

How to measure innovation in eLearning The i-AFIEL methodology

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Summary

This paper presents and discusses innovation in relation to the European project Innovative Approaches for a Full Inclusion in eLearning (i-AFIEL) and, in particular, the methodology applied to measure innovation in eLearning projects developed by the Spanish OVSI Foundation. The paper focuses on the concept of innovation and the three key aspects related to the eLearning context: technological innovation, sociological innovation and service customization.

A series of Innovation Criteria are proposed and discussed as elements to be measured in order to understand the degree of innovation of each eLearning project. The challenge of the i-AFIEL methodology is the transformation of these indicators into numbers and scores, and thus to evaluate quantitatively the success and the novelty of the projects. The evaluation system involves the transformation of the Innovation Criteria into Indicators, and the transformation of the latter into questions and tools addressed to two different target groups, a students' questionnaire and an organization's questionnaire, allowing to have broader and more objective views and measurements.

Some examples of the application of the i-AFIEL methodology are provided in the paper with some final reflections and conclusions about the need of further improvements and development of the methodology itself. The i-AFIEL model can be considered in deed a concrete example of how a research study in eLearning may be carried out in a creative way.

Keywords: e-learning, i-AFIEL, innovation, methodology

1 Introduction

This paper is aimed to present the European project entitled Innovative Approaches for a Full Inclusion in e-Learning (i-AFIEL) and to describe how "creativity and innovation" can find an example of good practice and application in the project itself.

Nowadays, stakeholders, educators, content providers, software providers and e-learning developers have come to understand that for e-learning, in order to be effective and inclusive for all, it is crucial to create awareness around the "added value" which it brings with it, which does not mean simply transposing face-to-face classes online, on the Internet or on a CD Rom. E-learning should bring novelty, should support users' creativity, active participation, relationship building, connections, information sharing, collaboration inclusion and should innovate the old educational frameworks. Everything still needs to be reinvented.

The i-AFIEL project was carried out during 18 months in 2007 and 2008, by seven European institutions, from three different countries: Spain, Italy and UK. The main aim of the project was to seek out best practices and new ideas to make e-learning possible for people who for socio-economic reasons, age, disability or any other marginalising factors have not found ICT to be a part of their daily lives yet.

The i-AFIEL project¹ can be considered as a concrete example of innovation and creativity in e-learning² for a full access and inclusion for all. In this context innovation is described as:

“a concept which should amalgamate both technological novelties (tools, programs, hardware, etc.) and sociological novelties (target audience, social integration, social interaction) and also the improvements in the quality of the service (educational improvement, learning support, teaching support, etc.)”³

A clear reference is here made to all learning 2.0 technologies, (social networks, wiki, weblogs, etc.) which, in a very simple way, can easily and constantly connect users with each others, allow them to share and create new contents and which make them their own actors of the learning process.

The project was also aimed to build a methodology to measure innovation in e-learning. However, the methodology should be understood in the context it was created: its goal is to measure innovation based on the projects presented by the partners (see table 1) and it is not enough prepared to measure all e-learning initiatives. For this the methodology should be updated to include the latest trends on e-learning and also adapted to the different situations which should be measured. As first premise, this methodology should be understood as a starting point for the measurement.

2 The i-AFIEL Benchmarking Methodology

The i-AFIEL project uses a number of e-learning initiatives and some innovative e-learning projects for statistical and technical analysis carried by some partners so that the benchmarking process could be developed and templates for questionnaires for developers and learners could be offered for a wider use.

According to the i-AFIEL project partners' idea, the benchmarking methodology is considered as a comparative analysis widespread in European projects to evaluate policies and initiatives. It allows having a full view of the unit of analysis from several perspectives so that they can all be complementary.

This is the underlying approach to the assessment of the benchmarking method, because with these techniques it was not only evaluated the innovation in a course or programme, but also extracted its key points to provide ideas and assistance to others who are developing e-learning projects.

Innovation does not always lead to success: there are projects with a very innovative approach which struggle to reach their objectives. On the other side, there are really successful projects without any innovative perspectives. The most interesting point would be to find the relationship between innovation and success, that is, to ascertain when innovation contributes to success.

The following figure helps us to better understand the theoretical construction of the methodology used in the project:

¹ i-AFIEL project www.iafiel.gva.es

² For definition of e-learning concept see for example OECD's report "eLearning in tertiary education: where do we stand?" (2005) <http://www.oecd.org/dataoecd/27/35/35991871.pdf> and European Commission's eLearning Action Plan (2001) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2001:0172:FIN:EN:PDF>

³ i-AFIEL guidelines www.iafiel.gva.es

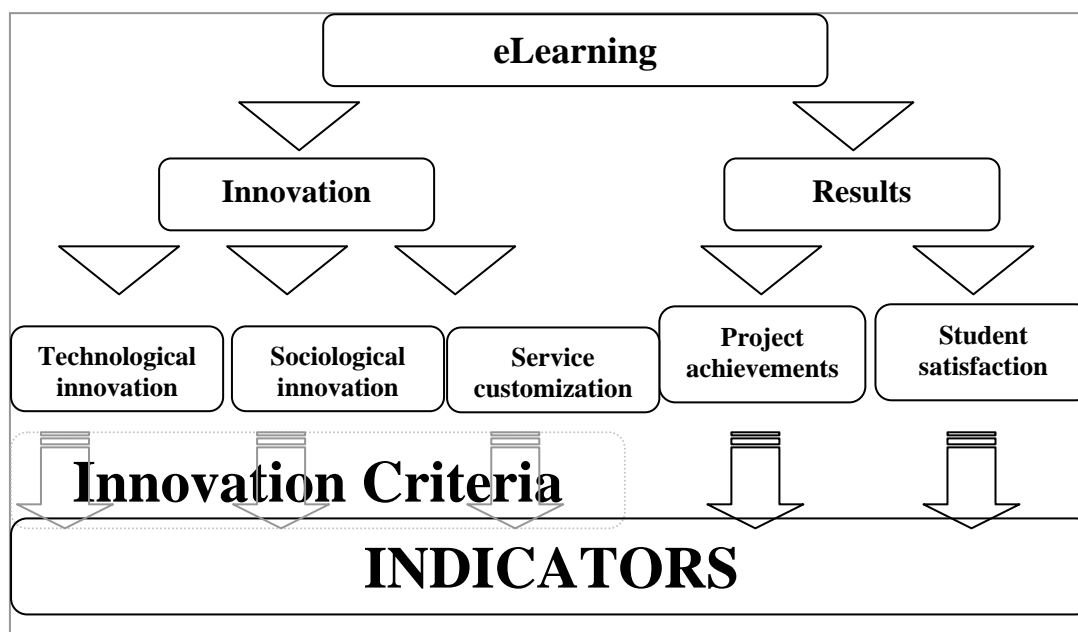


Figure 1. The i-AFIEL methodology

The figure shows how the evaluation proposed by the i-AFIEL project is based on two main areas: **results** and **innovation**. “Results” mean the final achievements of a project, measurable outcomes displayed as figures based on previous targets defined by the project itself. “Innovation” is, on the other hand, a more complex concept, and the methodological development to measure it is more elaborated.

Once identified these two main areas of interest they can be broken down into three fields:

INNOVATION:

- **Technological innovation**, which is the inclusion of the newest and more sophisticated technical advances, instruments, tools.
- **Sociological innovation**, which is based on the inclusion of social risk and disadvantaged people in the e-learning initiative.
- **Service customization**, which shows the quality of services offered and the involvement of e-learning organisations in the improvement of the features of their programme.

RESULTS: they can be measured from two points of view:

- **Project achievements**, which is the impact of the project in terms of coverage and students enrolment.
- **Student satisfaction**, to collect pupils’ opinions enrolled in the e-learning programme/course.

It is possible to see that there are some differences between the innovation and the results categories. The three variables of innovation -technological, sociological and service customization- are defined by several **criteria**; which would indicate the innovation grade of a project to the extent that they can be identified as a feature of that project.

In the meanwhile, the field of the results has a direct statistical measurement through the project achievements and the student’s satisfaction indicators.

Furthermore, in the following table there are listed all the European e-learning projects studied with the i-AFIEL benchmarking methodology.

Project name	Short description	Link
Qual ELearning	The Qual-ELearning project deals with quality of eLearning providing European professionals from the creation to the application of training programmes with knowledge, tools and methods to improve evaluating the effectiveness and impact of training cycles.	www.qual-eLearning.net
Benvic (Benchmarking of virtual campuses project)	The BENVIC project is aimed at developing standards for quality assessment of the European virtual campuses and quality criteria of this type of training.	www.benvic.odl.org/indexpr.html
Quality on the Line. Benchmarks for success in internet based distance education.	This project examines case studies of six colleges and universities which provide Internet-based degree programs. The final outcome is a list of 24 benchmarks.	www.ihep.com/organizations.php3?action=printContentItem&orgid=104&typeID=906&itemID=9239
DLAE (Distance learning accreditation in Europe)	The SIG-DLAE project aims at developing a model similar to the U.S. Accreditation Model (DETC), but adapted to European experiences and practices.	http://dlae.enpc.fr
MECA-ODL Compendium of reference materials on quality in open and distance learning delivered via internet	The aim of the project is to identify and analyse different quality criteria of Web-based distance learning.	www.adeit.uv.es/mecaodl/
Distance education and training council (DETC) accrediting commission	DETC promotes the use of quality standards of distance learning and offers official accreditation to those institutions which comply with them.	www.detc.org
Information advice and guidance	Provide Deaf people with access to information through Deaf advisers that Walsall Deaf Peoples Centre (UK) won support from the UK government to develop the learning package NVQ2/3.	www.walsalld deaf.org.uk
E-learning for adults	The project consists in establishing a partnership medium where best practises related to vocational systems, eLearning, online courses, software platforms, etc. can be shared.	www.elfora.net
ELBA Electronic book for adults	The project is aimed at elaborating an electronic version of a European social anthology in an electronic book format which will be incorporated into some digital libraries and which will be accessible to anyone through the internet.	www.elbaproject.net
IALL Internet for autonomous lifelong learning	The project aims at using Internet to help adult learners get access to basic education and developing subsequent lifelong learning activities, while improving their personal and/or professional skills.	www.sec.ro/iall
SEE EU TOOL	The project aims at developing a complex training tool enabling secondary school teachers to rise the pupils' interest on science and technology by promoting sustainable energy in practical-orientated training.	www.unitbv.ro/Default.aspx?tabid=561
Principle of radio protection in Lombardy & Italy	Objectives of the online formation are the improvement of the radioprotection acquaintances to fine radioprotection preparation of the professionals who follow curative performances or diagnostic surveying which imply the	http://cirm.sirse.net/fad/corsi/1_Radio_MAC.pdf

	use of ionizing radiation.	
eLane eLearning European Latin America New Education	Provide society with high quality & low cost educational material, maximizing impact both at academic and non academic fields. Focus on the support of educational programs at isolated Latin-American communities through distance learning systems.	http://e-lane.org
CompeTIC	CompeTIC objectives are to provide access to Internet and a website to the SMEs. CompeTIC aims to promote productive intelligent environments (EPIS), avoid SME digital divide and develop SME complete programmes.	www.competic.es
INTERNAUTA	Internauta, aims to allow the citizens of the Valencia Region to use Internet in an intelligent way. It is aimed at groups at risk of digital exclusion.	www.internauta.gva.es

Table 1. The i-AFIEL analysed e-learning projects

2.1 The Innovation Criteria

Since the innovation indicators are based on these criteria, next they are listed and explained in order to understand the connection between both concepts and their importance for the methodology:

1. **Open work methodology.** Students should be able to move into the technological platform, progressing at their own pace and choosing their own options in the training itinerary.
2. **Interactive.** System should response every intervention depending on its nature; this response is prompt and specific.
3. **Integrative.** System arranges virtual places which allow direct personal or group communication amongst the individuals both in training situations and relationships.
4. **Participative.** There should be procedures and tools in order to collect all interests and expectations of the participants. This means that, eventually, this collection could carry out effective changes in the system.
5. **Technologically innovative.** System includes contributions from the newest technological advances.
6. **Transparent.** Technological aspects do not disturb, only the unavoidable, the learning process, that is, it does not add conceptual confusion due to informatics resources or technical terminology.
7. **Independent on the space, time and technology.** Students should participate in the course/programme from everywhere, every time and every computer.
8. **On-line resources.** System has training accessible resources on-line: training resources, query resources, practice, guidelines, assessment, etc. and it also should allow access to Internet resources through guides, bookmarks, etc.
9. **Intercultural.** System should allow intercultural communication, that is, the participation of students and trainers from different cultures, countries, languages.
10. **Non-exclusive or non-discriminative.** System has resources to avoid barriers and obstacles in the learning due to geographical, cultural, gender, age or other differences.
11. **Easy development and updating.** Contents, materials and resources should be modified and updated in an easy way independently from the place where trainer is.
12. **Security.** Data protection and privacy is ensured, both intellectual production and personal data of students and teachers. Access to the platform should be personal and different by functions.
13. **Collaborative.** System ensures procedures and resources for collaborative working, so that it is possible the joint work as well as discussion and knowledge exchange to reach the training goals.
14. **On-line and distance assessment.** System allows the evaluation using on-line procedures so that the student could know his progress from everywhere.

15. **Excellence in the training resources supply.** All involved resources in the system should look for offering added value services: manuals, instructions, teacher's preparation, etc.
16. **Effective communication strategy.** Dissemination and information about the programme/course should be congruent with reality in order to avoid misunderstandings as well as to enable an effective communication.

As expected, the technological criterion is neither the only one nor the most important, there are many more which were elaborated after the review and reading of several initiatives, including that ones involved in the i-AFIEL consortium. However, it is important to consider these sixteen facts or ideas as the main challenges in the field of e-learning.

The existence or non existence of these criteria in the projects will be evaluated through a set of indicators. This will be the key point of the evaluation model; the simple success of a project is not the main interest for i-AFIEL partnership, but the contribution of innovation to success. I-AFIEL methodology tries to study the relationship between innovative tools, models, programmes, courses with the progress of e-learning and its application and usage in new scopes and new audiences.

The final step, as shown in figure 1, is the construction of the indicators, which will take the form of two questionnaires, one devoted to the organisation offering the e-learning course and the other, addressed to the students. It is necessary to take into consideration both actors due to the fact that both are equally involved in the e-learning process, thus, there will be indicators related to students and also to the organisation offering the course or programme.

The system is supported in the usage of quantitative methods which allows us to achieve an objective model. The final goal of the methodology advises the usage of the most aseptic ways of measuring, that is, the same criteria and indicators should be used for every project evaluated and the observation of these characteristics must be equally measured. However, qualitative interviews are also welcome and could be carried out by evaluators if they think it is needed, remarks and explanations on the projects are supposed to be present during the evaluation. In fact the final questionnaire allows the collection of further information although it is not taken into account for scoring the project, this means that the final assessment report could include that information, but comparative results and final evaluation of the project will come from quantitative indicators⁴.

2.2 The Indicator System

The list of indicators, ordered and categorised, is shown next. It is introduced through factsheets which allow to study in depth each indicator. Before looking at some examples of factsheets and in order to facilitate their understanding it is important to pay attention to some of the different fields included and its explanations.

- The **code**; It is necessary to point out that an indicator may belong to two fields, as we will see there are indicators noted only with "I+NUMBER", related to innovation, with "R+NUMBER" related to results and "IR+NUMBER", related with both fields.
- The **respondent** field. We consider there are two respondents: the student enrolled in the course, who will give us an idea of the general satisfaction of the audience, and the organisation offering the course.
- The **criteria** cell fulfils an important task in the indicators system because it notes the criteria related to that indicator. Indicators are measuring the presence (or non-presence) of innovation criteria, all sixteen criteria are measured by, at least, one indicator, although most of them are related to two, three or even more criteria.
- The **fields** are the areas and categories where indicators are classified. The same indicator may belong to two categories.

⁴ The information here reported on the i-AFIEL benchmarking methodology are extracted from the i-AFIEL guidelines available at www.iafiel.gva.es

Furthermore not all indicators are related to these criteria; this technical framework divides the indicators in “innovation” and “results” indicators. The latter ones are independent on the innovation criteria, they are just giving to the evaluators an approximation to the satisfaction of the users and the success of the e-learning project based on the students experience and their behaviour measured through this figures.

The following factsheets present the indicators following the fields described before. First, here are presented just two examples of the indicators which will be asked to the organisation in charge of the e-learning programme analysed, and then other two examples of those related to the students.

Indicator:	Total amount of Students expected to be enrolled	Code:	R01
Respondent:	Organisation		
Criteria:	Not applicable		
Rationale:	Shows the starting enrolment expectations and serves as basis for other indicators		
Field:	Results (Project achievements)		
Question:	1. How many Students did you expect to be enrolled before the beginning of the course/programme?		
Extra Question:			

Notes:			
Indicator:	Student's expectations testing	Code:	I11
Respondent:	Organisation		
Criteria:	4		
Rationale:	Shows the attention paid to expectations of the Students		
Field:	Innovation (Service customization)		
Question:	2. Is there a test to know the expectations of the Students in the course/programme? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Extra Question:	<i>Is any Quality Control measurement used? If yes, which one?</i>		
Notes:			

Indicator:	Assessment of the teachers support	Code:	IR01
Respondent:	Student		
Criteria:	15		
Rationale:	Shows the opinion of the Students about the teachers support		
Field:	Innovation (Service customization) / Results (Student satisfaction)		
Question:	1. Did the teacher / mentor give enough help during the course? <i>Please answer scoring this scale where 0 means not enough at all and 4 totally enough</i>		
	Not Enough.		Enough
	0	1	2
		3	4
Extra Question:			
Notes:			

Indicator:	Adequacy of the course/programme to Student's expectations based on the information provided by the Organisation	Code:	IR02
Respondent:	Student		
Criteria:	6, 16		
Rationale:	Shows the adequacy between the communication of the programme/course and the final contents Students got		
Field:	Results (Satisfaction) / Innovation (Service customization)		
Question:	4. Did the course deliver what you expected from it? <i>Please answer scoring this scale where 0 means the course does not deliver what you expected at all and 4 the course</i>		

	<i>was exactly what you expected.</i>				
	Not at all				Exactly as expected
	0	1	2	3	4
Extra Question:					
Notes:					

Figure 2. Organization and Student's indicator factsheets

2.3 The Evaluation System

Therefore, there are three components of the final evaluation system: the results indicators, which give an idea of the success or not success of the project according to its own expectations, the indicators about innovation, which give the innovative approach on the e-learning perspective and, finally, the innovation and results indicators, which offer complementary information as a whole. These indicators are articulated in two collection data tools: a questionnaire for the organisations, to be responded by the managers of the project studied and another one for the students, which offers the opinions of the students about the course or programme carried out. But, although it is possible to separate all these components, they can not be considered individually because all together they compose the whole evaluation system.

Innovation indicators are both present in the organisations and in the students' questionnaire, but there might be a difference between them depending on the type of answer the respondent could give:

- Most innovation indicators are represented through questions which can be answered with “yes” or “no”. These are dichotomous questions. This is a clear way to identify the presence or non presence of the characteristics measured by the questionnaire. Logically, the presence of these is positive, non presence is negative.
- On the other hand, there are indicators which have to be answered through scales; these questions allow the respondent to indicate agreement/disagreement or opinion and even the presence of some features in these graded scales which have five response options explained in every question.

The challenge is the development of a scoring system which allows to evaluate these two types of questions together.

Bearing this in mind, the solution found lies on assigning a zero [0] when the feature asked is not present and a four [4] when it is present, and this permits the assignment of middle values [1, 2 or 3] to intermediate responses given in the scales type questions, and four [4] or zero [0] points for yes/no questions.

Scale questions are suitable for satisfaction and opinion indicators, in fact this is the only scale question in the organisation's questionnaire, most focused on the e-learning platform features. On the contrary, the students' questionnaire includes more scale questions due to its higher usage of indicators related to opinion and satisfaction.

This scheme applies a standard scoring system to all questions while it could have been developed giving more or less importance to different questions. However, this latter would have been a problem due to the big amount of different projects on e-learning with varied objectives, actors involved, procedures, tools, etc. Probably some questions are more important for a concrete project, but it is also possible that the same ones are not interesting for others.

On the other hand, assigning different weights would also have been a problem because of the different character and priorities of each project. In this context, the solution given is, as it is stated in the Indicators System, the usage of optional qualitative questions when needed, these

will facilitate the customization and will allow the evaluators to detail the particularities of a project and point out their singular and most relevant aspects.

However, this individual qualitative information obtained by each project can not be included in the scoring for the innovation assessment because this is based on quantitative methods.

Once decided the scoring strategy it was crucial to make an easy-application system which would take into consideration all questions equally.

Let's explain the innovation evaluation system. Once gathered the information through the answered questions for each innovation indicator, the data will be treated adding up all scores obtained in the questionnaires after their application and then dividing this addition by the total score which could be obtained.

Example:

If we apply the system we will obtain a percentage, e. g. we have 23 questions in the organisations' questionnaire and 8 in the students' one, this means a project can obtain, as a maximum, 92 points (23x4=92) in the first and 32 (8x4=32) in the second, that is, a total score of 124 points. Imagine the project we are evaluating obtains a total score of 93 points:

$$(93/124)*100 = 75\%$$

Example 1. The Innovation Evaluation System

The procedures and calculations are not difficult to carry out, however, while in the organisations' questionnaire only one response will be collected, the students' one will collect several answers, how do the evaluators treat them? They can not be considered as individual responses and added up; it would not have any sense due to the differences between projects and initiatives. The students' responses must be analysed calculating central tendency statistics, especially averages, which will be considered and counted on the final add for assessing innovation.

This recovering can be shown in the previous example:

We said we had two questionnaires, imagine we get 80 points from the organisations' questionnaire and we have the following responses to the students' questionnaire:

	Student 1	Student 2	Student 3	Student 4	Student 5
Q1	1	1	2	2	1
Q2	3	2	1	3	3
Q3	3	1	1	3	3
Q4	3	2	2	4	3
Q5	1	1	1	2	1
Q6	3	2	1	4	3
Q7	1	1	1	1	1
Q8	2	1	1	1	2

We can not add the scores of every student, it would not be logical because the final score of a project would depend on the total amount of students enrolled answering the questionnaires, and it would not be a good measure of innovation, but of the students registered in the programme or course.

We have to analyse the answers, specifically we should calculate the average of each question:

Example 2. Responses to the students questionnaire

	Student 1	Student 2	Student 3	Student 4	Student 5	AVERAGE
Q1	1	1	2	2	1	1,4
Q2	3	2	1	3	3	2,4
Q3	3	1	1	3	3	2,2
Q4	3	2	2	4	3	2,8
Q5	1	1	1	2	1	1,2
Q6	3	2	1	4	3	2,6
Q7	1	1	1	1	1	1
Q8	2	1	1	1	2	1,4

Once we have the average score of every question, we have to add them up in order to obtain the whole score of the students' questionnaire:

Example 3. Students' average score of every question

	Student 1	Student 2	Student 3	Student 4	Student 5	AVERAGE
Q1	1	1	2	2	1	1,4
Q2	3	2	1	3	3	2,4
Q3	3	1	1	3	3	2,2
Q4	3	2	2	4	3	2,8
Q5	1	1	1	2	1	1,2
Q6	3	2	1	4	3	2,6
Q7	1	1	1	1	1	1
Q8	2	1	1	1	2	1,4
						15

Then we add up this score to the organisations' one, what gives us the whole score of the project:
 $78 + 15 = 93 \rightarrow (93/124) * 100 = 75\%$
 In this case, the final score is 75%.

Example 4. Calculation of the total score

It is very important to count on enough responses from the students, if not analysis will not be possible. It is not possible to foresee the minimum amount of answers because each e-learning programme will have a defined number of students and probably it will not be necessary to create samples. Therefore logic should be the reason which guides the students' data collection for the evaluators.

Regarding the final percentage obtained after the data analysis, which would be the final score of innovation of the project evaluated, it is a figure and, obviously, the higher it is the more innovative will be the project. But evaluators have to take into account the optional and qualitative questions and, probably the key point of this methodology, the potential benchmarking with the evaluation of other projects. This helps project coordinators to detect weaknesses or strengths in their own e-learning courses or others.

The achievement of the innovation score is the basic aim of this methodology, but not the only one. Evaluators have a complete tool capable to give a whole view of the project. The assessment begins with the review of the project from scratch, paying attention to its particularities and objectives. Then, the application of the questionnaires and its further analysis offer information about the innovative aspects detected. In addition, the "results indicators" help to understand how successful has been the course. Once the evaluators have all this

information they are capable of carrying out a full report of the project pointing out not only its innovation level, but also how it is related to the results obtained.

3 Conclusions

Although the i-AFIEL methodology might represent just an attempt to measure innovation in e-learning, it can be considered as an example of concrete application of how a research study in e-learning could be creatively carried out.

The methodology was created and tested among the e-learning projects illustrated in table 1. However, the methodology was not tested on other wider settings and, hence, the methodology still needs further research and study in order to develop its full potential at European level.

While the methodology brought a lot of innovation, some aspects are still obscure and need further improvements.

For example, it was not possible to define well how the relevant qualitative elements collected could be transposed into the quantitative system of measurement. Hence, some questions are here due: how much is the weight of qualitative elements on the final quantitative score? How much the former might influence the latter? How to translate this into practice?

The fact that the methodology was not unfortunately fully applied on the expected number of projects was another unsolved issue. A pre-test was made but its full and concrete application is what really would have given the real results of the methodology which could be considered partial, at this stage.

Furthermore, among the innovation criteria there is not a specific section dedicated to “pedagogy” in e-learning although probably this issue is touched more or less indirectly by some of the criteria presented in the list. Pedagogy is very important while discussing about e-learning and innovation and would have needed to be treated with a special attention as a single item among the other innovation criteria. Innovation is also about pedagogy and the approach to e-learning used for guaranteeing a full inclusion for all.

Finally, the i-AFIEL is an open and live methodology, which must be continuously updated with the latest technologies and its applications to education which will come in the future. That is why this methodology can be considered in continuous evolution also because of its possible different application in different contexts and countries. Hence other contributions in the field are then expected for further improvements and developments⁵.

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