project partners and the following steps have been performed:

- Taking into account issues related to logistics, context and competences two groups have been defined by the project Scientific Leader (SL) to brainstorm on the relevant characteristics of the questionnaire and on questions to include. In particular a first group was composed by members of BoC, NME, FHNW with a strong expertise on modeling and previous experience in learning project, while a second group was set with members representing the final users, such as Marche Region and Unicam. In particular the representatives of Marche Region involved in such an activity have expertises in teaching to civil servants, in the SUAP process, and in business processes of the PA in general.
- The two groups independently derived a questionnaire and in particular in one of the group emerged the necessity to have two different sets of questions for two different profiles, corresponding to the two relevant profiles listed above
- The SL merged the two questionnaires taking into account the considerations emerged in the two meetings. Then the merged questionnaire was uploaded on a googledoc, and shared with all members of the two groups
- A conference call was fixed, in which each question to include in the questionnaire was discussed. A final version of the questionnaire to be submitted to PAs was thus defined
- In order to avoid issues related to the language the questionnaire was made available both in Italian and in English, via two distinct google forms [1]
- The link to the questionnaire was then distributed to civil servants in Italian PAs and EU PAs, including PAs not directly involved in the project. The deadline for filling the questionnaire was fixed in two weeks. Provided answers were directly saved in a spreadsheet by the google form technology
- After 20 days, to account for possible delays, the answers were analysed by a group of people with members belonging to CNR and Unicam. The total number of questionnaires filled accounted to 110.

2.2. The questionnaire to retrieve users needs and expectations

In this section we report *verbatim* the questionnaire that we have defined in order to clarify user needs, and then to highlight related requirements that will drive further investigations within the project in order

[1] EN version: https://docs.google.com/forms/d/15FD4s7FwV1tUonslZYRHcySJ4iDEexdbNHrKJfo6u9Y/viewform?usp=send_form

to better satisfy those needs.

The questionnaire has been conceived having in mind two different types of people: *(i)* Employees that have to perform activities within BP enactment and then will directly use the Learn PAd platform; and *(ii)* Employees that instead are responsible for process enactment and for the achievement of process objectives. In such a case the employee will not directly perform activities in the enacted process, instead he/she is interested in having tools that can train people on the specific process.

Thus the questionnaire consists of three parts, namely user profile questions, questions for back/front office employees, and questions for process responsibles. Everyone compiles the first part, and then goes to either the second or the third part depending on his/her role.

2.2.1. User profile

The following questions have been defined in order to identify the profile of the person answering to the questionnaire, and then to hijack him/her to the successive set of questions considered relevant for the specific profile. In particular the successive set of questions is selected on the base of the answers to question 2 or 3. Nevertheless all the other questions permit to have relevant information on the employee that will be used in the future to check for interesting correlation and needs coming from specific employee profiles.

1) For how many years have you been working in the Public administration?

   ❍ less than one year
   ❍ between one year and three year
   ❍ between three years and ten years
   ❍ more than ten years

2) Which is your role in the organization?

   ❍ 1. PA office director
   ❍ 2. Responsible for specific procedures
   ❍ 3. Back office employee
   ❍ 4. Front office employee
   ❍ 5. Other but my responsibility are more in line with roles 1 and 2
   ❍ 6. Other but my responsibility are more in line with roles 3 and 4

3) In case you answered 5 or 6 to the previous question, please specify your role below.

   Role:

4) How long are you working in your current role within your organization?

   ❍ less than one year
   ❍ between one year and three year
   ❍ between three years and ten years
   ❍ more than ten years

5) How would you classify your expertise in the usage of software systems, such as office automation tool-suites (example: Powerpoint, Word, Excel) and Internet browsing?

   ❍ Non autonomous usage
   ❍ Basic knowledge and usage

- ❍ Good knowledge and usage
- ❍ Proficient knowledge and usage

6) How often do you access social network systems during your free time? (example: Facebook, Twitter, Google+ etc.)

- ❍ Never
- ❍ Rarely
- ❍ At least once per week
- ❍ Daily

7) Please can you specify the social network you use the most? (write "None" in case you do not access to social networks much):

Social network:

8) Have you ever participated to learning activities using Information and Communication Technologies (e-learning)?

- ❍ Yes
- ❍ No

2.2.2. Questions for back/front office employees

In this section are listed those questions directed to those employees directly working on a business process enactment. The questions in this set intend to clarify the perceptions of the employee with respect to process representation and related learning aspects.

1) In a document that describes a procedure, which is the most important quality that you expect from that document?

- ❍ It should be as detailed as possible
- ❍ It should provide an overview of the process
- ❍ It should include a graphical representation of the procedure (for example, a diagram with blocks and arrows)
- ❍ It should specify the people to contact in case of problems
- ❍ It should provide practical examples
- ❍ Other - Please specify:

2) Which are the issues that you often face when you need to perform actions within a process? (please provide 4 answers at maximum)

- ❑ regulations and manuals associated to the process are not known or not easily retrievable
- ❑ when a new regulation/law modifies a process it is not clear hot to put in place the rules defined by the regulation/law
- ❑ the content of laws and regulations are often unclear
- ❑ often the sequence of actions to apply does not emerge clearly
- ❑ the real process to apply it is actually a combination of processes described in different documents/regulations/laws
- ❑ it is not clear the role I should play within a complex process

❑ the training activity on the process was not enough

❑ there was not enough time for individual study/training

3) Consider the processes in which you have been involved, and please briefly describe the tasks you had problems/difficulties to handle or that caused you the most time and effort? Please give 3 examples:

Task1
Task2
Task3

4) For each of the problems what did you do to solve the problem?

- Task 1
  - ❍ asked an expert
  - ❍ checked additional reading
  - ❍ looked at historical cases
  - ❍ read comments related to this problem
  - ❍ watched videos
  - ❍ Other - Please specify:

  How did you identify the expert/the additional reading/historical case/comments/videos/others?
  Please specify:
- Task 2
  - ❍ asked an expert
  - ❍ checked additional reading
  - ❍ looked at historical cases
  - ❍ read comments related to this problem
  - ❍ watched videos
  - ❍ Other - Please specify:

  How did you identify the expert/the additional reading/historical case/comments/videos/others?
  Please specify:
- Task 3
  - ❍ asked an expert
  - ❍ checked additional reading
  - ❍ looked at historical cases
  - ❍ read comments related to this problem
  - ❍ watched videos
  - ❍ Other - Please specify:

  How did you identify the expert/the additional reading/historical case/comments/videos/others?
  Please specify:

5) Imagine that you are facing an issue in performing your activities in a process for which you are not proficient, yet. Which one of the following sentences would you consider true (mark them):

❍ It is difficult to identify resource containing the needed piece of knowledge to solve the problem, and in general I found myself reading many documents that are not related to the issue before finding the solution

- ❍ the learning resources which I can access are organized according to the activities in the process therefore I go straight to these resources and there I found the solution even if sometimes it is not easy
- ❍ Organizing the learning resources according to the process structure would make easier the search of a solution
- ❍ In general it is clear to who direct a request for clarification/help
- ❍ Once you identified a colleague/expert that should know a solution he/she helps you within a short time frame

6) Imagine you are working on a task in a process. Which kind of information do you apply and how often?

	very often	sometimes	in exceptional cases	never
address book (e.g. to involve a colleague)	❍	❍	❍	❍
information about organisational structure (e.g. to find the right colleague to involve)	❍	❍	❍	❍
database with historical cases	❍	❍	❍	❍
law texts / commented laws	❍	❍	❍	❍
other documents	❍	❍	❍	❍
organisational goals	❍	❍	❍	❍
others	❍	❍	❍	❍

7) How did you inform responsible people about problems you are facing?

- ❍ via eMail
- ❍ in person
- ❍ during coffee breaks
- ❍ via telephone call
- ❍ I did not inform anybody
- ❍ Other - Please specify:

8) How do people approach you when they need your help?

- ❍ via eMail
- ❍ in person
- ❍ during coffee breaks
- ❍ via telephone call
- ❍ Other - Please specify:

9) How do you provide the help generally?

- ❍ I write down my recommendations/suggestions in a document
- ❍ I post it in a blog
- ❍ I answer a question in FAQ
- ❍ I write it in a WIKI

- ❍ I respond to an email
- ❍ I help in person
- ❍ via telephone call
- ❍ Other - Please specify:

10) What do you think is the best way to provide help in the future?

- ❍ Provide a user guide which can be used repetitively
- ❍ Post in a blog
- ❍ Answering a question in FAQ
- ❍ Write it in a WIKI
- ❍ Reply by email
- ❍ Help in person
- ❍ Phone call
- ❍ Other - Please specify:

11) Could you please shortly explain the reason for your preference?

Please explain:

12) If you want to make suggestions or have a concern which impact on the general organization of the work to be done, what are the main channels for you to express and address your thoughts?

- ❍ Write an email to colleague
- ❍ Discuss in chats
- ❍ Talk to colleagues/boss
- ❍ Describe it in a document and share it
- ❍ Other - Please specify:

13) How do you manage information in your organisation? (example: new procedures, guidelines, rules to follow, general notifications)

- ❍ information is stored on a shared drive
- ❍ I manage the information I need by my own, for instance on my personal computer
- ❍ I send eMails (with attachments) to the people involved
- ❍ Other - Please specify:

14) How do you communicate intuition, rule-of-thumb, gut feeling etc. ?

- ❍ I talk to colleagues about it
- ❍ I note it down to make it available for others
- ❍ I keep it private
- ❍ Other - Please specify:

15) Do you keep notes for the unclear/complex aspects of the process in which you are involved?

- ❍ Yes
- ❍ No

16) Among the following working situations which one do you like more?

- ❍ I like to work independently trying to be as much precise as possible, avoiding many interactions with colleagues that could lead to confusion
- ❍ I like to work in cooperation with other people which would apreciate my contribution
- ❍ I like to work in collaboration with expert colleagues which reassures me on the correctness of the taken actions
- ❍ I like to work in team, independently from possible evidences of clear advantages

17) Think about all the knowledge that you need to perform a process in your daily work. If you want to get more familiar with a process that is not familiar to you, yet, for instance before working on a concrete application, to what extent does the following learning methods help you to pick up this knowledge?

	very helpful	quite helpful	slightly helpful	not helpful
being guided by a person	❍	❍	❍	❍
classroom training	❍	❍	❍	❍
reading by myself	❍	❍	❍	❍
watching a video	❍	❍	❍	❍
playing a game which simulate the process, possibly with some colleague	❍	❍	❍	❍
learning by doing (I right away start with my work and get learning support when needed for each specific action I need to perform)	❍	❍	❍	❍
others	❍	❍	❍	❍

18) Now consider, you are actually working on a case and want to know more about the process. To what extent do the following learning methods help you to pick up this knowledge? (1) An avatar is the representation of a person or idea. In the computer world, an avatar specifically refers to a character that represents an online user, for example someone providing support (URL: http://techterms.com/definition/avatar) An example of an Avatar is “Anna”, the electronic assistant provided by IKEA (TechTerms. URL: http://www.ikea.com/gb/en/)

	very helpful	quite helpful	slightly helpful	not helpful
being guided by a person	❍	❍	❍	❍
getting help from an avatar (1)	❍	❍	❍	❍
reading by myself	❍	❍	❍	❍
watching a video	❍	❍	❍	❍
others	❍	❍	❍	❍

19) Imagine a task in which you create information (results of calculation, budget reports etc.). Do you know what happens with the information you create?

- ❍ Yes
- ❍ No

20) In case you answered YES to the previous question, does it infulence your work, for example are you aware of the importance of the quality of your output? In case you answered NO, would it change the way you work if you knew it?

Please answer:

21) Do you think that it is a good idea to structure the learning resources for a process according to the different activities?

- ❍ Yes
- ❍ No

22) Imagine you have to perform a procedure, and imagine that such procedure is described in a document. You prefer to have:

- ❍ a document WITH a graphical description of the procedure (for example, a diagram with blocks and arrows)
- ❍ a document WITHOUT any graphical description of the procedure
- ❍ no preference

23) Did you ever take part to workshop/focus group/communities in which issues about processes and working activities are discussed among peers in order to improve them?

- ❍ Yes
- ❍ No

24) In case you answered NO to the previous question, would you be interested in such an opportunity?

- ❍ Yes
- ❍ No

25) What do you expect from an e-learning tool?

- ❍ it saves me time for travelling to a course
- ❍ I can collaborate with other learners
- ❍ I get guidance related to my work
- ❍ it allows me to simulate work scenarios in a playful manner
- ❍ I don't want to use an e-learning tool.
- ❍ Other - Please specify:

26) In case you do not want to use an e-learning tool please explain why?

Please explain:

27) what do you expect from a collaboration tool?

- ❍ I can share my opinions with others
- ❍ I can get feedback on my own work/opinions
- ❍ I can see what others think
- ❍ we can work on the creation of documents together
- ❍ I don't want to use a collaboration tool, please explain why not
- ❍ Other - Please specify:

28) In case you do not want to use a collaboration tool please explain why?

Please explain:

29) what encourages/motivates you to contribute to a collaboration tool?

- ❍ Arising points for expertise level within the tool
- ❍ Feedback from my colleagues
- ❍ Feedback on how useful the contribution is for my organisation
- ❍ Receiving a bonus (the more contributions, the more reward)
- ❍ Not to be at the bottom of the list (publish a list of people's contributions monthly, with ranking)
- ❍ It saves time for me in the long run as the information is documented, I do not need to provide this information again and again
- ❍ Other - Please specify:

2.2.3. Questions for process responsibles

1) What skills / qualifications the employee in your team need to perform their job? Please order them by importance (top = the most important - bottom = least of all)

   Please specify:

2) Do you define precise goals for the employees in your office (Example: the process has to be completed in less than 15 days) and for the organization as a whole (Example: reduce queued requests)? In case yes please list some of them:

   Please specify:

3) In case you define precise goals, and with respect to the previous list, how do you know when the employee reached the goal?

   Please specify:

4) Is there a management framework in place at your workplace? MBO is a multidimensional management approach with emphasis on the importance of target agreements with the employees. Important part is the participation of employees in the goal setting process and the periodical review of the achievement of objectives; TQM aims at optimizing the quality of products and services of a company in all functional areas and at all levels through cooperation of all employees. You are encouraged to actively contribute to getting better; KAIZEN is derived from a process of Japanese manufacturing technology. It means consistent innovation management or simply improvement. Kaizen is a continuous improvement process and means not only product improvements but improve all operational processes (development, production, sales, distribution, etc.)

   - ❍ MBO (Management by Objectives)
   - ❍ TQM (Total Quality Management)
   - ❍ KAIZEN
   - ❍ SixSigma
   - ❍ No
   - ❍ Other - Please specify:

5) How do you define the goals of your team?

   Please specify:

6) How do you know the goals of your organisation?

Please specify:

7) How do you contribute to reach organisational goals? please briefly explain and give an example:

Please specify:

8) Please rank the following sentences with respect to their relevance

- To make a good job it is important to be up-to-date with the laws in the specific sector

1	2	3	4	5
❍	❍	❍	❍	❍

- It is important to reflect on the working processes to improve them and make them more effective

1	2	3	4	5
❍	❍	❍	❍	❍

- A knowledge sharing platform permit to the employees to be constantly up-to-date and to perceive being part of an organization

1	2	3	4	5
❍	❍	❍	❍	❍

9) What do you expect from an e-learning tool?

- ❍ it saves me time for travelling to a course
- ❍ I can collaborate with other learners
- ❍ I get guidance related to my work
- ❍ it allows me to simulate work scenarios in a playful manner
- ❍ I don't want to use an e-learning tool.
- ❍ Other - Please specify:

10) In case you do not want to use an e-learning tool please explain why?

Please explain:

11) what do you expect from a collaboration tool?

- ❍ I can share my opinions with others
- ❍ I can get feedback on my own work/opinions
- ❍ I can see what others think
- ❍ we can work on the creation of documents together
- ❍ I don't want to use a collaboration tool, please explain why not
- ❍ Other - Please specify:

12) In case you do not want to use a collaboration tool please explain why?

Please explain:

13) what encourages/motivates you to contribute to a collaboration tool?

- ❍ Arising points for expertise level within the tool
- ❍ Feedback from my colleagues

- ❍ Feedback on how useful the contribution is for my organisation
- ❍ Receiving a bonus (the more contributions, the more reward)
- ❍ Not to be at the bottom of the list (publish a list of people's contributions monthly, with ranking)
- ❍ It saves time for me in the long run as the information is documented, I do not need to provide this information again and again
- ❍ Other - Please specify:

14) Have you ever considered the possibility to express the complexity of the various aspects of the work to be performed within your team using graphical representations of the procedures (for example, diagrams)?

- ❍ Yes
- ❍ No

15) Which are the aspects of the office that you consider would benefit more from a graphical representation in order to make easier the learning activity of your team?

- ❍ Organization
- ❍ Processes
- ❍ Organization objectives
- ❍ Documents and Forms
- ❍ Other - Please specify:

16) How valuable do you consider a learning platform for learning and training in you office that provides graphical representations (models) like business process models, organisational charts etc?

- ❍ Yes
- ❍ No

17) Do you know the BPMN representation for business processes? (below an exemplificative diagram in BPMN is reported)

- ❍ Yes
- ❍ No

18) How do you improve your business processes?

- ❍ I participate in focus groups responsible for process improvement
- ❍ I talk to the process owner/responsible
- ❍ I make suggestions for improvement at board meetings
- ❍ Other - Please specify:

19) Below you find four types of representations for the same business process and for organizing the corresponding knowledge. Which one you would consider the best to organize learning activities and material for your employee? (Please briefly explain why)

- BPMN representation (Rank)

1	2	3	4	5
❍	❍	❍	❍	❍

BPMN representation (Explanation)

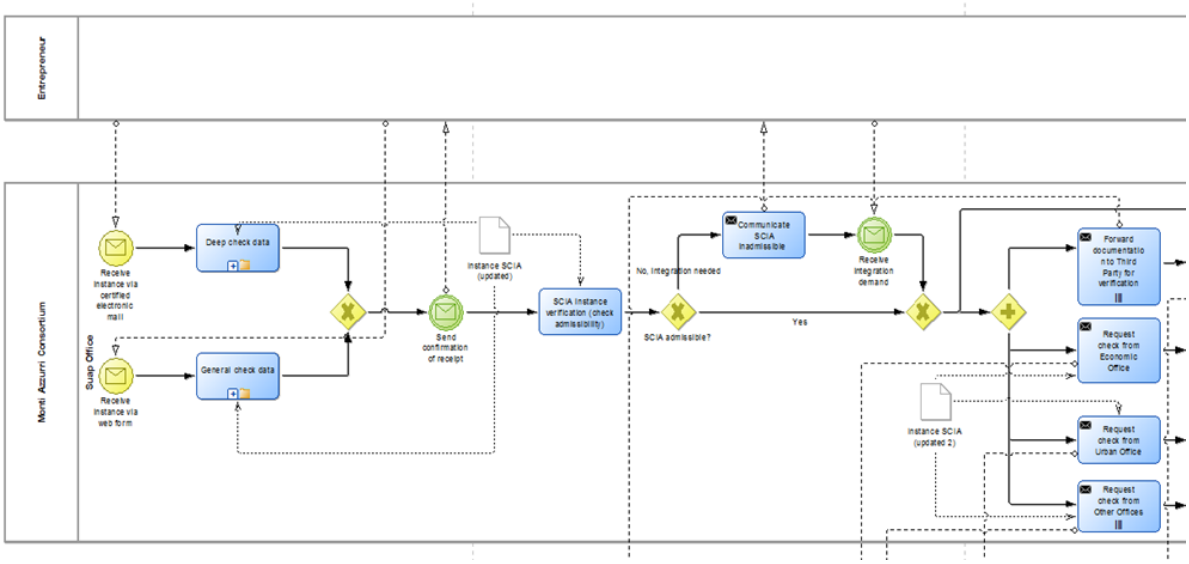

Figure 2.1: BPMN Model

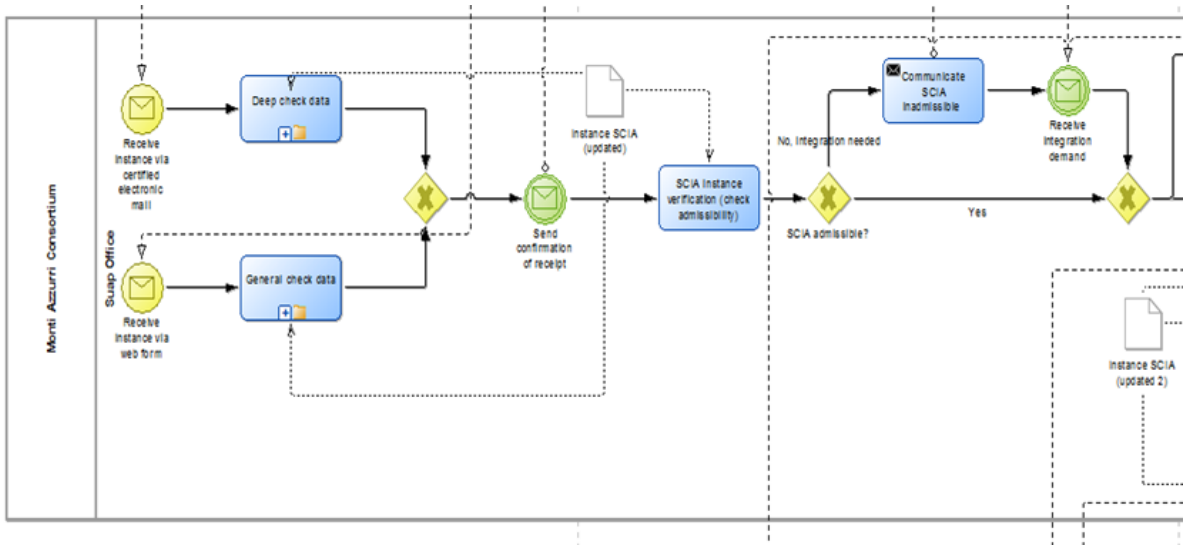

Figure 2.2: BPMN Representation

Please explain:

- Simplified Flow Chart (Rank)

1	2	3	4	5
❍	❍	❍	❍	❍

Simplified Flow Chart (Explanation)

Please explain:

- Table (Rank)

1	2	3	4	5
❍	❍	❍	❍	❍

Table (Explanation)

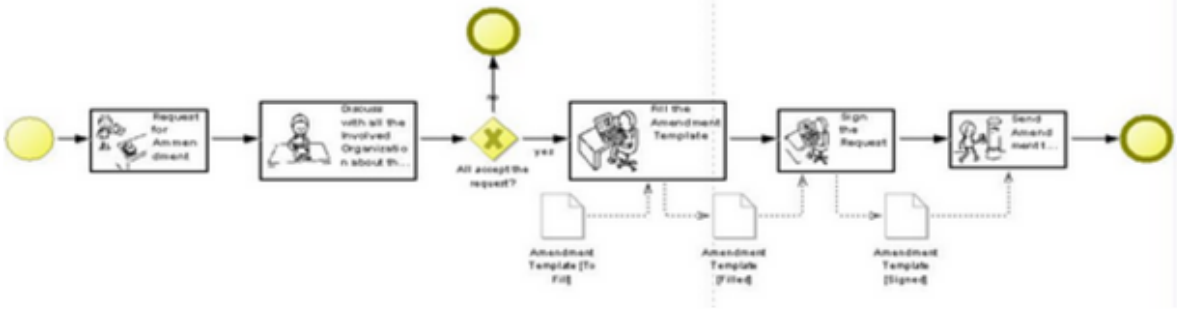

Figure 2.3: Flow Chart

Process Name: SCIA Commerciale

Description

"Monti Azzurri Consortium is involved in the BP when the SUAP office receives the SCIA request from the entrepreneur. In case SUAP office receives the request via Web Form it has to quickly check documents and certificates since the software available in the Web Form does most of the checks, otherwise it has to check manually the request. If the request is correct an automatic communication of reception is sent. Then, the SUAP office checks if the request is admissible, in case it is not admissible integration is requested to the entrepreneur. At this point, SUAP office forwards the request to the involved municipality offices and to third parties. If someone finds some lack of documentation, integration can be requested to the entrepreneur. At the end if the request is correct no communication is sent to the entrepreneur, otherwise a communication of stop of the business activity is sent.

Name	Type	Role	Doc	Description
1. Application starts	Message	SUAP Office	Email Application	Process is started by receiving an Email application
2. Deep check data	Manual task	SUAP Office	Instance SCIA (updated)	In this activity the SUAP office has to check carefully the documentation and certificates sent by the entrepreneur since they are sent via certified email.
...				

Figure 2.4: Table

Please explain:

- Textual description (Rank)

1	2	3	4	5
❍	❍	❍	❍	❍

Textual description (Explanation)

Please explain:

2.3. Results

In this section we report some preliminary illustration and discussion of the answers to the questionnaires. In particular, we report below the categorization of answers for most interesting ones among multiple-choice questions, whereas a more detailed analysis including all answers will require more time and effort and will be reported in future. For ease of exposition, we have numbered progressively the questions processed.

2.3.1. User profile

Q 1. For how many years have you been working in the Public Administration?

Business Start-up Certified Notification - SCIA Commerciale

The BP of "Business Start-up Certified Notification" scenario is modelled using BPMN 2.0 language. Four participants are involved in; they are represented as BPMN 2.0 Pool and following listed.

- **Entrepreneur**, he has to certify the start of an activity.
- **"Monti Azzurri Consortium** , it is the PA taken care of the activities of an aggregate SUAP office.
- **Municipality**, in this example it is the municipality of Sarnano. Different unit of the municipality are involved in the BP, they are represented as BPMN 2.0 Lane:
  - **Economic office**;
  - **Urban office**;
  - **Other offices**, they are other offices of the municipality that are delegated to check some part of the documentation sends by the Citizen Applicant. They are not generalizable since they change case by case.
- **Third party PAs**, it is an external PA that is involved in the BP. It is delegated to do some checks. More than one external PA can be involved in the "SCIA Commerciale" then, we type this participant using Multi-Instances BPMN 2.0 marker.

Figure 2.5: Textual Description

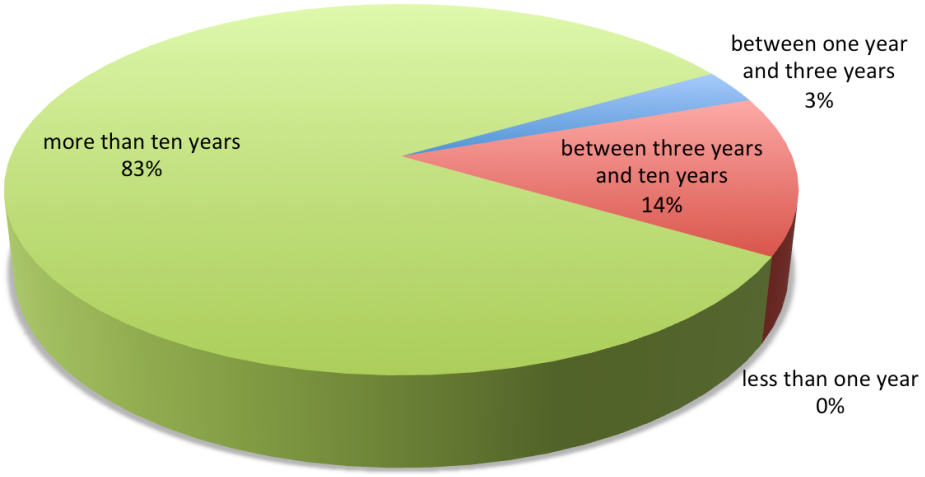

Figure 2.6: Answers to Q1

Most of the interviewees have an expertise of more than 10 years (i.e. 86%), some of them have a medium-term working experience (i.e. 14%), few classified themselves as junior, while no one of the interviewees was a novice.

Q 2. Which is your role in the organization?

The resulting pool of civil servants is quite heterogeneous: 52 of the interviewee are back/front office employees, while the remaining 49 civil servants have some responsibilities in a process. Figure 2.7 reports such a distribution; while Section 2.3.2 presents the answers given by the back/front office employees, and Section 2.3.3 describes the analysis on the answers from the civil servants having some responsibilities in a process.

Q 3. How long are you working in your current role within your organization?

Most of the interviewee have been working in the same role for a quite long period. In particular, Figure 2.8 reports that almost half of the pool for more than 10 years, while the 43% of the civil servants has at least 3 years of experience.

Q 4. How would you classify your expertise in the usage of software systems, such as office

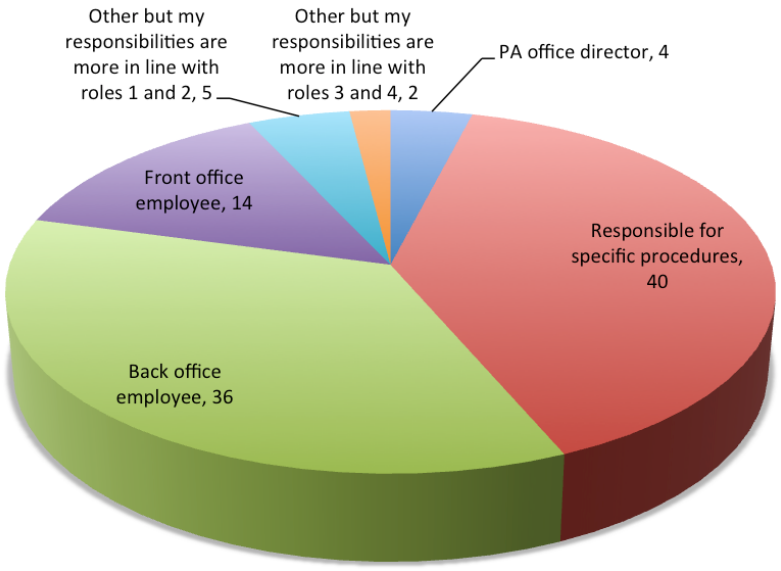

Figure 2.7: Answers to Q2

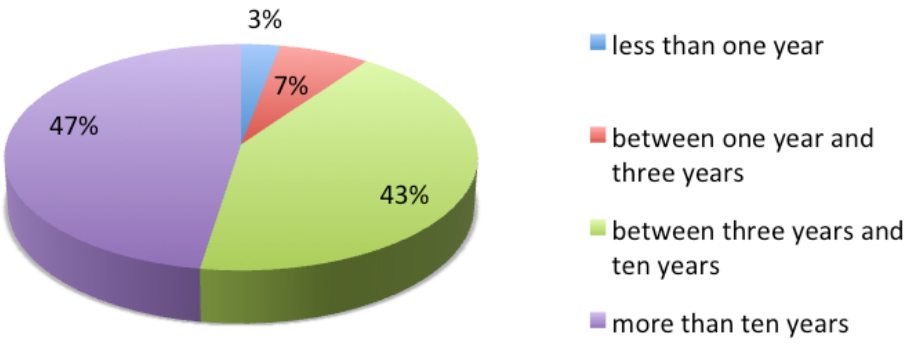

Figure 2.8: Answers to Q3

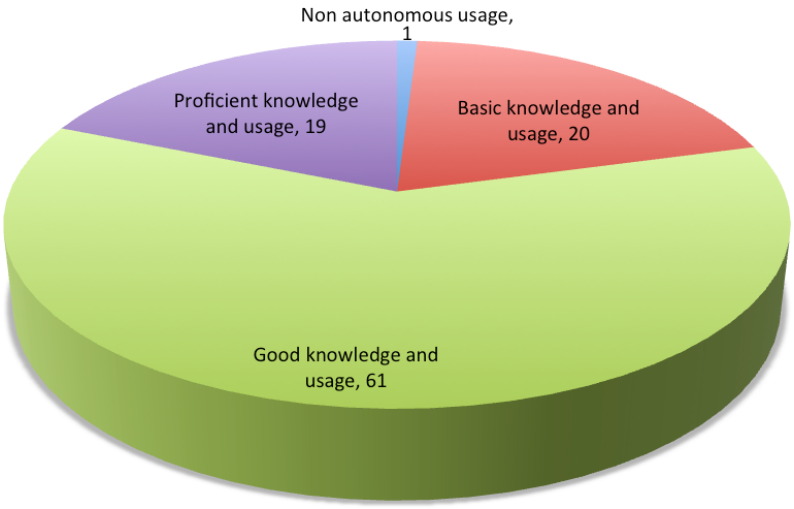

Figure 2.9: Answers to Q4

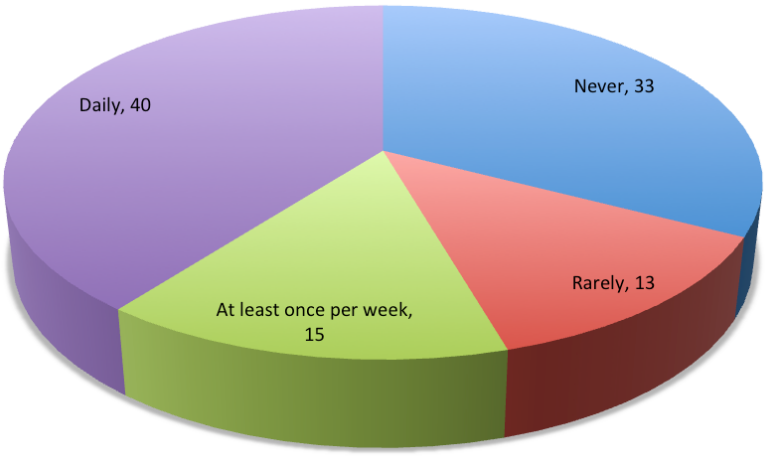

Figure 2.10: Answers to Q5

automation tool-suites (example: Powerpoint, Word, Excel) and Internet browsing?

While most of the interviewee revealed a medium/long-term working experience in the Public Administration, only the 61% of them declared a good knowledge and usage of office automation tool-suites, and almost 1 civil servant out of 5 still has only basic skills. The details are reported in Figure 2.9.

Q 5. How often do you access social network systems during your free time? (example: Facebook, Twitter, Google+ etc.)

The 68% of the interviewees are familiar with most common social networks, and most of them daily access such platforms (see Figure 2.10).

Q 6. Have you ever participated to learning activities using Information and Communication Technologies (e-learning)?

Form the collected answers, it results that most of the civil servants (i.e. 79%) already took e-learning sessions, while only the 22% is new to such approach.

2.3.2. Questions for back/front office employees

Q 7. In a document that describes a procedure, which is the most important quality that you expect from that document?

Around the 42% of the interviewees considered that the most important quality expected from a

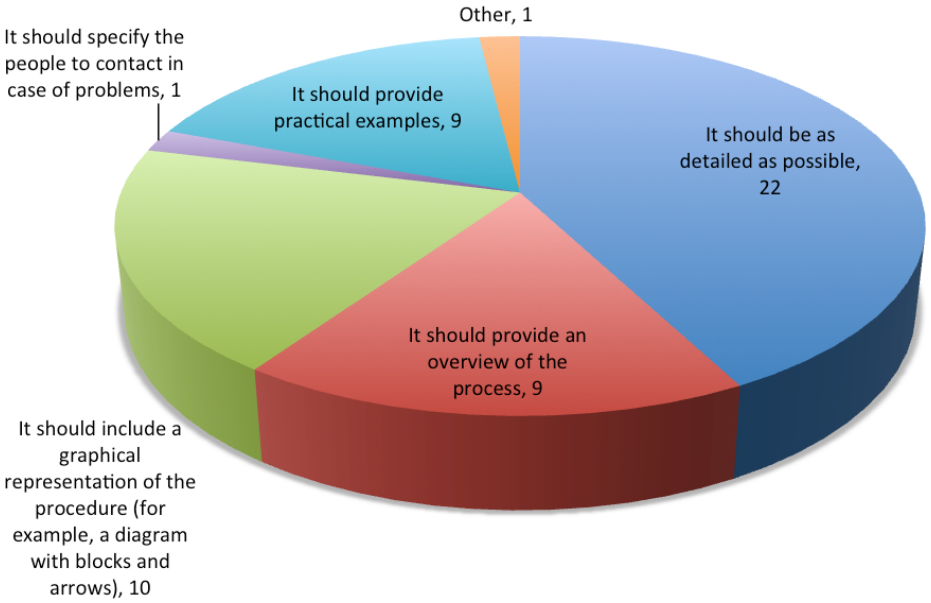

Figure 2.11: Answers to Q7

document is the level of detail. A minor interest is given to aspects related to: practical examples, graphical representation, or overview of the process. Notably, the indication of a reference person (to be contacted in case of problems) is not perceived as fundamental. Details of the data are in Figure 2.11.

Q 8. Which are the issues that you often face when you need to perform actions within a process? (please provide 4 answers at maximum)

The answers to this question provide an interesting record of the issues as experienced by the civil servants. The details are reported in Figure 2.12.

Q 9. For each of the problems what did you do to solve the problem?

As reported in Section 2.2.2, we asked the civil servants to report three problems they had to face, and then for each one we repeated this same question. We have grouped all answers into a unique collection, and in the analysis we do not take into account which problem each answer refers to. Our goal was to get a comprehensive record of the attempts made by the civil servants in solving a problem. Details are depicted in Figure 2.13

Q 10. Imagine that you are facing an issue in performing your activities in a process for which you are not proficient, yet. Which one of the following sentences would you consider true (mark them):

The options available for such a question were:

A : It is difficult to identify resource containing the needed piece of knowledge to solve the problem, and in general I found myself reading many documents that are not related to the issue before finding the solution

B : the learning resources which I can access are organized according to the activities in the process therefore I go straight to these resources and there I found the solution even if sometimes it is not easy

C : Organizing the learning resources according to the process structure would make easier the search of a solution

D : In general it is clear to who direct a request for clarification/help

E : Once you identified a colleague/expert that should know a solution he/she helps you within a short time frame

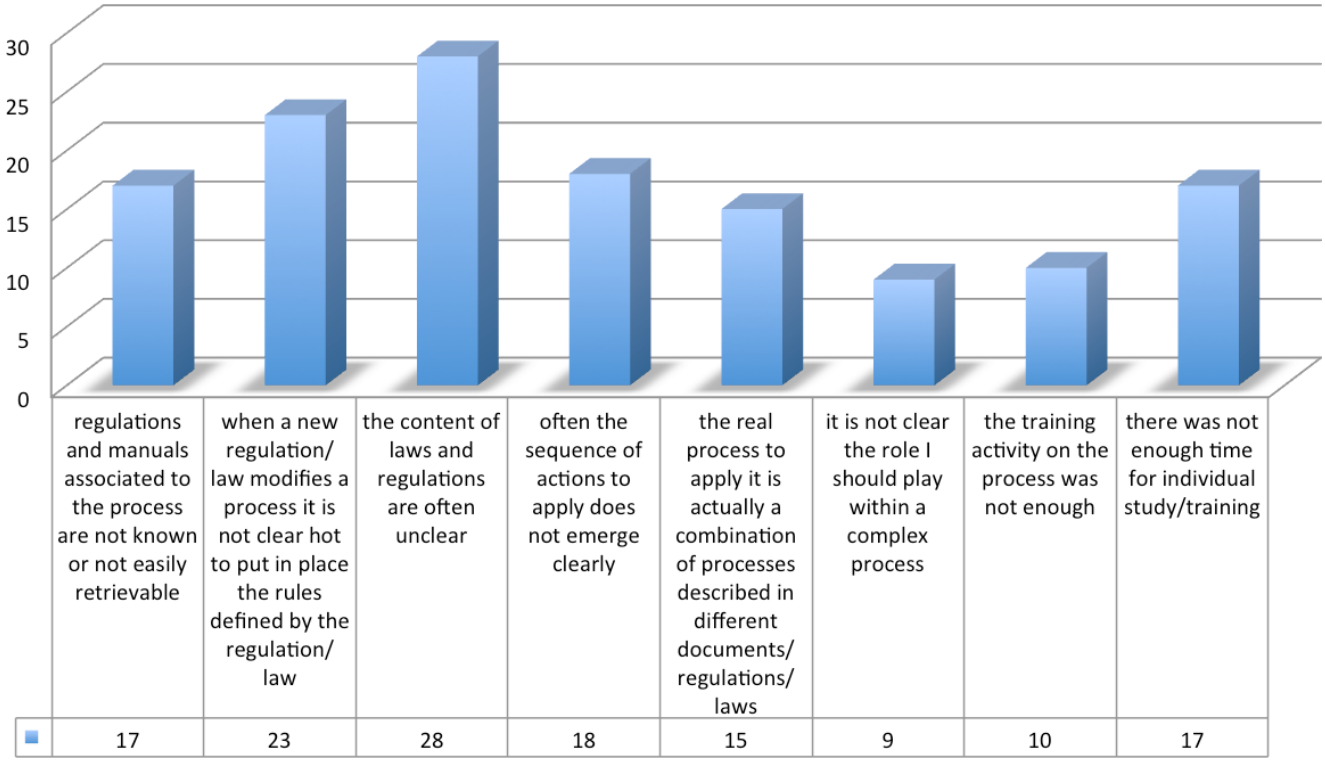

Figure 2.12: Answers to Q8

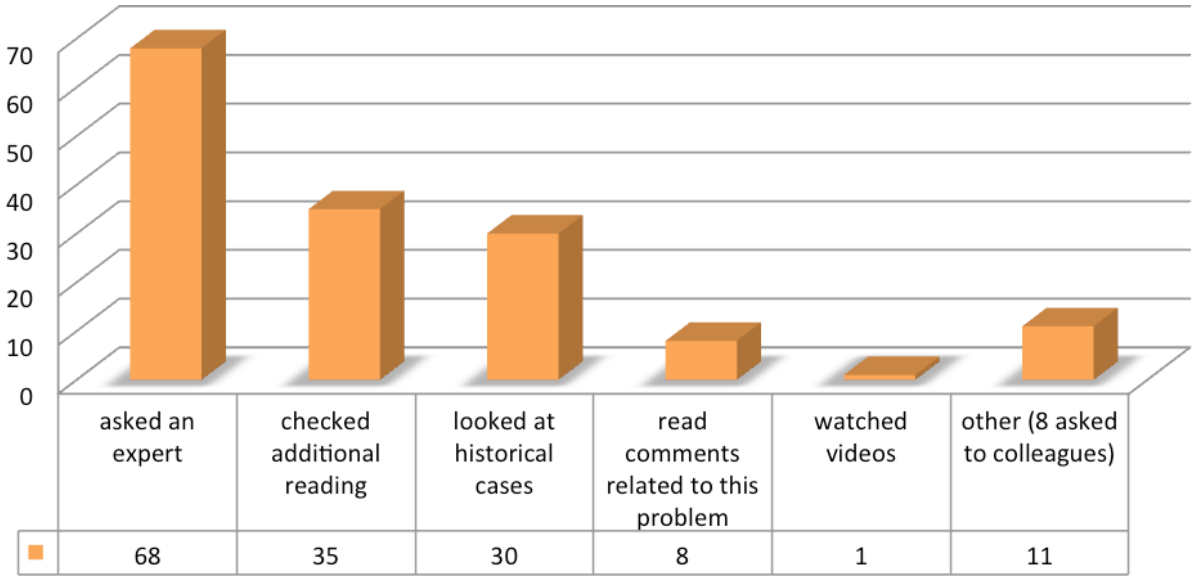

Figure 2.13: Answers to Q9

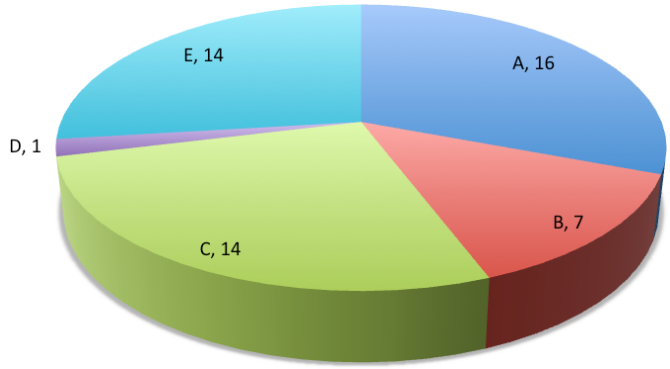

Figure 2.14: Answers to Q10

	very often	sometimes	in exceptional cases	never
address book (e.g. to involve a colleague)	23	22	6	1
information about organisational structure (e.g. to find the right colleague to involve)	8	31	13	0
database with historical cases	13	22	8	9
law texts / commented laws	19	21	9	3
other documents	17	26	9	0
organisational goals	4	19	12	17
others	3	21	17	11

Table 2.1: Answers to Q11

Figure 2.14 reports the collected answers.

Q 11. Imagine you are working on a task in a process. Which kind of information do you apply and how often?

Table 2.1 details the breakdown of the collected answers.

Q 12. How do you manage information in your organisation? (example: new procedures, guidelines, rules to follow, general notifications)

The collected answers reveal that almost the 50% of the interviewees access information on a shared drive; nevertheless, this aspect does not imply that the content is actually organized in way that can ease learning activities. Also, there is still a quite consistent sub-set of civil servants (i.e. almost 30%) that only keep their own local copy of the official document. Figure 2.15 reports the distribution of the answers.

Q 13. Think about all the knowledge that you need to perform a process in your daily work. If you want to get more familiar with a process that is not familiar to you, yet, for instance before working on a concrete application, to what extent does the following learning methods help you to pick up this knowledge?

Table 2.2 details the breakdown of the collected answers.

Q 14. What do you expect from an e-learning tool?

As reported in Figure 2.16, almost the 40% of the interviewees think that the major benefit from an e-learning platform is that it saves time from travelling to a physical classroom. Only the 36% of the answers report that an e-learning platform could support the collaboration among the learners (i.e. 19%), or it can be an actual support during the work (i.e. 17%).

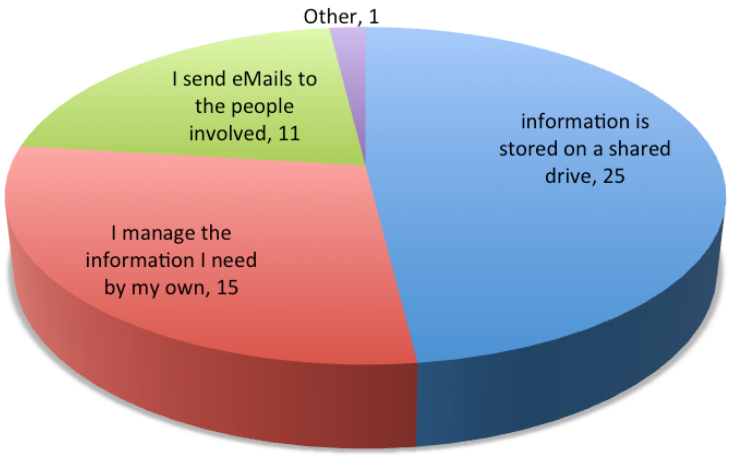

Figure 2.15: Answers to Q12

	very helpful	quite helpful	slightly helpful	not helpful
being guided by a person	34	15	3	0
classroom training	16	28	7	1
reading by myself	14	27	10	1
watching a video	8	23	20	1
playing a game which simulate the process, possibly with some colleague	26	19	7	0
learning by doing (I right away start with my work and get learning support when needed for each specific action I need to perform)	24	18	8	2

Table 2.2: Answers to Q13

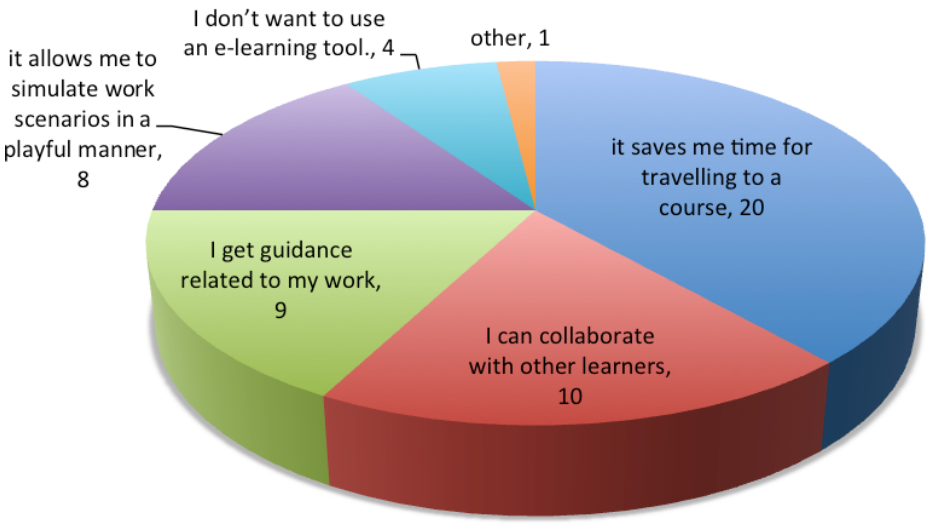

Figure 2.16: Answers to Q14

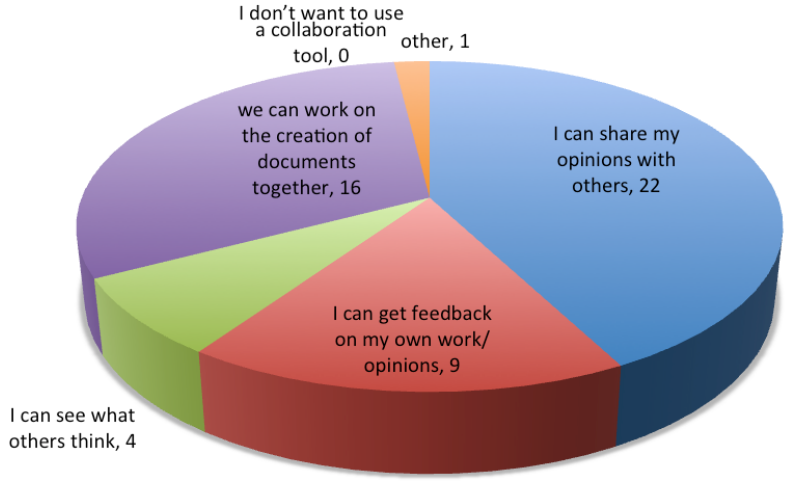

Figure 2.17: Answers to Q15

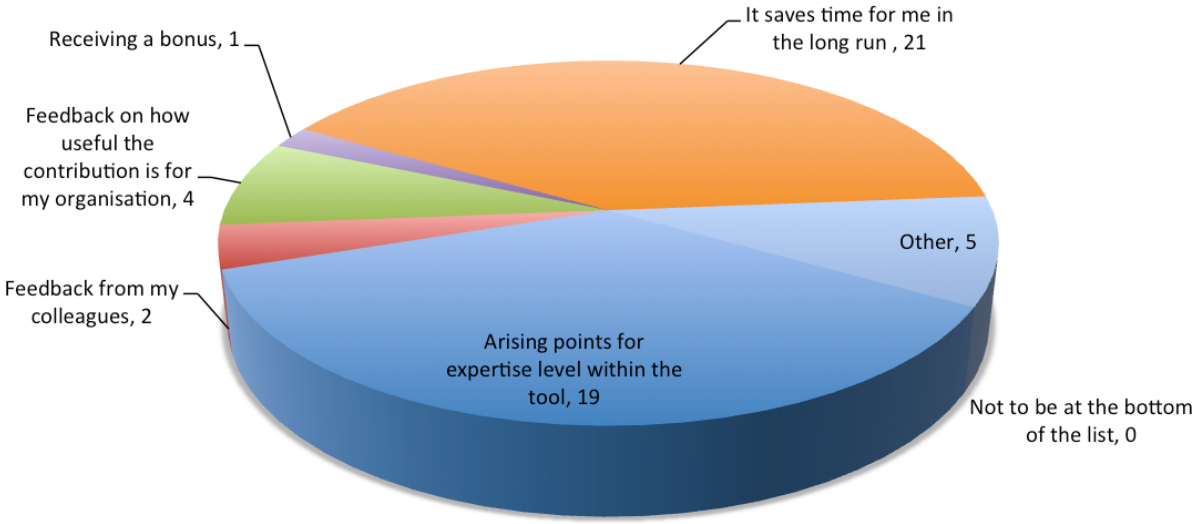

Figure 2.18: Answers to Q16

Q 15. What do you expect from a collaboration tool?

With respect to collaborative platforms, somewhat contrariwise to our expectation the collaborative creation/editing of documents is only the second most required feature for such platforms (i.e. 30%); see Figure 2.17.

The majority of the interviewees (i.e. 42%) consider the possibility to exchange opinions is the most desired feature. This aspect is even more relevant if we consider that almost the 17% of the answers are about "receiving feedbacks". In this sense, almost the 60% of the civil servants working as back/front office employee see a collaborative platform mainly as a mean for exchanging feedbacks and opinions, thus mostly like to any platform for social networking.

Q 16. What encourages/motivates you to contribute to a collaboration tool?

Figure 2.18 reports how the interviewees recognize that contributing to a collaborative platform could save time in the long run, and it could increase the level of expertise. However, while the possibility to exchange opinions has been rated as a high desired feature for the collaborative platforms (see Figure 2.17), Figure 2.18 also denotes such feature is not enough in order to encourage/motivate the contributors.

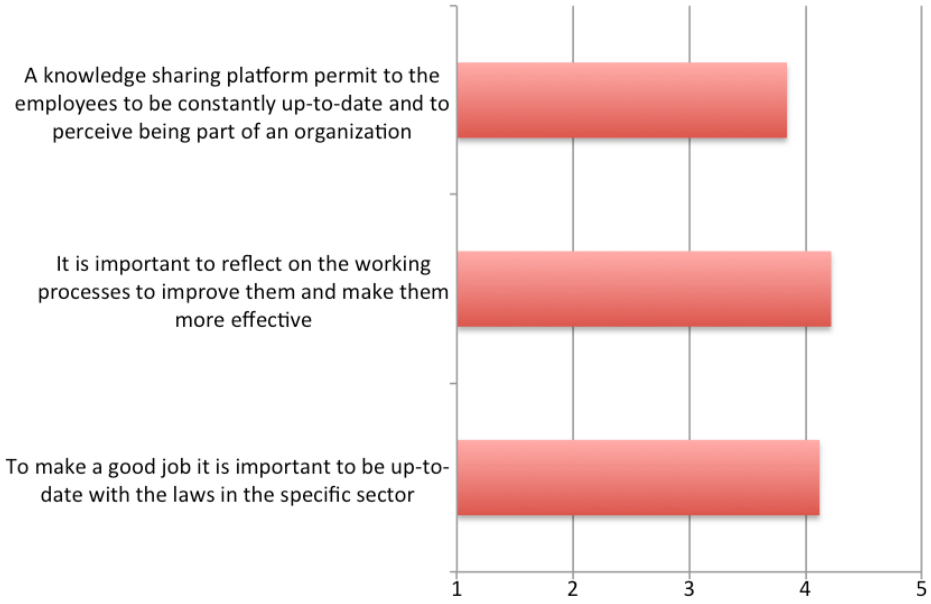

Figure 2.19: Answers to Q17

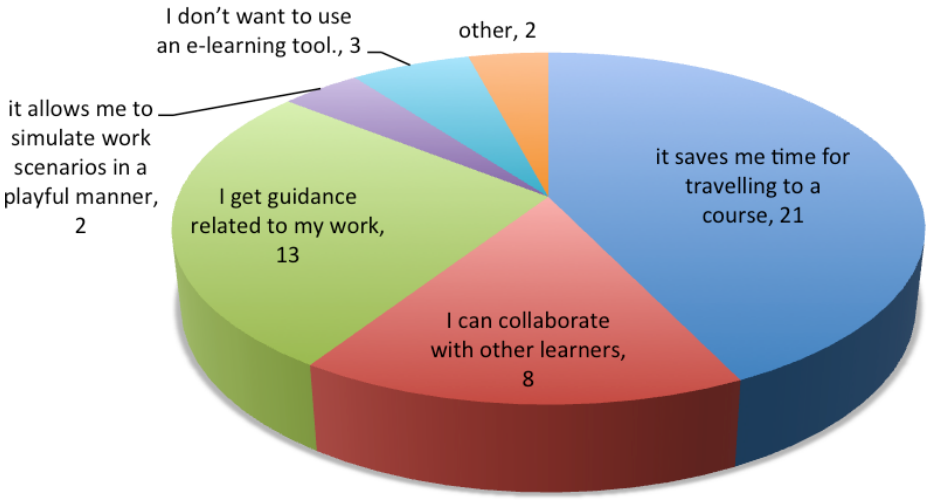

Figure 2.20: Answers to Q18

2.3.3. Questions for process responsibles

Q 17. Please rank the following sentences with respect to their relevance

Figure 2.19 reports the mean ranks provided by the interviewed civil servants having some responsibilities in a process.

Q 18. What do you expect from an e-learning tool?

This is the same as Question 14. It can be interesting to compare the answers from process responsible with those from employees. For this question, percentages are not very different. As reported by Figure 2.20, almost the 43% of the interviewees think that the major benefit form an e-learning platform is that it saves time from travelling to a physical classroom. More than the 26% of the answers reported that an e-learning platform could be an actual support during the work; but only the 16% that it can actually enable the collaboration among the learners.

Q 19. What do you expect from a collaboration tool?

This is the same as Question 15 for employees. With respect to collaborative platforms, similarly to previous case, the collaborative creation/editing of documents is only the second most required feature for such platforms (i.e. 24%); see Figure 2.21. The majority of the interviewees (i.e. 30%) consider the

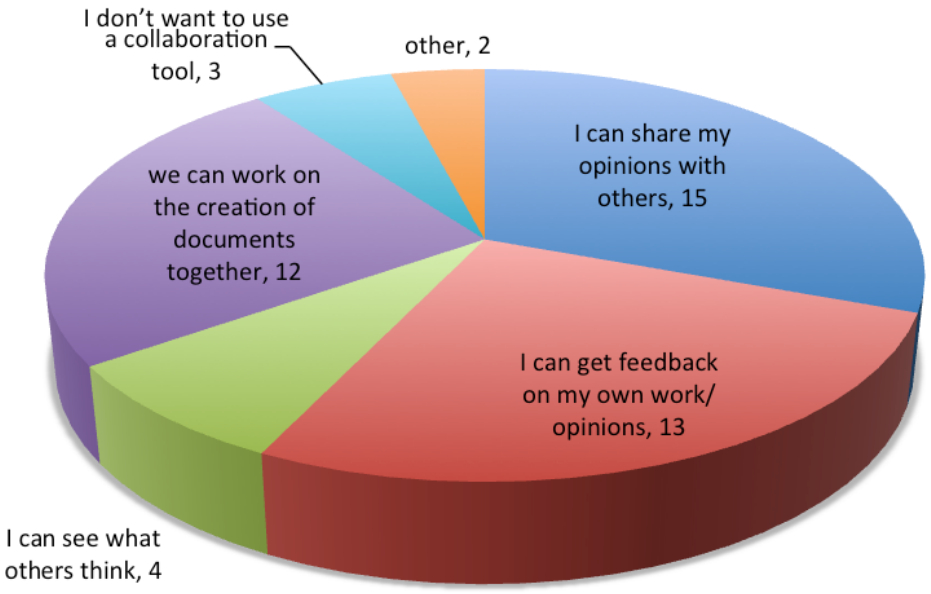

Figure 2.21: Answers to Q19

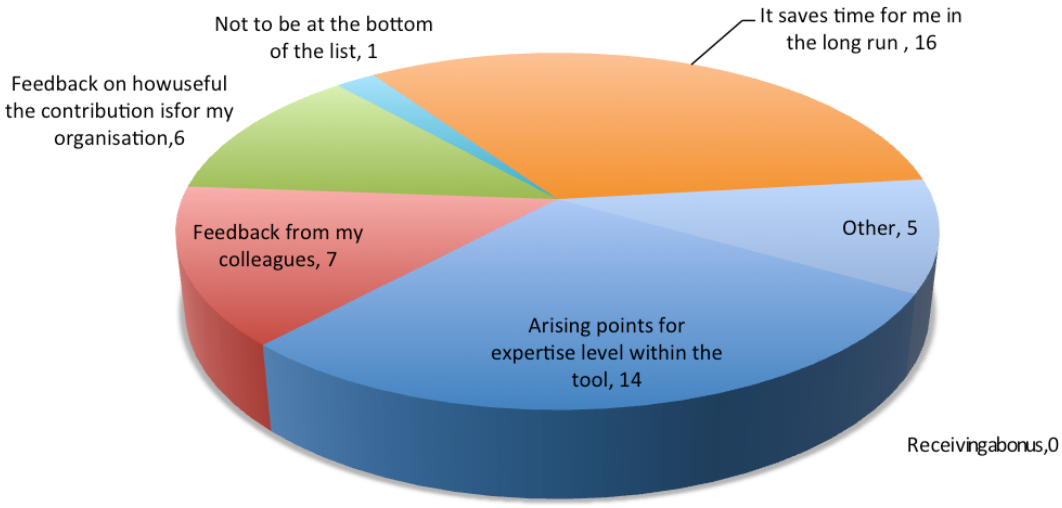

Figure 2.22: Answers to Q20

possibility to exchange opinions is the most desired feature. This aspect is even more relevant if we consider that almost the 26% of the answers are about "receiving feedbacks". In this sense, as argued for Figure 2.17, almost the 57% of the civil servants that are responsible for one or more tasks in a process, consider a collaborative platform mainly as a mean for exchanging feedbacks and opinions. Again, it is mostly perceived as any platform for social networking.

Q 20. What encourages/motivates you to contribute to a collaboration tool?

Same as Question 16 for employees. Figure 2.22 reports how the interviewees recognize that contributing to a collaborative platform could save time in the long run, and it could increase the level of expertise. However, while the possibility to exchange opinions has been rated as a high desired feature for the collaborative platforms (see Figure 2.21), Figure 2.22 also denotes that such feature is not enough in order to encourage/motivate the contributors.

Q 21. Do you know the BPMN representation for business processes? (below an exemplificative diagram in BPMN is reported)

For the collected answers emerged that only the 35% of the interviewees know the BPMN representation for business processes.

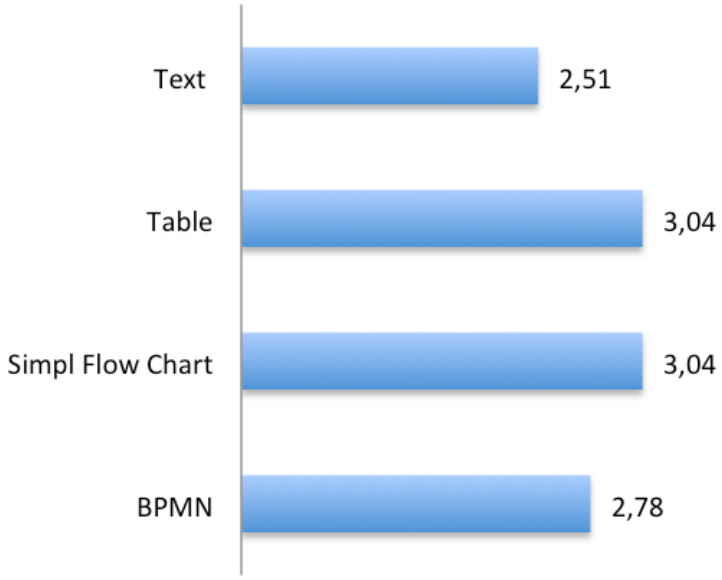

Figure 2.23: Answers to Q22

Q 22. Below you find four types of representations for the same business process and for organizing the corresponding knowledge. Which one you would consider the best to organize learning activities and material for your employee? (Please briefly explain why)

The answers to this question provide an actual record of the personal opinions from the civil servants.The distribution is reported in Figure 2.23.

3 Gathering user needs/expectations/context from related literature

In this chapter the consortium reports findings in relevant literature concerning how to motivate and engage the targeted Learn PAd learners. For this purpose, the project has started a campaign in different directions, and while we continue to investigate potential means to improve learners engagement, we report the main findings so far. The project mixes into a novel approach known strategies from learning theories, findings from cognitive science in social learning, and game-like approaches in simulation. These relevant approaches are discussed with respect to the Learn PAd project. The related literature review has been advised by the interaction with experts in the specific area and in particular with Rosaria Conte who is a member of the Learn PAd Project Advisory Board.

3.1. Relevant learning theory

In order to be able to effectively engage learners from the offices of Public Administrations, it is first necessary to understand the learning process that can be instantiated for PA workers, and what learning framework(s) the Learn PAd approach can apply.

Admittedly, on the one side background and competences in the consortium are more-oriented towards software technologies and business process management fields than learning and pedagogy; on the other, most of the resources are directed towards designing, developing and validating the model-based platform. Therefore, to investigate learning theories and paradigms we rather rely on advice and guidelines from experts as collected in relevant literature and projects.

In [34], the authors explore the application of e-learning as a medium for workplace learning from a theoretical point of view, as a form of both adult learning and organisational learning. The cited paper provides an interesting review of features specific to adult learning in the workplace, highlighting that it is typically *problem-oriented*, and should be *highly flexible*, as adult learners appreciate to stay in control of how, when and where learning should happen.

A learning theory describes how information is absorbed, processed, and retained during learning by individuals, groups or organizations [37]. Learning theories have been defined and introduced since the times of ancient Greek philosophers centuries before Christ, although critics have been moved to the very need to study them. Nowadays, most attention is drawn by the disruptive impact of modern media and technologies on learning habits and approaches.

A recent survey [27] carried out within the European Project HoTel (Holistic approach to Technology enhanced learning) (http://hotel-project.eu/) provides us with the useful reference of a conceptual map on learning theories, focusing especially on those supported by ICT. Based on a study of the referred survey, we can state that through the model-based collaborative Learn PAd approach we combine in innovative way aspects from different proposed learning practices, including “situated learning”, “personal learning environment”, “connectivism”, and “gamified learning”.

Situated learning refers to the acquisition of professional skills within a community of practice and a social situation. In modern society, *situated learning is becoming more involved with technology in ways to help individuals learn information differently than they have in the past. The model of learning a skill through technology mimics how individuals learned in the past from a professional in that*

skill [38]. Also the already cited study on e-learning at work [34] mentions situated learning as a typical context, emphasizing the importance of peer-to-peer interaction and mutual communication. We see situated learning as closely related to Learn PAd approach, in that we foster collaborative learning within community of co-workers, both within and across different organizations.

Personal learning environment refers to employing ICT systems that help learners take control of and manage their own learning. *This includes providing support for learners to: set their own learning goals, manage their learning, both content and process, communicate with others in the process of learning, and manage their personal learning network* [27]. In Learn PAd we provide a personal learning environment with respect to personalized wiki pages as the context of a user determines the learning objects offered to the user.

Connectivism is a learning practice built on the thesis that knowledge is distributed across a network of connections, and the nodes are anything that can be connected to another node such as an organization, information, data, feelings, and images. Downes [12] bases connectivism on a pedagogy that seeks to describe :

- successful networks (as identified by their properties, such as diversity, autonomy, openness, and connectivity);
- the practices that lead to such networks, both in the individual and in society.

This vision closely fits with our aim of using formalized models (e.g. processes, organization, competences, etc.) for both purposes such as representing a context and documenting these representations.

Finally gamified learning refers to using game mechanics and elements of game design in non-game contexts in order to motivate a desired learning behaviour [27]. In particular in Learn PAd, we introduced a gamified learning approach through simulation.

Games are definitely among the biggest human interests, as it can be verified by the many archaeological evidences showing that games have been played throughout humankind's history [35]. Nowadays, gamification (called also gameful design) and serious game are hot topics in both industry and research, and widespread over a range of different domains. In fact, such topics relate to the promotion of learning using the inherent problem-solving skills and engagement that interactive games facilitate. Often, there is confusion between these terms but some semantic differences can be identified. Gamification is not clearly described in literature. There have been few attempts that tried to define the term scientifically. In [10], authors define it as the use of game design elements in non-game contexts. This definition is the most comprehensive and the best known. In fact, the authors aim to separate gamification from serious game, toys and playful design. They classify them in two dimensions as illustrated in the Figure 3.1.

The act of playing a game is generally considered an enjoyable and intrinsically satisfying activity on its own [28]. Therefore the general idea behind gamification is that it attempts to harness this enjoyment and fun that people find from games and use it to frame non-game contexts as game-like in order to make them more enjoyable and motivating also. Through the previous definition, the essence of gamifying something entails adding any number of game elements such as leaderboards, badges and other rewards or incentives to a non-game context to enhance the user experience or increase motivation and engagement. Overall gamification generally has the goal to make a more appealing product or create a more active and motivated user base [15]. The term serious games often refers to games designed for the purpose of teaching a specific skill. This kind of training technique applies game principles, but does so in a way that focuses on a specific skill-building outcome [11]. Indeed, they have the goal of winning, that is overcoming challenges proposed by the game itself or by other human players mostly from competition. Along such purposes, we plan to apply both gamification and serious game concepts to simulation of tasks and activities to be learned, so to engage civil servants while training them.

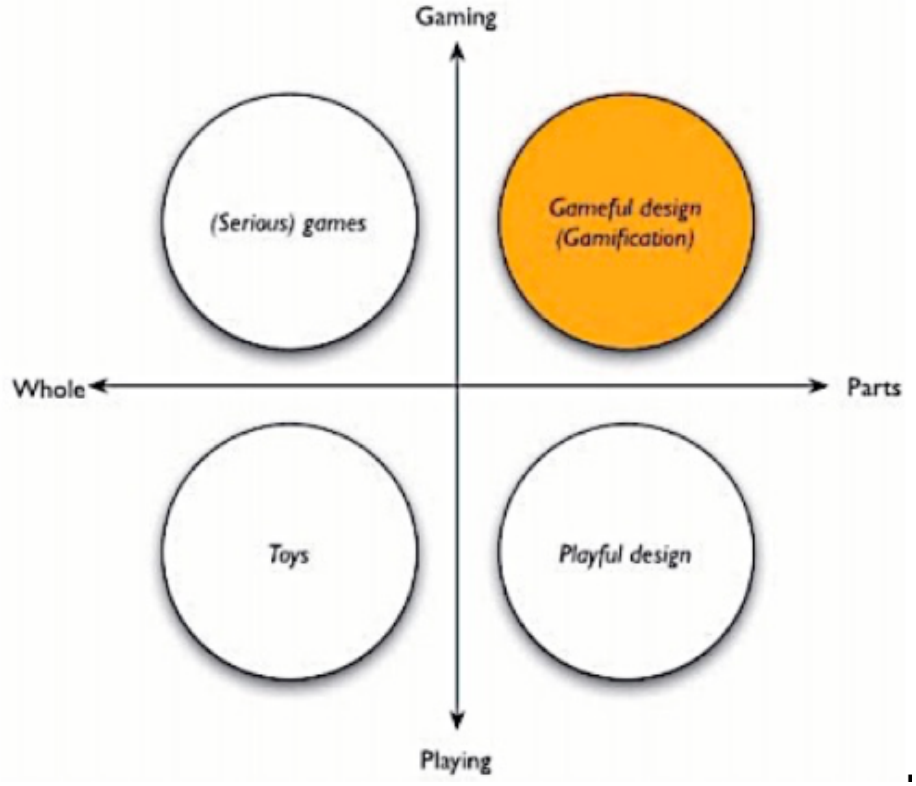

Figure 3.1: Types of Playing and Gaming [10]

3.2. Literature review on cognitive aspects in human societies

This literature review has been driven by considering two main research areas in cognitive science and human cooperation within social contexts. According to the feedback we received from Rosaria Contethe former pillar concerns how a human society is organized, and how such an organization is perceived within the mind of its members; the latter how to motivate the members of such a society (i.e. the civil servants in the PA) according to some overall indications that are investigated by both cognitive and psychological research communities.

The Dependence Theory [32] is a cognitive approach for heterogeneous agents systems [8] that proceeds from the assumption that agents (both humans, and artificial) endowed with goals, beliefs, able to perform actions and situated in a common world are involved in more or less complex and dynamic networks of relationships. Thus, even though agents are often conceived as autonomous, they somehow may have goals that exceed or differ from their capacities to reach them. In this sense, often agents' autonomy results intrinsically limited, and there is the need to consider also how a collection of agents (i.e. a society) is organized. Techniques based of such a theory been applied in scenarios based on artificial agents but they also have been investigated by considering hybrid systems (i.e. where also human being are involved) or human societies [16, 2, 13].

Learn PAd fosters cooperation among the various civil servants in order to reach the goal of a process. The consortium has started a reflection on this aspects considering them extermely interesting in particular to permit to civil servants to act cooperatively not only for the purpose of learning.

In [9], a mathematical framework (DEPNET) that models the emergence of social relationships and networks (for example, dependence networks) from societies of autonomous social intelligent agents has been proposed. DEPNET supports the analysis of how social dependencies impact on the strategies and the goals/objectives of the single members/participants. In this approach a society is modeled as a graph where each node models a participants in terms of both its objectives and its competencies. The network (i.e. the society) is maximized for a maximum local satisfaction as a compromise of both

goals (e.g. objectives and competencies) of its participants.

The application context for DEPNET has been classified as social-scientific, since its purposes are to evince social aspects, and to deal with socio-cognitive phenomena. Also, approaches on dependency networks such as DEPNET, usually works better when the considered collection of agents (i.e. the society) refers to some explicit organizational model. Among the others, such a result has been justified because organizational models can be exploited in order to foresee "local motivations" of the participants.

Dealing explicitly with the motivations of the members of a society (i.e. civil servants in a PA) was of second pillar in this literature review. Several works in the literature on psychology on how "intrinsic motivations" impacts on cognitive aspects [6, 7]. These motivations represent the "natural gratification" a human being feels in performing an action (e.g. learning something for a given goal). Thus intrinsic motivations have to be considered and encouraged.

A different approach can be followed in order to stimulate intrinsic motivations within the members of a community; for example by considering "rewarding strategy" aiming at dispatching some kind of incentives (e.g. money, individual ranking). However, the implementation of strategies exclusively based on rewarding mechanisms is discouraged by experts in the area of cognitive sciences [7]. Specifically this kind of strategies result quite helpful in the first phase of the cognitive/learning process; however after a given period, they do not bring benefit anymore, and in some cases they may also hinder intrinsic motivations of individuals as side effect.

In [2] some hybrid experiments (only humans, only artificial agents, or a combination of both) have been run in order to study the effects of several kind of "punishment strategies" guiding the cognitive process, and more specifically cooperation. The results of the work highlights how in general a pure punishment approach has a negative effect on cooperation. Nevertheless, the study also revealed that such an effect is not completely evident if the "sanction" for an undesired action is actually preceded by some alert reporting that some overall accepted/shared norm is going to be violated.

As a conclusion, strategies exclusively based either on rewarding or on punishment mechanisms has limitations form a cognitive perspective. Thus the first indication is to consider strategies mixing both the aspects. However, sanctions in punishment mechanisms still present some limitations, but they have interesting effects when combined with norm-signaling. Thus, both the mechanisms could be exploited in order to foster the intrinsic motivations of the individuals. An overall indication, is to combine both the strategies trying to give the perception that there is a kind of "competition" among the subjects.

However, if on the one hand rewarding is commonly well accepted by a subject, this is not the case for any kind of punishment. Thus in general, dealing with cooperation among humans, the altruistic punishment or alert for a norm violation may result inconvenient: for example individuals would avoid to punish/alert in order to project them self from retaliation. This situation could easily lead the actual motivation strategy as exclusively based on rewarding mechanisms, with all their limitations discussed above.

In literature a solution to this issue has been often found in techniques for social control. Social control is a spontaneous, decentralized social phenomenon, which allows the costs of pro-social behavior to be redistributed over a population in which altruists live side-by-side with non-altruists [17, 5].

In [16] a social control based on gossip has been proposed. In particular the work suggests to implement a model of social evaluation based on two families of indicators, and then using gossip as a process in order to circulate (a part of) them. In other words, the authors suggest to distinguish between public indicators called *image* which represent facts (i.e. truth value of that information) about a given subject, and *reputation* about a subject which is not necessarily assumed to be true, nor it is traced to a definite source.

From this model, the authors in [16] suggest that some negative impacts from the punishment mechanisms in human communities are mitigated. In fact, gossip as a mean for circulating reputation:

- does not imply any commitment of the speaker on the evaluation's truth value;

- does not imply any responsibility about the evaluation's credibility and consequences (e.g. "I am told that . . . ").

3.3. Impact

In this section we attempt to discuss results from literature review in the Learn PAd project, with an emphasis on those lessons learnt that can have an impact in improving user engagement.

As we aim at reaching and engaging workers from different PA offices, we need to keep in mind the basic concepts emerged from relevant studies in adult-learning in the workplace. First, the learning process implied by the Learn PAd platform will be problem-oriented, as the business-processes and related models from which learning is driven are directly derived from the specific real-world problems that offices have to tackle. Second, an emerging challenge relates to the need to link and align individual development with organisational learning and development. From several studies we are warned that effective e-learning at work requires active involvement of human resource development as well as of management personnel. For example, in their conceptual model for valuing adult learning, Waight and Stewart [36] state that e-Learning in a corporate setting can only happen if four championing factors exist, that are leadership, learning culture, technology infrastructure and financial support. As an impact from the above, we need to engage management and decisional people to support and promote the Learn PAd approach in the governed administrations.

Furthermore, from the literature review in Section 3.2 it emerges that both the individual and the organizational learning in human societies are often related to both trust and socio-cognitive aspects. The resulting impact on the Learn PAd project should be to consider the problem also from a social point-of-view. Among the others, it could be valuable to include means dealing with the motivations the Learn PAd IT-system will entail. For example support feature answering the following questions:

- Can the system enact a change in the motivations of the people?
- Would it be possible to envision "effects on the careers" from the contributions on the platform?
- Would it be possible to "project" (not only technically) impacts on the careers in order to foster the motivation to the collaboration?

Clearly we recognize the importance of these assets, but it could become quite difficult to address all of them in the time-frame of the Learn PAd project. This is also because some of them bring in scenarios that are much wider than the one that could be addressed by a single ICT-focused project.

Nevertheless there could be room for including some aspects/results from the research on cognitive aspects in human societies. For example, about the rewards mechanics that the Learn PAd project is investigating in both the simulation and the KPI contexts. Both simulation and KPIs could be enhanced with cognitive evaluations about reputation as discussed in Section 3.2. More specifically, some of the outcomes of the EREP EU Project in FP6 : "Social Knowledge for e-Governance"[33] could be considered.

Learn PAd project aims at developing a social, collaborative and learning platform for civil servants. By using the Learn PAd platform, workers in the Public Administrations are engaged in a holistic and collaborative learning experience, centered around an enriched model of the to be learned Business Process. In order to better represent the concepts being taught and get the learner engaged, games aspects can be incorporated.

According to the previous definitions, as Learn PAd project is a teaching environment and the competition context does not exist, gamification aspects meet our needs unlike serious games. Indeed, the gamification in learning and teaching according to Karl Kapp in [20] is the use of game-based mechanics and game thinking to engage, motivate action, promote learning and solve problems. Thereafter we present some gamification elements that we can find for educational purposes such as Progression, Virtual Rewards and Investment.

Progression it is important to see success visualized incrementally. Progress mechanics, which need not make use of advanced technology, are often thought of as constituting a gamified system. However, used in isolation, these points and opportunities to earn achievements are not necessarily effective motivators for learning. Engaging video games which can keep players playing for hours on end do not maintain players' interest by simply offering the ability to earn points and beat levels [20].

Virtual rewards are one of several types of mechanics used in games to motivate users. While some games may utilize real-world gifts in the form of money, gift cards, etc., many games motivate players with virtual rewards as certificates , badges, etc. [20].

Collaboration the chances for players to connect and collaborate with others, the immediate feedback, the increasing challenges, and the powerful choices given to players about how to proceed throughout the game, are immensely significant factors in sustained engagement [20].

In addition, about the simulation, it would be important to find a way to make its perception "socially useful" and not just as alienating machinery. In this sense, it may help making it clear the goal or the motivations the Civil Servant is using the simulator. Such an objective can be followed by envisioning organizational-level scenarios where the simulator is used in order to test alternative solutions/options. For example re-planning the activities of a group of Civil Servants, they first will "play" with the simulator, and then the choice can be made according to the result they score.

4 Relevant results to consider from other EU projects

The Learn PAd consortium surveyed EU funded projects in the area of Technology Enhanced Learning financed within the 6^{th} and 7^{th} framework programmes. The list has been retrieved from a dedicated page in the cordis website[1]. All the listed projects (26 in FP7 and 32 in FP6) have been considered and selected after the reading of the available short descriptions. Among the others the following ones have been identified as particularly relevant in relation to the activities and objectives of the Learn PAd project:

- **Mature**: *MATURE conceives individual learning processes to be interlinked in a knowledge-maturing process. The goals of the project are to understand this maturing process better, and to build tools and services to reduce maturing barriers, and to embed learning more seamlessly in work processes and knowledge management systems*
- **Mirror**: *The overall objective of MIRROR was to empower and engage employees to reflect on previous work performances and learning and to capture experiences of others in order to solve pressing problems immediately. A prerequisite for innovative solutions in this context is to rely on the human ability to learn directly from tacit knowledge – without the need for making it explicit. Specifically, MIRROR delivered a bundle of real-time, interoperable learning applications, based on a conceptual model of holistic continuous learning by reflection which incorporates the essential ingredients of training critical thinking, awareness of emotions, (collaborative) knowledge construction, creative problem solving and innovation*
- **Target**: *TARGET developed a responsive learning system with serious games at its core, that presents the learner with complex situations and results in experiences that are gradually honed into knowledge*
- **Prolix**: *The overall objective of PROLIX is to align learning with business processes in order to enable organisations to faster improve the competencies of their employees according to continuous changes of work requirements. The solution to developed integrates a number of technologies such as user modelling, models and workflows for competence building, simulations, and games into a reference architecture for process-oriented learning and information exchange.*

The following of this chapter will provide further details on the listed projects and will also discuss possible impacts on Learn PAd future activities.

4.1. The MATURE project

Web site: http://mature-ip.eu/
From 2008-04-01 **to** 2012-05-31
Topic: ICT-2007.4.1 - Digital libraries and technology-enhanced learning
Call for proposal: FP7-ICT-2007-1
Funding scheme: CP - Collaborative project

[1] http://cordis.europa.eu/fp7/ict/telearn-digicult/telearn-projects_en.html

4.1.1. Project overview

The MATURE project has revolved around the idea of "knowledge maturing" – a process of goal-oriented development of collective knowledge [30]. The collective level can refer to e.g. a team, an organisation or a community and knowledge is understood as both cognitive structures bound to individuals' minds (becoming manifest in their behaviour) and as an abstraction of the knowledge of individuals in a collective, expressed for example in documents or models.

As illustrated by successful initiatives in the area of Web 2.0 (e.g. Wikipedia), development of collective knowledge can evolve very effectively through creation of shared artefacts in a bottom-up fashion. In this sense, knowledge maturing can be understood not as the result of an individual's activity, but of an interconnected series of activities of interacting individuals, frequently also within different collectives.

In an enterprise context, however, community processes need guidance to ensure alignment with organizational goals ("goal-oriented").

MATURE describes the knowledge evolution (or indeed, maturing) process through the so-called knowledge maturing phases model, see Figure 4.1.

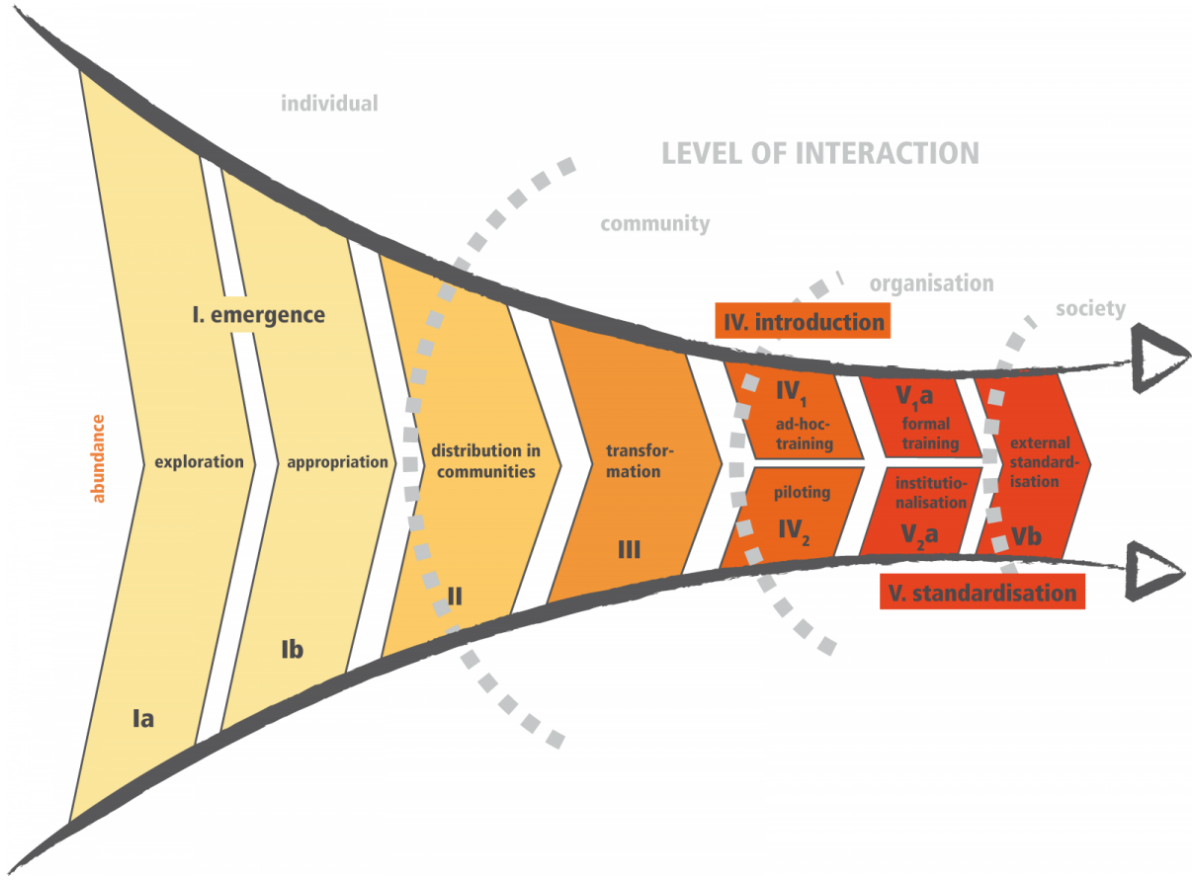

Figure 4.1: The Knowledge Maturing Phase Model

The phases are described as follows [24]:

Ia. **Exploration**: New knowledge is developed by individuals either in highly informal discussions or by browsing the knowledge spaces available inside the organisation and beyond. This typically comprises search and retrieval activities.

Ib. **Appropriation**: New knowledge or results found in the investigation phase that have been enriched, refined or contextualized with respect to their use are now appropriated by the individual, i.e. personalised so that an individual can benefit from its future (re-)use.

II. **Distribution in communities**: interactions between individuals driven by social motives and the benefits that individuals typically attribute to sharing knowledge. Distribution is not meant in the sense of a one way street, but includes discussing the new knowledge, negotiating its meaning and impact, convincing others and agreeing/committing to the knowledge within the collective, including a common terminology.

III. **Transformation**: Artefacts created in the preceding phases are often inherently unstructured and often only comprehensible for people in this community. Transformation means that knowledge is put into a form appropriate for moving it across the community's boundaries. E.g., structured documents are created in which knowledge is generalised and sometimes formalized.

IV. **Introduction**: Knowledge is prepared with a specific focus on enhancing understandability or ease of use on two alternative paths:

IV1. **Ad-hoc training**: Documents produced in the preceding phase are improved by enhancing comprehensibility, individual learning objects are arranged to cover a broader subject area. Tests allow to determine the knowledge level and to select learning objects or learning paths.

IV2. **Piloting**: Knowledge is arranged in a way so that it can be applied in the organisational setting, artefacts (e.g. software or a process model) are tested before roll-out.

V. **Standardization**: The knowledge is formally established in the organization to be used in repeatable formal trainings, work practices, processes, products or services. As in phase IV, we distinguish an instructional setting with standardised training activities, called formal training, and an experimental setting turning pilots into standard organizational infrastructure, processes and practices, called institutionalisation.

Vb. **External standardisation**: The ultimate maturity covers some form of standardisation or certification.

MATURE has developed a set of tools that support the knowledge maturing process, in particular the transitions between knowledge maturing phases. The tools and underlying knowledge have been classified into four strands [29], namely content (explicit factual knowledge), process (how to deliver products/services), semantics (shared understanding) and people (who knows what) knowledge. In addition to software tools, a set of design guidelines has been developed that can be used to overcome motivational barriers to knowledge maturing [23].

To measure the success of initiatives aimed at knowledge maturing support, the concept of a Knowledge Maturing Scorecard (derived from Balanced Scorecard) has been developed [18], along with a set of Knowledge Maturing Indicators that can be used to make knowledge maturing measurable.

4.1.2. Process knowledge maturing

Learning how to execute business processes is a particular challenging task when the corresponding processes are knowledge-intensive, i.e. when they involve complex decisions at runtime (e.g. exceptional situations, highly variable situations) and can include a wide variety of resources depending on the context.

MATURE addresses process-related learning through a combination of top-down modeling – resulting in a simple process skeleton – with bottom-up techniques, see Figure 4.2. The skeleton includes what is stable, i.e. a kernel of tasks or milestones that always have to be reached within a business process. Since it is hard – for knowledge-intensive processes – to model more than such a skeleton, the following means are provided to support the maturing of knowledge related to such a knowledge-intensive process [39]:

- The process skeleton is deployed as a workflow and tasks are assigned to employees

- Tasks are loaded into a task management application where employees can modify them by adding resources (persons or documents), notes, subtasks or statements of problems that occur during execution.
- Such task modifications are logged by the system – to be used for automatic recommendations to other task executors – and they can be shared by attaching them to a so-called task pattern that exists for every activity in a business process.

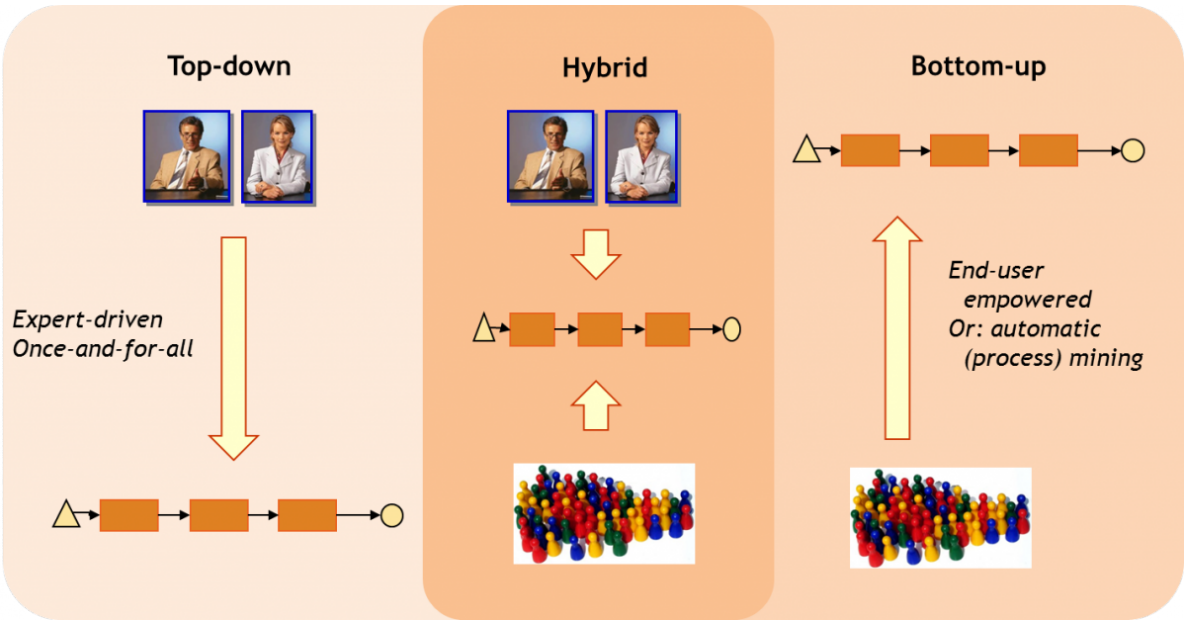

Figure 4.2: Process-related Knowledge Maturing as a Combination of Top-down and Bottom-up Creation of a Process Model

Thus, the knowledge that employees are gathering about a process is codified, shared and attached within the context of its use. An analysis of user contributions is later applied to identify potential improvements to the process skeleton. Thus, the knowledge matures in several cycles.

4.1.3. Impact for Learn PAd

Obviously, there is a notable difference between the MATURE approach and the objectives of Learn PAd, in particular while MATURE focuses on the collective level, Learn PAd cares for both individual and organizational learning.

Especially in the area of process knowledge maturing, the MATURE approach has had a strong influence on the way civil servants can interact with descriptions of business processes in the Learn PAd collaborative workspace: Learn PAd employs the idea of an initial process model that is subject to feedback and collective enhancement by civil servants.

To further exploit the results of MATURE, the Learn PAd consortium plans the following steps:

- The functionalities of the Learn PAd collaborative workspace will be mapped to the knowledge maturing phases. A rough mapping can look as follows: distributing ideas in communities (phase II) can be done in Learn PAd by giving feedback and discussing ideas about a business process in the collaborative workspace. The transformation (phase III) of these ideas happens when relevant changes are retrofitted into the model of the business process. Business process descriptions are then enhanced for presentation in both the browsing and execution mode of the collaborative workspace, which correspond to ad hoc training and piloting of the adapted process model (phase IV). Later, standardized test might be created for formal training (phase V) or standardized reference models might be created for use outside a particular public administration (phase VI).

- This mapping will be refined and analysed in order to facilitate the technology transfer from MATURE to Learn PAd: technical solutions supporting phase transitions that have been developed in MATURE might be adapted to Learn PAd.
- For learning goals that exist on a collective level in Learn PAd, the Knowledge Maturing Scorecard approach and the set of Knowledge Maturing Indicators will be exploited for defining appropriate KPIs in Learn PAd also for individual learning.
- The rich understanding of motivational factors and barriers gained in MATURE should be a basis for designing solutions and incentive systems in Learn PAd

4.2. The MIRROR project

Web site: http://www.mirror-project.eu/
From 2010-07-01 **to** 2014-06-30
Topic: ICT-2009.4.2 - Technology-Enhanced Learning
Call for proposal: FP7-ICT-2009-5
Funding scheme: CP - Collaborative project

4.2.1. Project overview

The focus of the MIRROR project is the creation of an easily used set of applications (Mirror apps), that enable employees to learn lessons from their own and others experiences to perform better in the future. The project facilitates learning on the job, at the workplace, through collaboration and reflection technologies [22].

One of the cornerstones underpinning MIRROR is the *reflection process*: reflective learning refers to *those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations* [4]. The process of reflective learning permits the learner to re-evaluate past experience by attending to its various aspects, thereby producing outcomes (Figure 4.3). This process is a core element in collaborative reflection and in organizational learning. In everyday as well as academic language 'experience' refers both to single experiences (of specific

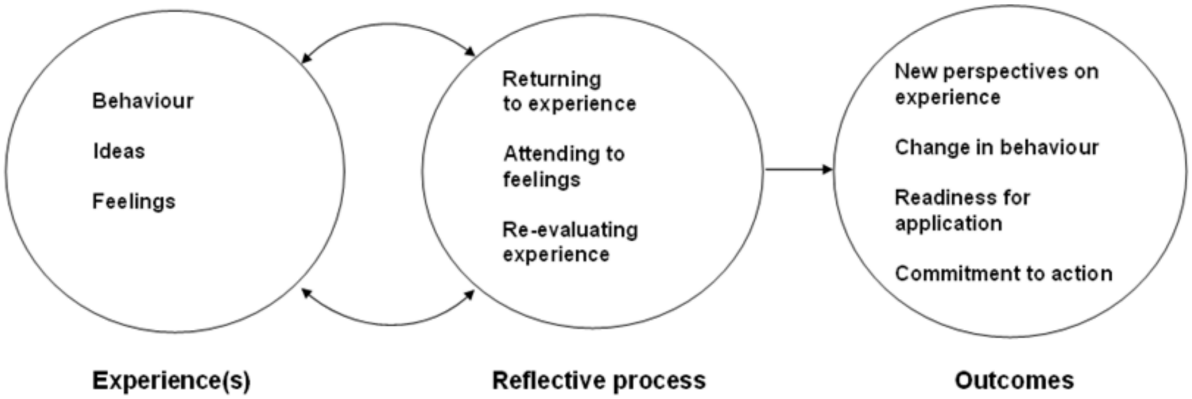

Figure 4.3: The process of Reflective Learning

events or situations) and general experience in the form of knowledge/skills/attitudes collected and developed over time. Also, experience can be seen as a continuous *flow* of which people can be more or less conscious.

In the reflective learning process (Figure 4.3) we can consider the experience returned to as a single experience or as a set of such single experiences. A single experience is defined as the total response

of a person to a situation, including behavior, ideas and feelings. Given the differences between individuals, the experience of one and the same event will be different in different persons. In the reflective process, the re-evaluation of experience requires generalization and abstraction from the concrete experiences as well as attention to their emotional aspects. The learners' knowledge serves as a resource for (and outcome of) the re-evaluation.

The outcome of reflective learning can be cognitive, affective, and/or behavioural. A reflective process, through its outcome, always results in some *resolution*, even if the outcome does not necessarily have an immediate and/or measurable impact on the work practice in question. In MIRROR reflection and reflective learning are considered as the same thing.

A key aspect in making a reflective process happen in MIRROR is the presence of *triggers*. Triggers are unexpected situations (e.g., disturbances and perception of uncertainty, or positive situations like surprising success) creating awareness of discrepancy between expectations and the current experience. Reflection might be triggered by an external event or agent (external trigger/incident) or might develop from one's own thinking (internal trigger/inner need to reflect).

4.2.2. Reflective learning on individual, collaborative and organizational levels

Reflection can take place individually and collaboratively. For reflection to be collaborative, the participants need to share experiences and relate to others' experiences in their own reflection, resulting in a spiral-like interaction between individual and collaborative reflection. Collaborative reflection may be based on experiences of shared events and situations of collaboration between the participants, but also on individual experiences that are not related to the same events but are comparable through a shared context (e.g. experiences from similar, individual work tasks taking place at different times and/or different locations). Individual and collaborative reflection has different advantages and can complement each other in workplace learning.

Reflective learning can also be viewed on the level of the organization. Organizational learning, an organization's improvement of its task performance over time [3], can be seen as a consequence of the learning taking place in individuals and teams in the organization in the context of their work, e.g. through a bottom-up learning process. Learning in an organization is also framed by the organization's top-down management of its processes, which may be more or less explicit about the role of informal learning and employees' reflection on work experience. Management in an organization may reflect on their own performance (and that of the organization) on the basis of data from the organization; this data may originate in processes of work but also in processes of reflection through which the employees share their ideas and views. In workplace learning, reflection and problem solving can be seen as closely related and feeding into each other [31].

4.2.3. The reflection session

By reflection session MIRROR refers to a time-limited activity framing and supporting processes of reflection. Reflection sessions range from the small, individual, spontaneous pause in between work tasks to the scheduled, elaborately organized and facilitated workshop in a team. Key dimensions that can be used to characterize reflection sessions are Objectives, Content, Process, Outcomes, Support, and Timing. These dimensions, to be elaborated below, are not completely independent as illustrated in [22]:

objectives The objective(s) of a reflection session link the reflection to work processes. The objectives may be more or less explicit. Objectives can be characterized in more detail outlining whether they are on individual, team and/or organization/management level, in which specific work/business processes and the objective(s) originate (e.g. day-to-day needs of individual work practice, plan for individual competence development,ect.), to which roles they relate, and what are the more specific goals (e.g. related to sense making, problem solving, improvement or performance);

content By content we refer to *the thing reflected upon*. The content can be characterized in more detail by outlining whether the reflection is addressing individual experience and/or shared experience (e.g. among the members of a work team), whether the reflection is addressing a single experience and/or a set of experiences, whether the reflection is concerned with one work process or issues that span several work processes, which work process(es) are in focus, and whether other representations of the relevant work practice (e.g. best practices, standards, simulations such as in a serious game) are being used in the re-evaluation of the experience;

process This refers to how the activities in the reflection session are being conducted. These processes can be individual and/or collaborative;

outcomes This refers to the results of the reflection session, e.g. what is being produced, some of which may be planned and some unplanned. In characterizing the outcomes of a reflection session, the following should be considered: which articulated knowledge is developed/constructed (e.g. lessons learned, creative solutions, proposed changes to certain work processes, and refined/annotated/aggregated data from a work process), which artifacts are produced (e.g. reports and personal notes), to which roles and processes the outcomes are relevant, which knowledge and artifacts are intended to be shared (and with whom), and what are the actual changes in work practices

support This refers to support or scaffolding for reflection, which can be provided by a human coach/facilitator and/or by tools. Support can be characterized by the way access to data from the work process is being provided (subject to numerous considerations regarding availability, privacy, representation/presentation, sharing etc.) by the roles in the reflection session (e.g. is there a facilitator), by the procedural support (e.g. guidance through certain steps), by the support for articulating and sharing knowledge within the reflection session and in the creation of its outcomes, and by the specific techniques/approaches used (such as creativity techniques and serious games);

timing This refers to when the reflection session takes place, in particular how it is scheduled with respect to work processes. It also refers to the duration of the session. The timing can be characterized by outlining to what extent the reflection session is separate from, or intertwined/concurrent with, the work process (if reflection happens in frequent, small steps, e.g. in between work tasks, it may be convenient to consider these steps together as one reflection session), whether the session is a prescheduled activity or initiated upon need or convenience, and what are the criteria and conditions for starting and terminating the session. The start of a session may for instance be based on the learnersâĂŹ initiative (e.g. on the occurrence of a trigger for a reflective process) and/or on some form of prompting. The termination of the session may be based on time allocated/elapsed, the occurrence of certain events in the work process, the completion of certain outcomes, etc.

4.2.4. The roles of tools in reflection at work

Tools may have different roles in supporting reflection at work [21]. Two key categories of tool use are gathering data from the work process and providing support for the reflection session. Tool support for a reflection session includes providing access to data from the work process. Some of this data may serve to trigger reflection, other data may be used to make sense of (recall, reconstruct) the experience(s) in question. Tool support for the reflection session may also take the form of process guidance, e.g. guide its steps. Further, tools may support the articulation and sharing of knowledge in a reflection session and in producing outcomes of value to the surrounding work and business processes. Finally, in considering support for reflection we need to consider tools that support the work process more broadly, since tool use in day-to-day work and reflection may be closely intertwined and one may impact on the other.

4.2.5. Impact for Learn PAd

Despite the different goals, the MIRROR project can have a beneficial impact on the objectives of the Learn PAd project. In particular, since the main focus of Learn PAD is the individual and organizational learning, reflective learning processes can be exploited in order to leverage the way experiences are documented and handled by the different actors and users. In fact, reflection can take place individually and collaboratively. This clearly should be conceived at an organizational level with the necessary support provided by the Learn PAd platform: organizational learning can be seen as a consequence of the learning taking place in individuals, reflected in teams and eventually further leveraged with proposals to refactor or revise the business process. In this respect, it is of crucial relevance to formalize those situation, which may represent (internal and external) triggers, and which may require the user to formalize his/her reflections by means of the functionalities offered by the Learn PAd platform.

4.3. The TARGET project

Web site: http://www.reachyourtarget.org/moodle/
From 2009-01-01 **to** 2012-10-31
Topic: ICT-2007.4.3 - Digital libraries and technology-enhanced learning (ICT-2007.4.3)
Call for proposal: FP7-ICT-2007-3
Funding scheme: CP - Collaborative project

4.3.1. Project overview

The goal of the TARGET (Transformative Adaptive Responsive and enGaging EnvironmenT)[2] project is to propose a new platform to accelerate the learning process. The training method is based on 5 axis:

- Guidance: the learner needs to have a clear understanding of the direction and steps they are undertaking
- Avoiding overload: a learner must not be introduced to too much information at the same time
- Individualized explanations: The training must be adapted to each specific organization in order to be relevant and engaging
- Active learning: the learner must have the opportunity to actively interact with the platform
- Worked examples: the learner has access to examples of expert-provided solutions to study.

The project aimed at establishing and fostering several sustainable communities revolving around the developed environment. Among the others, comunities form both university and industries were considered.

The platform is separated in several components:

- The *Lounge*, a 3D virtual environment for the learners to socialize and interact in a similar way to the Second Life platform. the lounge is the entry point of the platform.
- The *Knowledge Ecosystem Navigator*, a repository of learning scenarios, called “stories”, that the users can browse. The user can visualize previous experiences of others learners associated with the stories
- The *Serious Game*, where a learner actively engages into an 3D interactive learning session in the context of a story

[2] see at http://www.reachyourtarget.org/moodle/

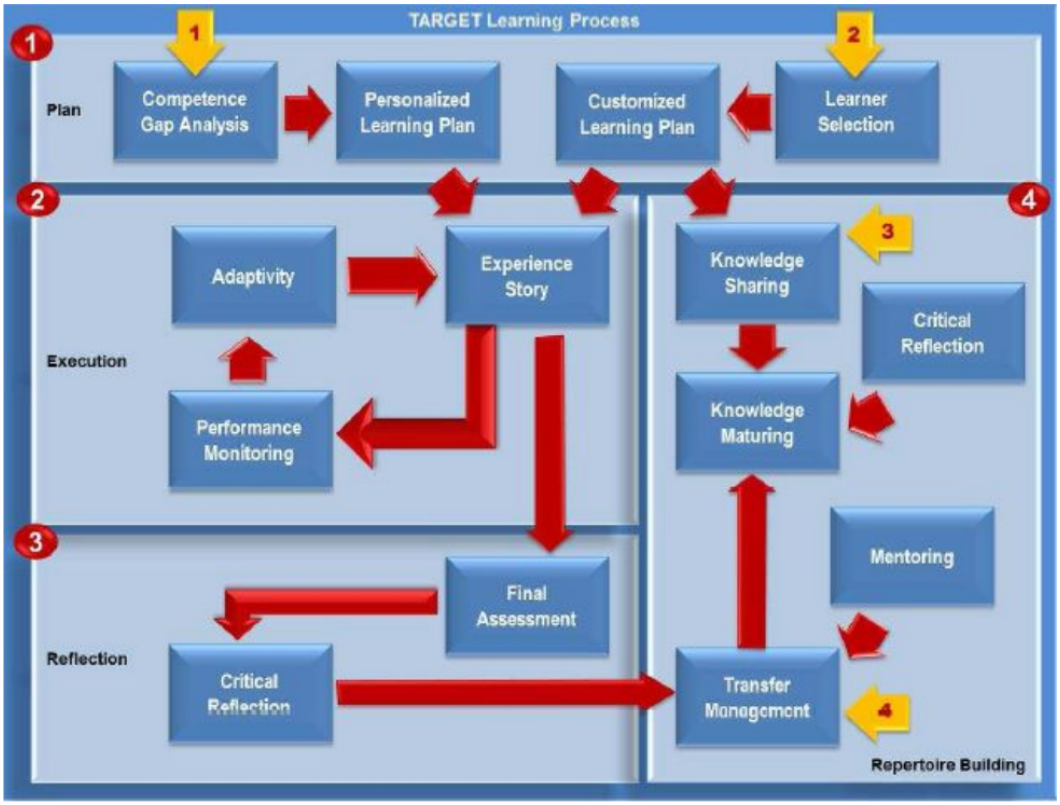

Figure 4.4: TARGET Learning Process

- The *Competence Performance Analyzer*, where the learner can view his or her performances and learning progress

4.3.2. TARGET learning process

The TARGET learning process is composed of four phases, summarized in Figure 4.4:

Plan : In this phase the learners decide if they will undertake goal-oriented learning or self-directed learning (respectively entry point 1 and 2 on Figure 4.4). In the first case, the learner defines both his or her current competencies profile and target competence profile. Based on the gap between these two profiles a learning plan composed on custom stories is created. In the second case, the learner creates his or her own learning plan.

Execution : In this phase the learner experience a story through a selected role. During the story the system monitors the actions of the learner to adapt the reactions of the Non-Player Characters.

Reflection : This phase starts when the learner finish a story, and present the learner with a competencies assessment.

Repertoire Building : Based on the acquired experience, the user can share this new knowledge with the community through the creation of knowledge assets put at the disposition of other learners.

4.3.3. Impact for Learn PAd

While for Learn PAd the application domain is Public Administrations, in TARGET it is universities and industry. This difference in scope is a reason for the difference in approaches between the two projects.

The TARGET project has a broader, less defined scope, meaning it needs to provide a general learning platform. In this regard, the choice of a 3D simulation-based environment can be justified, as it

can be adapted to a large range of contexts. However the conception of such a tool is difficult, and the creation of new scenarios is a complex task (designing the 3D assets, creating the scenes etc.).

The Learn PAd project concentrates on the more specialized and well-defined application domain of process learning for Public Administrations. In this context, it is more efficient to provide specialized tools taking advantage of the specificities of the domain. In addition, the adoption in the Learn PAd project of a 3D virtual environment (e.g based on the Second Life platform) has not been considered a major feature to provide. This aspect was also partially confirmed by the analisys of the questionnaire results presented in Section 2.3.

Serious Games and Gamification Mechanisms

While the TARGET project contains a "serious game" module, it does not seems to offer any traditional "gameplay" mechanisms (e.g. rules, win/loss conditions...), meaning it is more akin to a simulator or to a "serious toy" than to a serious game.

In this regard, Learn PAd takes a different approach. Instead of proposing to develop a serious game, some gamification mechanisms are planned to be introduced in the platform to enhance learners engagement.

Artificial Agents for Simulation

The TARGET project proposed an ambitious framework based on the Belief-Desire-Intention (BDI) agent model to design emotional agents. The goal of such agents was to take the role of Non-Player Characters (NPCs) and to provide mentoring for the learners. Sadly no details regarding further work beyond the first steps of the framework have been published.

The emotional agent approach of the TARGET project was justified by the open-ended nature of the "stories" and learners interactions. Since these scenarios do not contain success condition, and are meant for the learner to explore different approaches and possibilities, it is necessary to have agents able to react with various degree of emotions to the learner actions.

In the Learn PAd project, the simulation scenarios have well-defined interactions and success/failure conditions, specified either a priori or by experts. In this context it may be possible to refer to some external syntetic approach such as artificial agents or supervised machine-learning mechanisms; nevetheless these aspects will not be directly addressed by the consortium during this project timeframe.

4.4. The PROLIX project

Web site: http://www.prolixproject.org/
From 2005-12-01 **to** 2009-11-30
Topic: IST-2004-2.4.10 - Technology-enhanced Learning
Call for proposal: FP6-2004-IST-4
Funding scheme: IP - Integrated Project

4.4.1. Project overview

PROLIX vision is to make people and organisations more competitive by reducing the time to fill competency gaps and to build proficiency according to the business needs and daily work processes.

The delay between identification of a learning need and the actual learning should not be large. Furthermore, the learning material must be targeted to the learner's individual learning style and behaviour. In some cases, learning must also be "ad-hoc" available in order to improve the performance of the employee at his workplace significantly. Organisations need to understand that providing the necessary

means to learning at the workplace is mandatory for employees and the organisation alike to react quickly, cost-effectively and successfully in nowadays ever-changing markets. PROLIX will therefore couple business processes with learning processes in corporate environments.

The vision of PROLIX is a system that allows for business process driven learning at the workplace, taking into account the single learner and their needs as well as the corporate requirements. In addition, the learners will be able to initialize a learning task themselves enabling self-guided learning in corporate environments. Overall and seen from an organizational point of view, PROLIX will significantly contribute to the change management within companies that need to develop into a holistic learning organization enabling the integration of learning into the daily working tasks. Corporate culture requires the provision of strategies, methods and concepts to satisfy heterogeneous learning needs. Mechanisms and concepts for the organizational introduction of TEL in corporations have to be co-ordinated with its philosophy and company vision. Learning as “key enabler” for business process management shown in Figure 4.5.

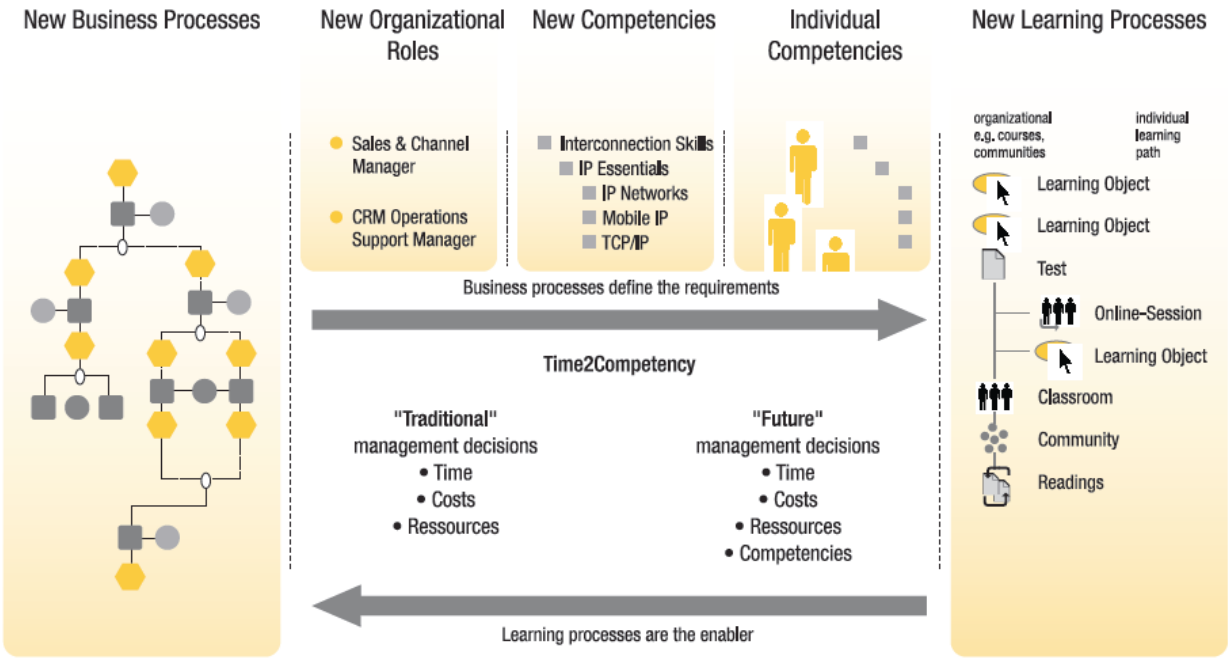

Figure 4.5: The PROLIX Vision

PROLIX will research, analyze and develop a process-oriented learning approach and a flexible and adaptive service-oriented architecture system which is capable of aligning training and knowledge production of people faced with so-called “complex situations” such as work and business process changes, or other complex multivariable learning environments, which cannot be solved with traditional eLearning or knowledge management approaches. Often, such situations also require a mix of individual and organisational learning, and of learning and knowledge acquisition/production. PROLIX objectives are:

- PROLIX aims to enable an organisation to close the learner’s life cycle
- PROLIX aims to make it easier to define Learning Goals based on business needs and business processes
- PROLIX aims to deliver a methodology for matching of needed competencies with “as-hoc” profiles
- PROLIX aims to provide competence oriented process decision support through simulation

- PROLIX aims to integrate Learning Technology Solutions with Business Information Systems
- PROLIX aims to monitor Learner's Performance according to Business Needs
- PROLIX aims to provide an Open Business Enterprise Learning and Information Systems exchange Reference Architecture (OBELIX)
- PROLIX will develop a repository of Didactical Learning Models to enable the identification of Learning scenarios for process- oriented learning

4.4.2. PROLIX learning process

PROLIX aims to deliver an open learning platform. It will integrate the systems needed to fully support the learning life cycle by providing interfaces to Skill Management Systems, Learning Management Systems, Learning Content Management Systems and Knowledge Management Systems as well as Performance Measurement Systems. Innovation through integration of Business Process Management, Learning Technologies and Competency Management shown in Figure 4.6.

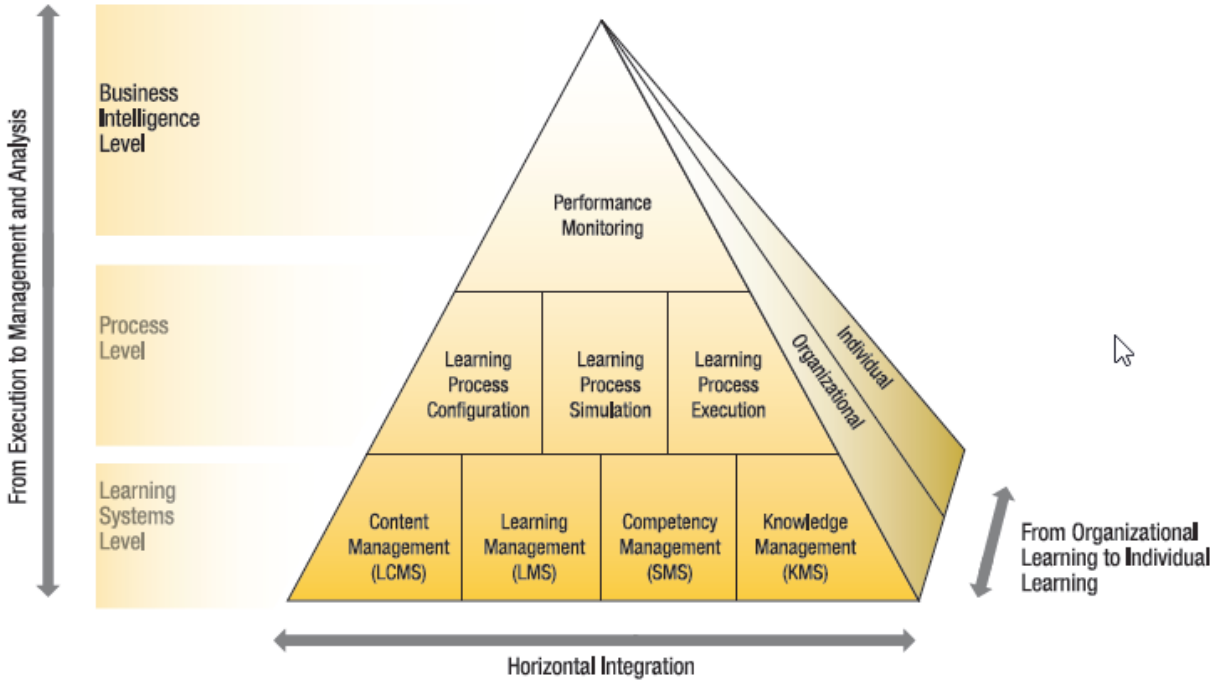

Figure 4.6: Innovation Dimension of the PROLIX Project

PROLIX supports a complete learning process life cycle comprising (see Figure 4.7):

1) the analysis of complex business situations
2) the identification of individual and organisational learning goals
3) the analysis of competencies and their matching with individual skills
4) the definition of appropriate learning strategies and the simulation of competency-oriented processes
5) the execution of improved learning processes
6) the monitoring of learners' performance according to the goals defined.

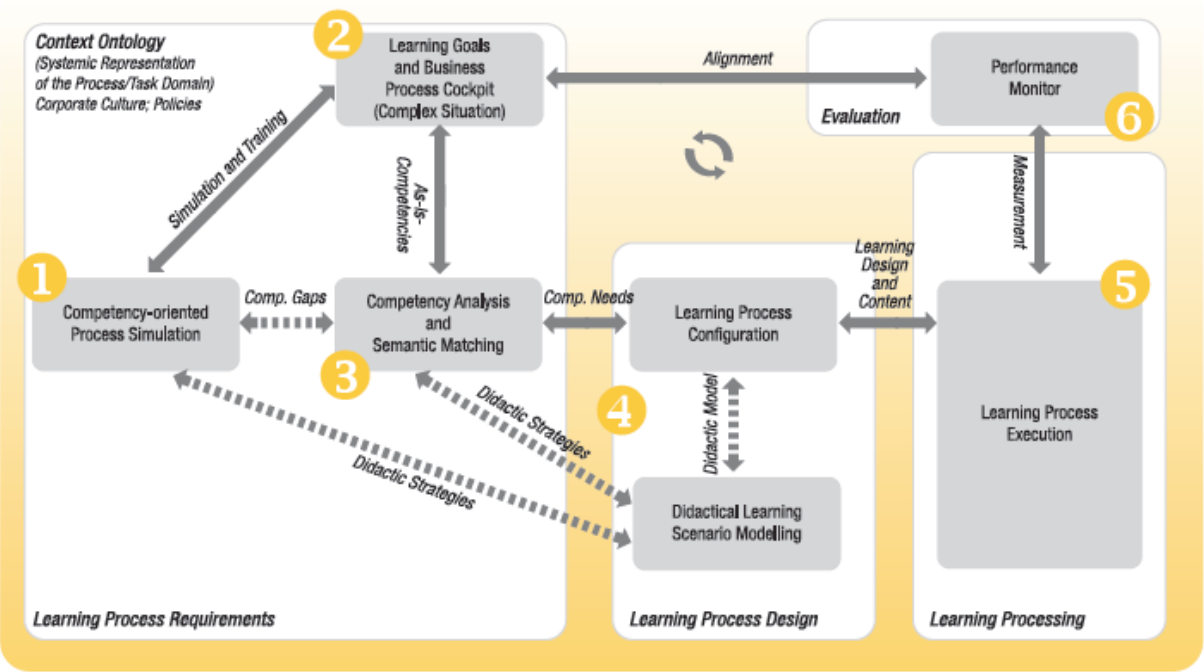

Figure 4.7: PROLIX Service-Oriented Architecture

4.4.3. Impact for Learn PAd

Learn PAd project aims at developing a social, collaborative and learning platform for civil servants working in public administrations. By using the Learn PAd platform, workers in the public administrations are engaged in a holistic and collaborative learning experience, centred around an enriched model of the to-be learned Business Process. The Learn PAd project supports process-driven collaborative knowledge sharing and process improvement on a user-friendly basis of wiki pages together with guidance based on formalized models. The platform supports both an informative learning approach based on enriched Business Process models and a procedural learning approach based on simulation and monitoring (learning by doing).

The PROLIX project aims at developing system that will allow for organizations to develop into holistic learning organizations which are going to integrate learning into daily working tasks. PROLIX aims to create a process-oriented learning approach which is capable of aligning training and knowledge product for business process changes, or other complex multivariable learning environments which cannot be solved with traditional eLearning or knowledge management approaches. It will help organisations to improve the competencies of their employees more quickly as business requirements change. The key innovation in PROLIX consists of a process and competency driven framework which interlinks business process intelligence tools on the one hand with knowledge management and learning environments on the other.

Learn PAd and PROLIX have some similarities, but different objectives. Learn PAd focuses on process-oriented collaborative learning and fosters cooperation and knowledge-sharing among PAs while PROLIX focuses on integrating business process in learning and creating open learning platform in order to improve competence of organizations employees. PROLIX is focusing on improving competencies of employees while Learn PAd focuses on improving competencies, i.e. learning of an organisation by collaboratively improving the quality of business processes performed by PAs.

In order to exploit the results of PROLIX, the Learn PAd consortium will consider the following indications:

- the PROLIX learning improvement life cycle (see Figure 4.8) could be a good reference example

for enhancing the current learning life-cycle envisioned in the Learn PAd project.

- the PROLIX methodological approach (see Figure 4.9) could be better analysed in order to see what aspects investigated by PROLIX could be adopted in Learn PAd too.
- PROLIX matured a good understanding about the integration of business processes with the learning processes. Such an experience could be referred by the Learn PAd project dealing with the definition and the validation of the approaches enabling a process-oriented, and collaborative learning.

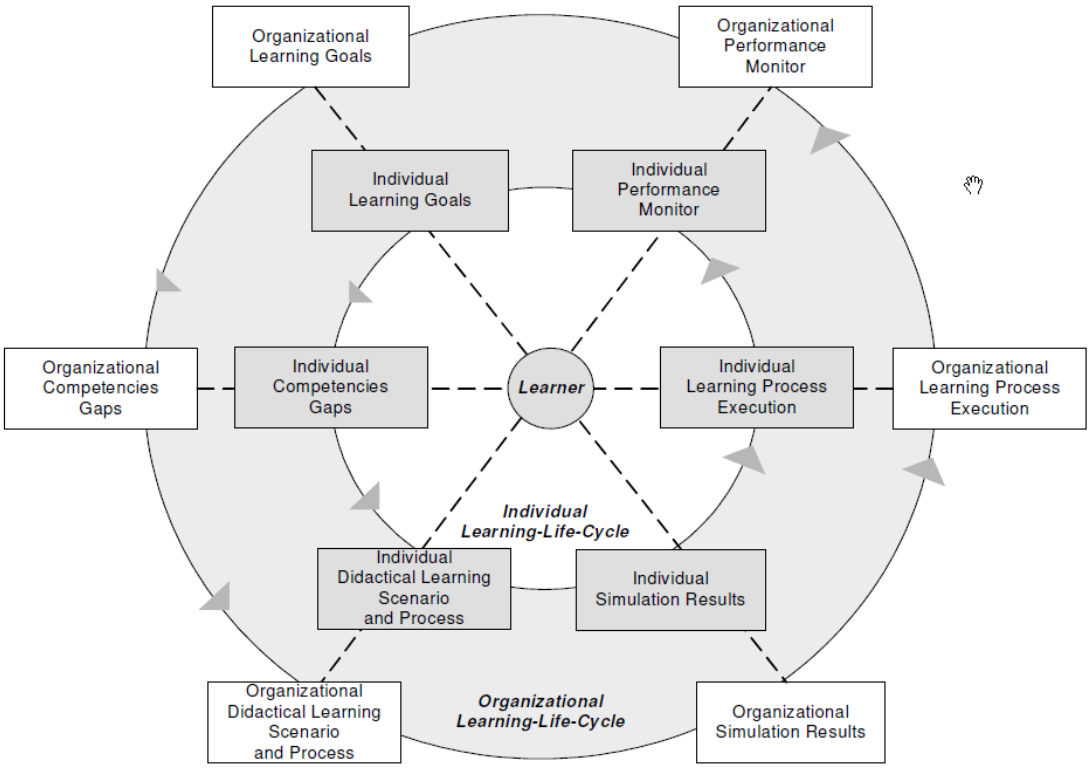

Figure 4.8: PROLIX Learning Improvement Life Cycle

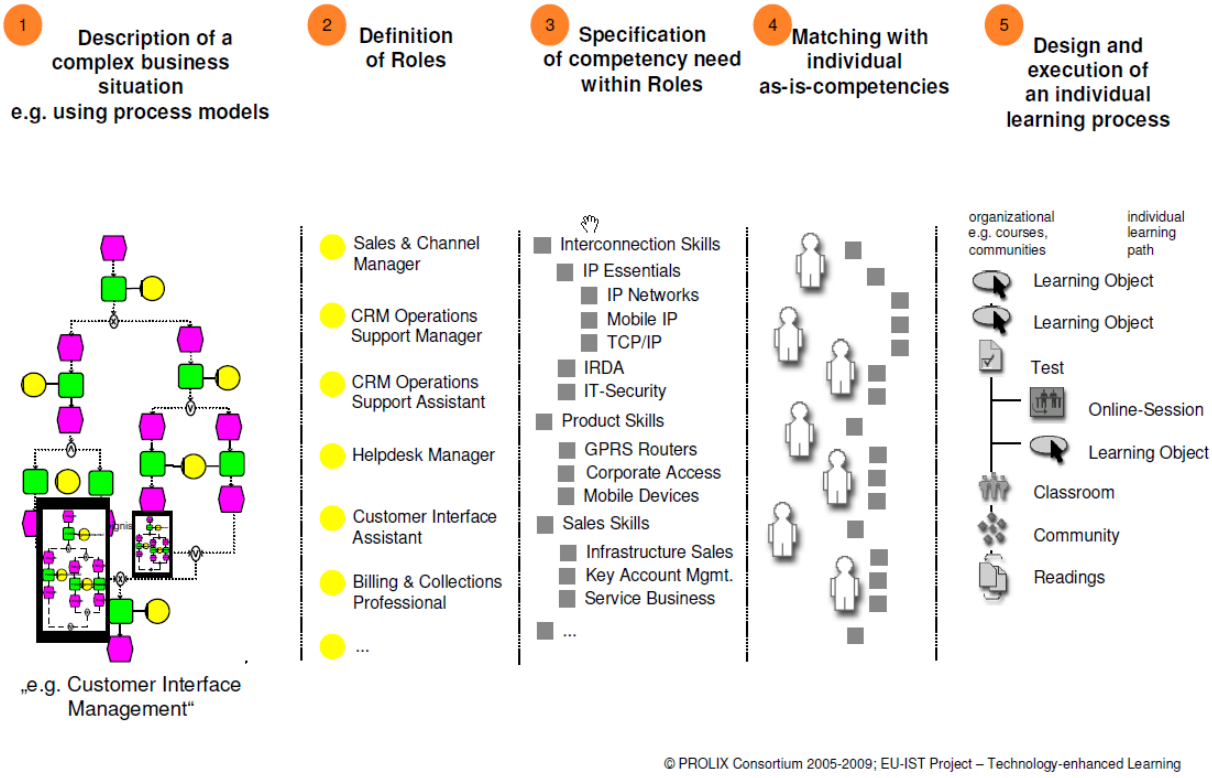

Figure 4.9: Methodological Approach within PROLIX

Part II

Learn PAd Project Achievements Evaluation Strategy

5 Evaluation strategies of the Learn PAd achievements

The main purpose of this chapter is to solve the issues raised by the reviewers in relation to the evaluation strategy to be applied to assess the success of the project. In particular the "review report" includes the following paragraph:

> It is as yet quite unclear about how the evaluation of the implementation at the two sites will be carried out and this needs urgently to be addressed as it is essential the consortium undertake a whole project perspective on the evaluation: in other words, examine the overall achievements of the project in the light of the overall impact aims of the project.

The Learn PAd project intends to have an impact on learning approaches and strategies for employees working in the context of a Public Administration. Outcome of the project will be an extensible platform for learning, according to different paradigms, the various aspects related to the activities that an employee has to carry out within a business process enactment.

5.1. Learning evaluation strategies

The assessment of the benefits related to learning, both for single employee and at an organizational level, is probably one of the most difficult activity in the evaluation of the introduction of a change within an organization. Indeed, improvements in competences and skills of the employees can have many different consequences, and many times their impact is difficult to identify and quantify. In particular positive effects of learning can manifest themselves long after a learning activity was performed. Nevertheless, notwithstanding such difficulties in having precise evaluations, it is important to have indications on how, and how much, an investment in learning can bring benefits to an organization.

In [14] the author lists 5 different possible non exclusive strategies to assess the impact of learning within an organization. In particular the five strategies can be shortly summarized as follows:

- Kirkpatrick's four levels: this is a well established approach to the evalution of learning proposed by Donal Kirkpatrick already in 1959. In particular the strategy suggests to conduct the evaluation of the effects of learning according to four different levels:
  - *reactions*: requires to retrieve the impression of learners, what they think and feel.
  - *learning*: asks for measuring what the learner have actually absorbed in terms of new knowledge, espertise or competences.
  - *behaviour*: asks to measure what changed in the behaviour of an employee and in concrete how its way of work improved
  - *results*: asks to measure the gain for the organization, which is somehow the real objective of the introduction of an innovation (in such a case a learning innovation). This level whould require then to show a business result.

- Return on Investment (ROI): this strategy suggest to make the evaluation on the base of financial factors. In particular the value resulting from the ratio between the benefits and costs should be grater than one in order to proceed with the change. The calculation of this ratio should consider the costs for instance the technology investment, software maintenance and licensing, installation time for new softwares, etc. On the other hands the evalution of benefits is particularly difficult since it asks for a quantification of effects such as increase in productivity and cost reductions due to the acquired skills.
- Return on Expectation (ROE): this strategy shifts the evaluation towards the expectations of the investors that not necessarily are expressed just in financial terms. Measuring the ROE it is then necessary to clearly specifiy the expectation of the various stakeholder and measure if they are achievable or not as consequence of investment in learning
- Six Sigma: this is a quite complex strategy initially introduced to improve the production process of manifacturing companies, and successively applied in many other contexts. In particular its objective is to reduce the number of defective products delivered by a production line. The adoption of the approach has been advocated also for the evaluation and improvement of the impact of a learning investment
- Total value-add: it is a strategy that suggest to use different approaches to the evaluation and combine the results of the different strategies to derive a value that intends to represent the "total value" added to the organization.

With respect to the Learn PAd project the objective, also in relation to the possible exploitation activities to be described in D9.3 [19], is to have some indications on the possible impact of the platform within a generic organization. In other words the measurement that we will put in place will permit both to assess how much the objectives of the project have been fulfilled, and to provide some input to carry on more precise impact analysis for PAs interested in adopting the solution in the future.

Therefore, also considering the study carried on by the consortium on evaluation of learning, the final evaluation of the implementation will clearly be related to the objectives of the project but will also consider factors useful to make an impact analysis for possible organization willing to adopt the system.

5.2. Learn PAd objectives and relevant factors for adoption of learning solutions

As usual the Learn PAd project has been conceived to answer to a call delivered by the European Commission. In such sense the overall objectives of the project are included in those delineated by the call itself, and in particular:

1) Effective solutions for adaptation to rapidly changing external/internal environment, changing task/competence requirements
2) Support to the development of performance culture, engaging the entire organisation at all levels, providing an efficient measuring method based on clearly defined performance metrics
3) Solutions aiming at developing critical skills, including transversal skills such as effective communication, collaborative building of knowledge resources, critical thinking, self-management
4) Validation of proposed solutions in public administrations

In addition to the listed objectives, and in order to better evaluate a novel solution for learning, it is important to highlight possible factors particularly relevant for the adoption of the solution in the context of PAs. In this respect in [26] the authors list 4 different objectives that should be generally considered in assessing the impact of a learning innovation (or a investement in humal capital more in general).

The introduction of the Learn PAd platform within an organization certainly relates to such scenario. The following class of objectives are then reported in [26] and shortly illustrated here:

- Impact outcomes: asking to identify the reason for the investement
- Performance improvement: asking to show improvement in what people do and how they do it
- Competence, knowledge, confidence: asking to show an improvement with respect to these aspects
- Engagement and motivation: asking to show that the introduced innovation takes in due consideration and foster engagement and motivation of learners, otherwise no advantage in the long run will be crystallized

The classes of objectives listed here are general and applicable to evaluate the introduction of any learning solution. Indeed the objectives fixed by the European commission clearly relate to such classes of objectives and make them more precise. Nevertheless this classification can help in defining the strategies for the evaluation once the various objectives are clearly put in the right perspective with respect to such classes.

The consortium answered to the call with a project which intends to fulfill the objectives above through the development of a learning platform with the following distinguishing characteristics:

- **Use of models to organize knowledge**. In particular, among the various models kinds supported, business process models will permit to directly relate activities to be performed, and required knowledge, as well as experts and related documents
- **Support to different learning paradigms**. In particular with support for simulation based learning, informative learning and collaborative learning. At the same time the organization of knowledge and resources according the BP model will make easier the retrieval of relevant resources while acting in a process enactment
- **Collaborative building of knowledge** thanks to the availability of a collaborative platform which is organized according to specified models, and will permit to civil servants to collaborate and contribute to knowledge building
- **Monitoring and KPI evaluation**. The platform will permit to collect data related to the activities carried on by the final users (civil servants), both when they access to the platform in learning mode, and when they contribute to build knowledge

The listed distinguishing characteristics intend to support the achievement of the objectives listed in the call, and this correlation has to be shown as much as possible by the validation strategy. The project then has to show that organizing knowledge according to models allows the employee to get a better comprehension of the activities to carry out and their relation. This in turn should permit to reduce the time for a novice to learn how to perform within a business process enactment. On the other hand the availability of mechanisms conceived according to different learning paradigm (simulation, informative, while serving real requests) should allow the learner to choose the approach that he/she prefers in different contexts. The possibility to share knowledge is enabled by the collaborative platform, and the definition of precise KPIs to measure improvements and willing to cooperate should permit to engage the civil servant both in learning and in coopeative activities.

5.3. Learn PAd evaluation strategies

The Learn PAd consortium carefully considered different strategies both for the evaluation of the results of the project, starting and adapting the ones listed above, and to get indications on those relevant

factors that can help the analysis of impact for possible adopters. In taking the decision the fact has been considered that it will not be possible, given the timeframe of a EU project, to derive data taking into account financial aspects for the adoption of the platform. Also the derivation of objective performance measurements, which for instance could testify that by using the platform civil servants will learn faster and change their behavior with respect to previous adopted strategies, will not be easily feasible. In fact the time to observe learning effects are generally longer then the timeframe in which the evaluation will happen in the project.

The evaluation will involve people from Regione Marche and Unicam offices that will work on different scenarios according to what is specified in the DoW. Different evaluation strategies will be adopted according to the achievements to demonstrate for the different objectives. In general the consortium decided not to use different groups of employees to base the evaluation on some comparison in the results reported by the two groups. This is due to the fact that competence models for the various employees will not be available at the two sites. Without such an information the results of any experiment could be biased by differences in the previous knowledge and competence of members of the two groups, resulting in an unreliable measurement.

As a result of the conducted investigations on evaluation strategies illustrated in Section 5.1, the project decided to adopt the approach suggested by Kirkpatrick to derive an evaluation for the various objectives and related achievements. In particular the evaluation will be based on the collection of the reactions of the employees that will use the platform (1^{st} level of Kirkpatrick's strategy). The consortium will define in the next future a specific questionnaire that will be submitted to the civil servants in order to get their impressions on the various aspects of the platform and its mechanisms after they will have the opportunity to use it. According to the timeline of the project this kind of evaluation can happen after the final release of the platform final prototype foreseen for month 27.

The questionnaire directed to the users will also permit to assess if the indication collected now, as result to the questionnaire reported in Section 2.2, will have been fully satisfied or not. The questionnaire will clearly be structured according to different groups of questions each one more related to the different objectives to achieve. Moreover the questionnaire shown in Section 2.2 will certainly be a source of inspiration for the definition of the final evaluation questionnaire. Therefore in order to assess if the use of models, as implemented in the platform, helps an employee in understanding how and what has to be done in a process the questionnaire will include specific questions to get user impressions. Depending on the answers we will be able to conclude if the current implementation actually achieves the objectives of making learning easier. Similarly will happen for the assessment of the other objecives. In particular in order to assess if the "support to different learning paradigms" is satisfactory we will require to the user to report his/her experience in using simulation mechanisms to learn what to do, and similarly if the support to learning "while doing" is satisfactory. Specific groups of questions will refer to the collaborative emergence of knowledge and to the mechanisms implemented to foster contribution and collaboration, as well as to get evaluation from the users with respect to their interest in using the platform, and to assess how the included mechanisms could generate real engagement for the learners.

It is worth mentioning that the usage of the platform during the evaluation sessions will generate useful data. Such data can be collected and analysed to discover the behaviour and the activities carried out by the users and then compared with data collected using the questionnaire, when this will add value to the assessment. The definition of the data and analysis that will be carried out will also depend on the KPIs that will defined by the consortium in *D5.4 - KPI Ontology and Learners Assessment Mechanisms* and then on the supporting mechanisms. Depending on the data collected and the time of the collection with respect to the learning activity, the analysis will permit to have initial indication with respect to level 2 of the Kirkpatrick assessment strategy. In particular simulation activities and then the performance of the users related to the *learning* level permitting to have information on how the learner actually behaves on concrete, even if synthesized, situations.

Nevertheless it is well known that this approach to evaluation of learning outcomes tend to get positive (happy) answers from the users. In order to reduce such a risk the consortium, in addition to a careful formulation of the questions to avoid as much as possible easy and happy answers, as it has been done

for the questionnaire reported in Section 2.2, decided to conceive and use another questionnaire to be submitted to learning experts working at the “Scuola di formazione” (Training school) of Marche Region. This questionnaire will permit to collect the point of view of the experts that will have the opportunity to see a working installation of the Learn PAd platform. Such an evaluation, not requiring a fully functional version of the platform, can be performed even before the final release of the platform.

In summary the evaluation strategy to apply in order to show the results of the project will be based on the following pillars:

- use of questionnaires to assess the various achievements in relation to the various objectives discussed above
- definition of precise KPIs and data collection activities to analyse the performances of the learners

Part III

Conclusions

6 Conclusions

This document reports the results of the activities carried out by the consortium in order to answer to the requests made by the project reviewers in the first year review report.

The main ojectives of such activities were twofold. On the one side the project needed to acquire more awareness of the needs and expectations of the final users (learners). This request resulted from the fact that the project in the first year put too much effort on the technical aspects of the learning platform while the point of views of the learners were partially neglected. On the other side the project needed to clarify the final evaluation strategies for the learning platform being them written in a rather innacurate way in the description of work. To overcome the highlighted issues the answer of the project was to activate a task force composed by representative of all partners which, in parallel to the already planned activities according to the DoW, defined an action plan and performed a set of activities leading to the results described in the previous chapter.

The issues related to the need of getting deeper awareness on learner perspectives have been addressed by:

- defining a questionnaire on the various aspects of learning and the platform. The questionnaire have been submitted to PA employees and BP responsible and more than one hundred questionnaires have been filled and successively analysed
- interacting/involving experts in cognitive sciences and performing a literature review, starting from suggestions provided by the expert, on cognitive aspects in human societies and learning theory

In addition and related to these activities we investigated the results of related FP6 and FP7 EU projects in the area of Technology Enhanced Learning in order to better align our effort with already reported results. In particular four different EU projects were identified and relation and impact on the Learn PAd project reported.

Finally this document reports the work done in order to clarify the final evaluation strategy. In this case the project defined a strategy that takes into due account also relevant literature on the evaluation of learning adoption strategies in complex organizations, also in view of successive possible need of showing the sustainability of the proposed solution in real context.

The effects of the described activities on the project does not have to be considered fully completed. In particular further investigations on the results of the questionnaire will be conducted in order to deepen our understanding on the point of view of the possible users of the platform (learners). At the same time the more precise understanding of the issues related to the final evaluation of the platform made evident that it is important to continuosuly refine the strategy to get a clear specification of the objectives and of the measures to perform before starting the collection of the evaluation data.

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