Education and Culture DG
Lifelong Learning Programme

Education and Training

Network promoting

e-learning for rural development

e-ruralnet

LLP Transversal Programme
Key Activity 3 ICT - Networks

WP2 – E-learning supply and demand surveys

Demand & Supply surveys of e-learning in 11 countries Synthesis Report

August 2011

Project Nr: 143418-LLP-12008-1-GR-KA3-KA3NW
With the support of the Lifelong Learning Programme, Key Activity 3, ICT of the European Union

Rostock, August 2011

Prepared by: Dr. Lutz Laschewski, University of Rostock, Germany
With a conclusions section by Dr. Fouli Papageorgiou, PRISMA- Centre for Development Studies

For more information on E-ruralnet visit the website www.e-ruralnet.eu

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

CONTENTS **PAGE**

PREFACE

This report presents the synthesis of the e-learning demand and supply surveys conducted in 11 European countries, as part of the E-ruralnet project, co-funded by the European Commission under the Lifelong Learning Programme. The project addressed e-learning as a means for enhancing lifelong learning opportunities in rural areas, with an emphasis on SMEs, micro-enterprises, the self-employed and persons seeking employment. The focus of the project was on informal and non-formal adult learning.

Three surveys were conducted in each country:

- E-learning supply: surveys of e-learning providers. The synthesis of these results is presented in Part I of the report.
- E-learning demand surveys including e-learners (people with e-learning experience) and a control group (people with no e-learning experience). The synthesis of these results is presented in Part II of the report.

The questionnaires used for the surveys can be found at www.e-ruralnet.eu

The data for the surveys were collected by the e-ruralnet project partners, using online questionnaires in 11 countries:

Greece: PRISMA Centre for Development Studies

Germany: University of Rostock

Poland: Nikolaus Copernicus University

Hungary: Hungarian Academy of Sciences, Centre for Regional Studies

Finland: Ruralia Institute, University of Helsinki

Italy: Institute of Biometeorology, National Research Council

Spain: Mediterranean Institute for Sustainable Development

Portugal: i-Zone Knowledge Systems

UK: Norton Radstock College

Sweden: EMMERCE Ltd

Estonia: Estonian University of Life Sciences

PART I E-LEARNING SUPPLY: E-LEARNING PROVIDERS SURVEY

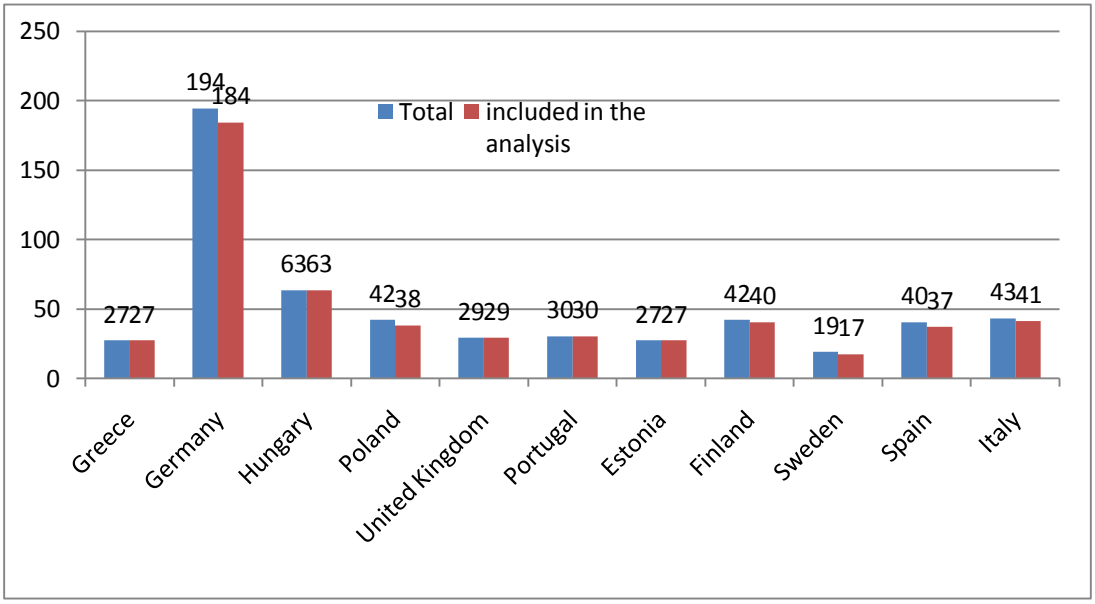
1 Introduction

This part presents the findings of the survey of e-learning providers for all partners. The analysis includes both a comparison of the results of the national surveys as well as an (explorative) analysis of causalities. Various statistical techniques are applied to analyse the data set, in particular correlation and regression analysis.

2 Survey Design and Sampling

The survey was based on a common online questionnaire, which has been translated into 11 national languages and has been made available at the project website. The questionnaire contained 27 questions and covered structural parameters of providers, the providers' profile as well as their attitudes towards some aspects of e-learning in rural areas. Every partner has approached training providers individually. The survey was conducted between January and December 2010. All responses have been collected in a joint database. Each partner has produced a national report, in which national results are outlined and basic statistical analysis has been undertaken according to a common guideline. The analysis in this report is based on the compiled data set, and also refers to the national reports, particularly to interpret national differences.

Figure 1: Sample sizes



The sample sizes differ very much between countries. The average sample size is 51, but is obviously very strongly influenced by the large German sample. The Median is 40. If we consider different population sizes of the participating countries, the picture looks different. The Estonian sample covers approximately 20 providers per 1 Mill. Inhabitants, while the German sample covers only 2,36, which is the median value of all countries. With regard to population size the samples in Spain, Italy and the United Kingdom are very small (less than 1 provider per 1 Mio. Inhabitants), while Finland and Hungary are the runners up behind

Estonia. The Greek and the Swedish samples are in a middle range, despite the fact that the total sample size is small.

In order to achieve high quality standards the data sets has been very critically tested for anomalies. Thus, some tables differ slightly from the national reports. It is noteworthy that it is not wrong to include all data sets into the analysis, as it has been done in national reports were only basic statistical analysis has been undertaken. However, the more in-depth statistical inference in this report requires are more critical approach. For instance, extreme cases have been excluded from the analysis. Excluded data sets are no "wrong" either, but may be unique and would have blurred the statistical test. Finally, a total number of 533 cases have finally been included in the analysis.

The full data set is large enough to reveal national differences among all countries. However, the number of cases per country is often too small to identify specific differences for individual countries.

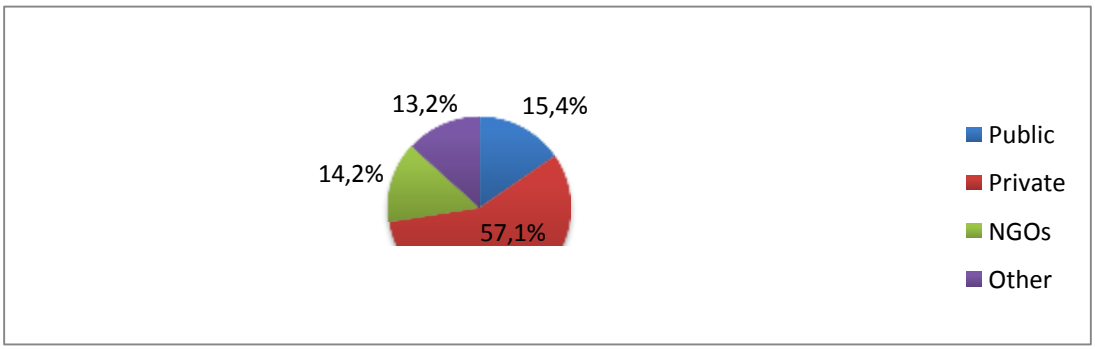
3 Provider institutional profile: type, size, training activity

In this section 533 cases are included. Missing cases are not included in table or graphs.

3.1 Type of organisation

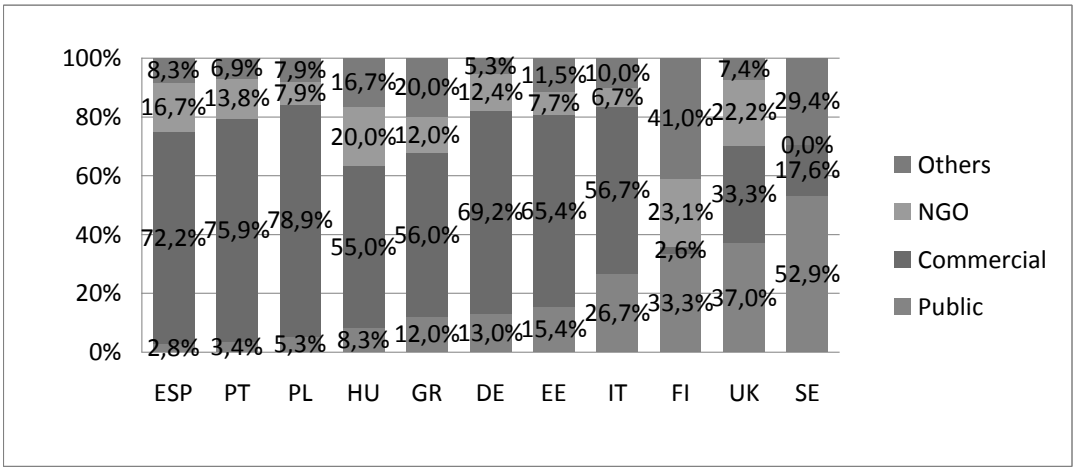
In some countries the question about the legal form of the provider's organisation has caused some difficulties. This has been particularly the case for institutions that are in public ownership, but are private according to the legal form. This has produced a proportion of unclear answers, when interviewees ticked multiple options. Here, these cases are included in the option "others". The majority of businesses of these providers are private businesses (289), while public sector institutions and NGOs take almost an equal share.

Figure 2: Type of organization



The shares of the type of organisations differ between countries. The χ^2-statistic cannot be applied here, because of an insufficient number of cases in some countries. However, it is apparent that the group "others" is particularly strong in Finland and Sweden, which also report high shares of public sector providers. It seems that the identity of providers as being public, in sense of ownership, and private, due to the legal form, has caused conflicts, how to answer this question.

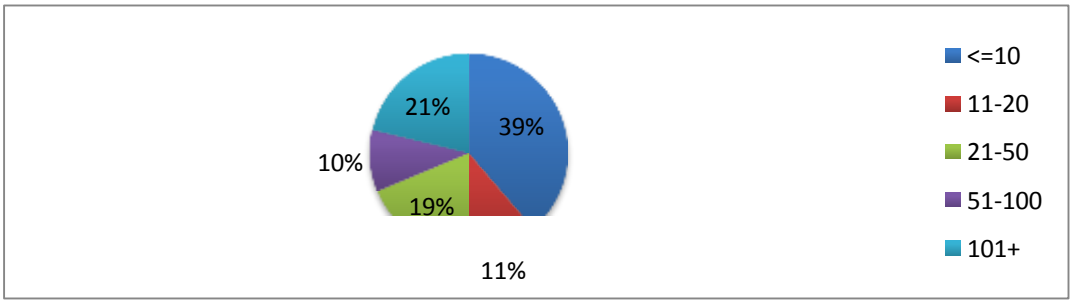
Figure3: Type of organization by country



3.2 Number of teachers / e-learning teachers

For this analysis cases have been excluded that did not yet start e-learning provision (Question 8). On this basis 428 cases are included in the analysis. The mean value of teachers is 100,2. The range is from 0 to 1800, and the standard deviation is 211,5.[1] Half of all providers employ 20 or less teachers (median = 20).

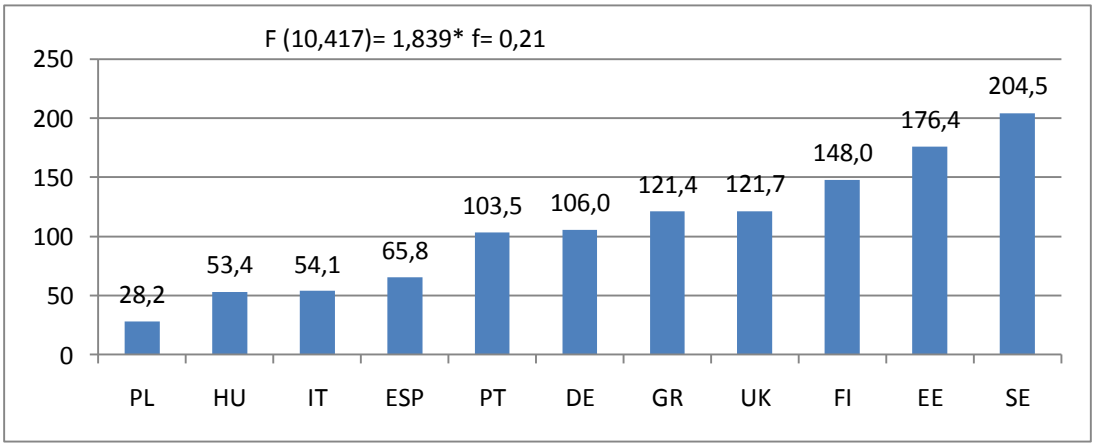
Figure 4: Teachers employed



The large range and variance are caused by the fact that providers very often employ teachers part time. The averages differ significantly between all countries. The effect size f points at a medium effect. Since the sampling may be biased differences have to be treated with care though. It is difficult to asses, if the mean difference reflects true differences between countries or a caused by a biased sampling.

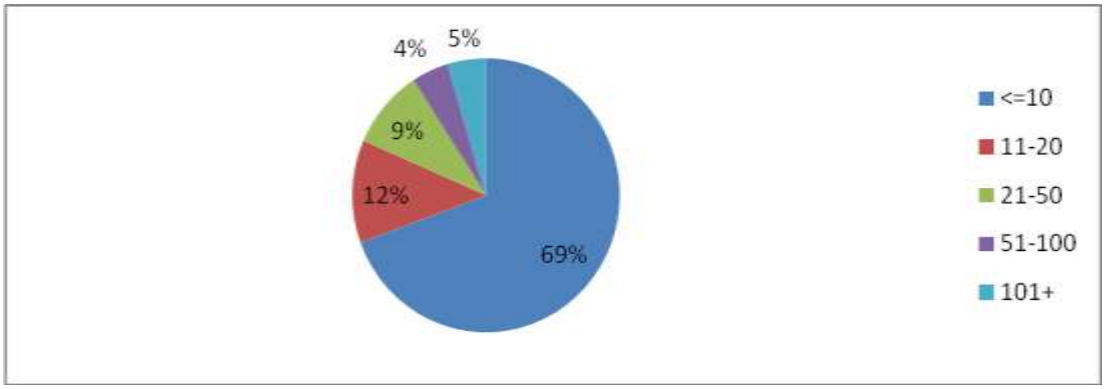
[1] If the sample is considered to be „representative", the „true"mean is estimated to be in the range of 100,2 ±2*211,5/√428. That is in a range of 79,8 to 120,6.

Figure 5: Number of teachers: country means



For this analysis of the number of e-learning teachers cases have been excluded that did not yet start e-learning provision (Question 8). The number of e-learning teachers ranges from 0 to 750 (n=428). The mean is 29.2 and the median is 5. The standard deviation is 88. Almost three quarter of all providers employ 10 or less than teachers for e-learning, and 81 % employ 20 or less e-learning teachers.

Figure 6: E-learning teachers



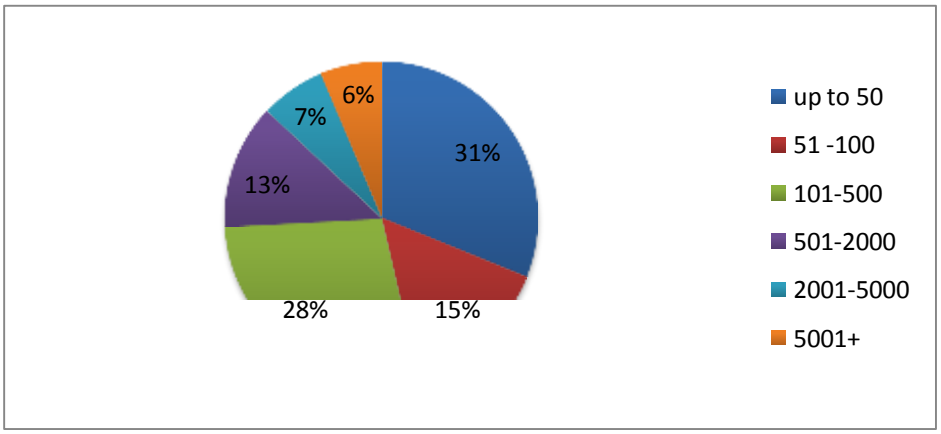
It is easily comprehensible that the number of e-teachers is strongly correlated with the total number of teachers (r=0,638**). Thus, means differ between countries accordingly (F(10,417)=2,234*, f= 0,231).

3.3 Students/female students

For this analysis cases have been excluded that did not yet start e-learning provision (Question 8) (n=414).

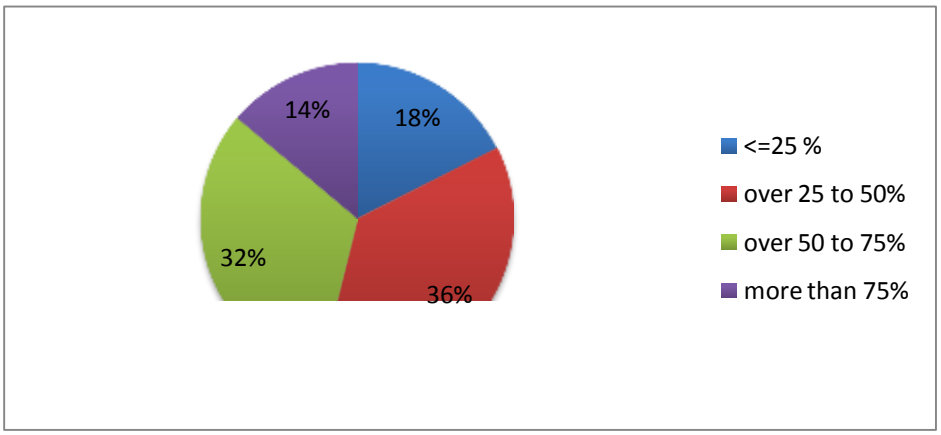
The number of e-learning students range from 0 to 25000. The average is 1228,6, but the median is 120. Thus, 50 % of all providers have 120 or less students. A small number of large e-learning providers influence the mean. The standard deviation is 3169,99. The differences between countries are statistically not significant.

Figure 7: Number of e-learning students per provider over past 6 months



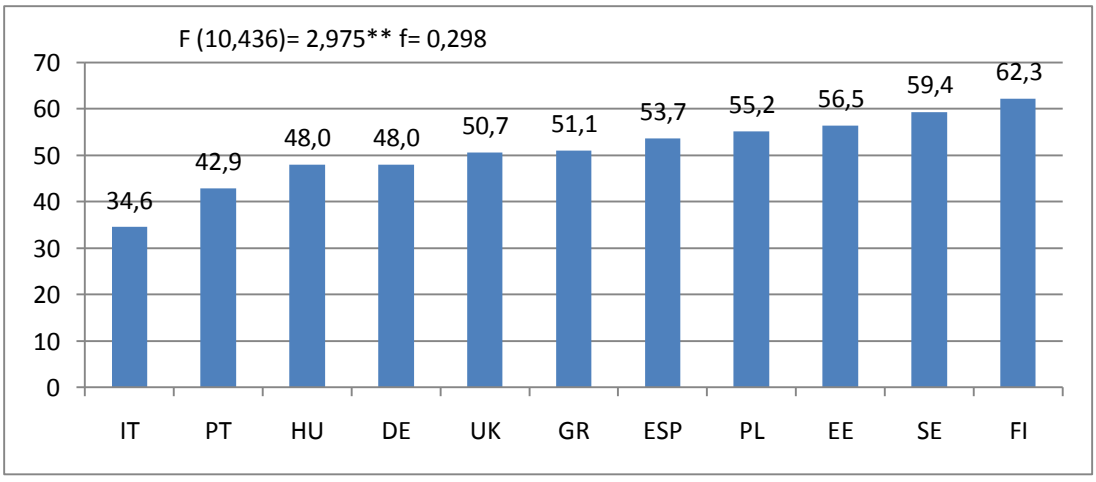
The share of female students has also not been calculated for providers that did report zero students over the past 12 month (n=347). There are no visible gender differences. Percentage of female students is almost perfectly normally distributed around a mean of 50,3% and a standard error of 24,0. Thus, 68 of all cases report a share of female students within the range of 25 to 75%.

Figure 8: Women as a % of e-learning students per provider over the past 12 months



The share of female students differs significantly between countries.

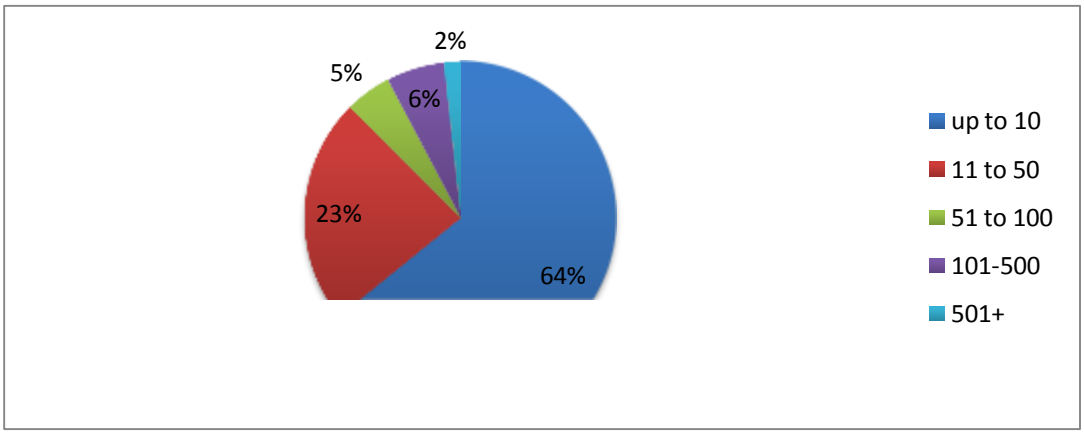
Figure 9: Share of female students: country means



3.4 E-learning packages

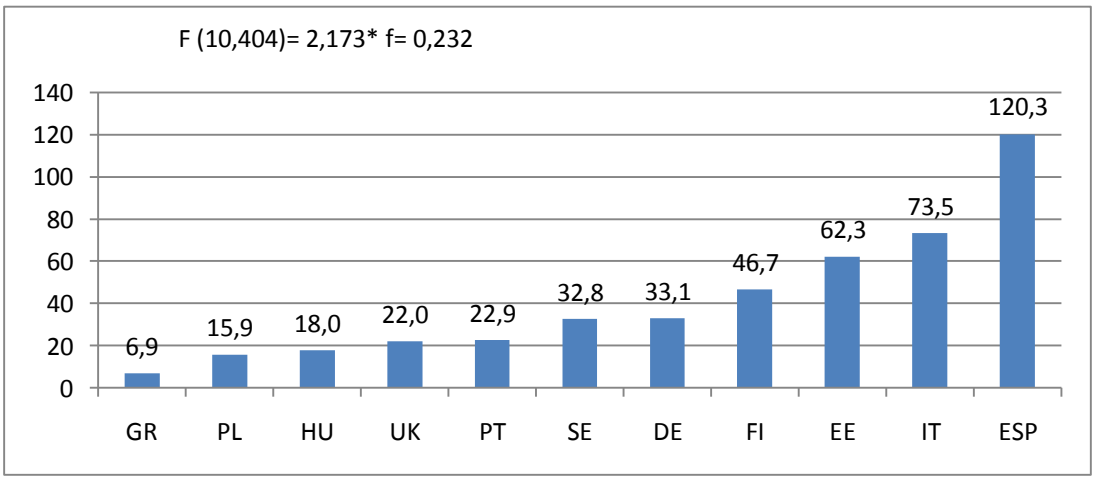
For this analysis cases have been excluded that did not yet start e-learning provision (Question 8) (n= 414). The number of e-learning packages range from 0 to 1500 with a mean of 40,5 and median of 6. The standard deviation is 129,1. Again a small number of very large providers have a strong impact on the average.

Figure 10: Number of e-learning packages currently offered



The reported number of e-learning packages offered differs significantly between countries. The causes for such huge differences are unclear.

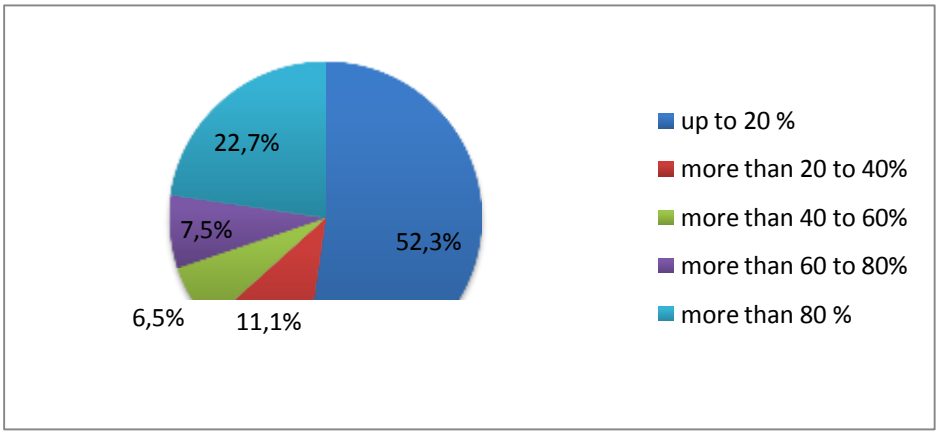
Figure 11: Number of e-learning packages currently offered: country means



3.5 Proportion of e-learning outputs

For this analysis cases have been excluded that did not yet start e-learning provision (Question 8) (n=415). About a quarter (22,7%) of all providers than offered e-learning courses in the last 12 month can be considered as **specialised e-learning providers**, while for more than the half of all training providers e-learning is rather an add-on. A further quarter has a mixed profile.

Figure 12: Proportion of e-learning courses within total output



Specialised e-learning providers show certain, distinctive characteristics:

- They are more commonly private businesses or NGOs
- They are significantly smaller than other providers (with regard to the number of teachers employed.
- Yet, they reach out for similar number of students. The student per teacher ratio is the highest (about 75).

Table 1: Share of e-learning courses by type of organisation

Type of Organisation	share of e-learning courses			Total
	Up to 20%	21% - 80%	More than 80%	
Public	46	10	8	64
Commercial	102	57	61	220
NGO	29	17	12	58
Others	33	11	8	52
Total	210	95	89	394

$\chi 2 = 17{,}043$; df=6; sig. = 0,009 C=0,204, w=0,208

Figure 13: Number of teachers (mean)

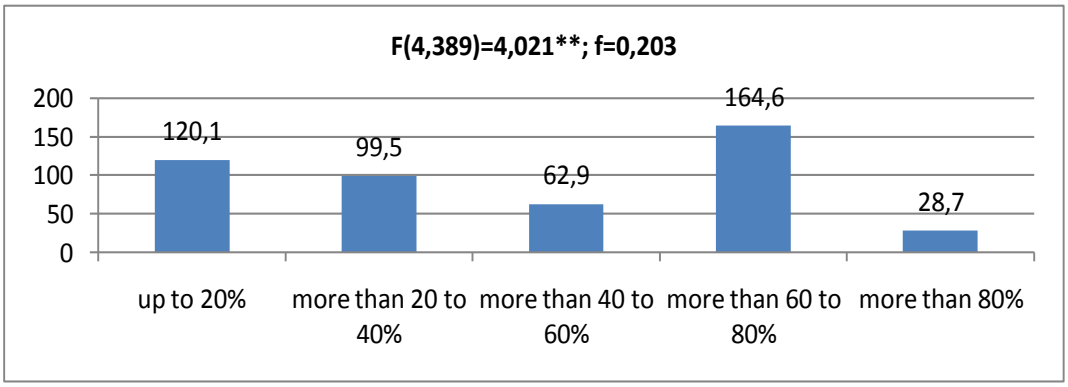
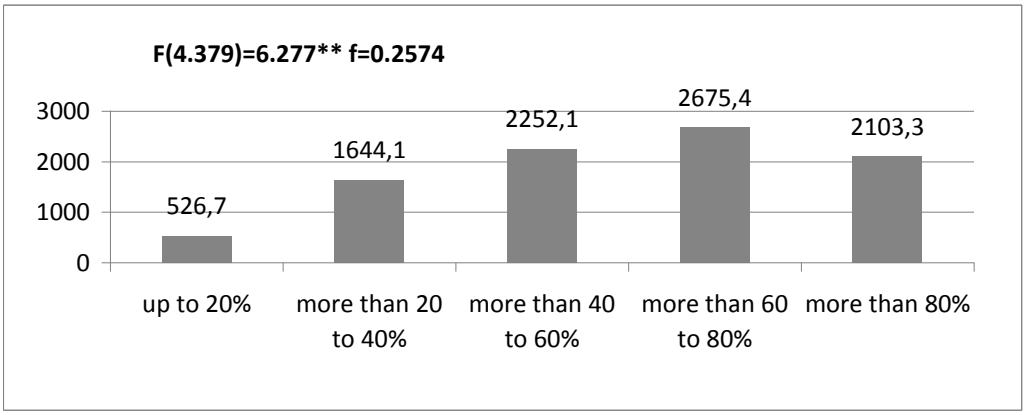


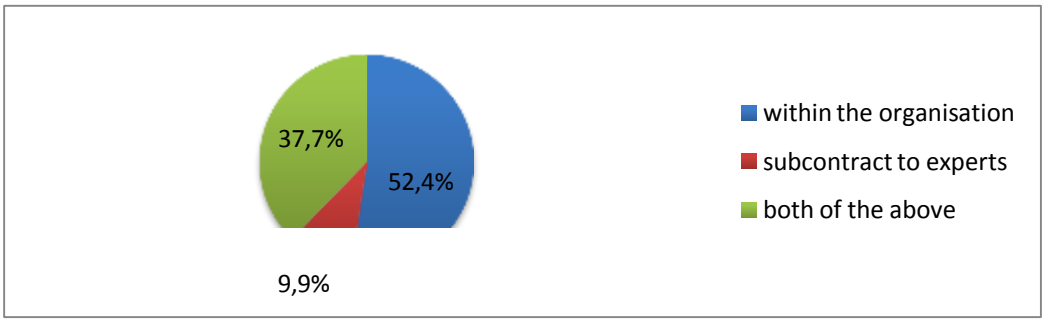
Figure 14: Number of e-learning students (mean)



3.6 E-learning development

Regarding the way providers developed e-learning content (Q9), only 9,9% of providers outsourced fully e-learning content development of, whilst 52,4 % developed e-learning content in house and the rest combined outsourcing and in house content development (n= 424).

Figure 15: Development of e-learning content



There are no significant correlations between type or size of organisation and the development of e-learning content.

In order to analyse interdependencies between variables correlation analysis has been applied for structural parameters of training providers. The full table of correlations is included in the Annex (Table 2). The analysis suggests the following:

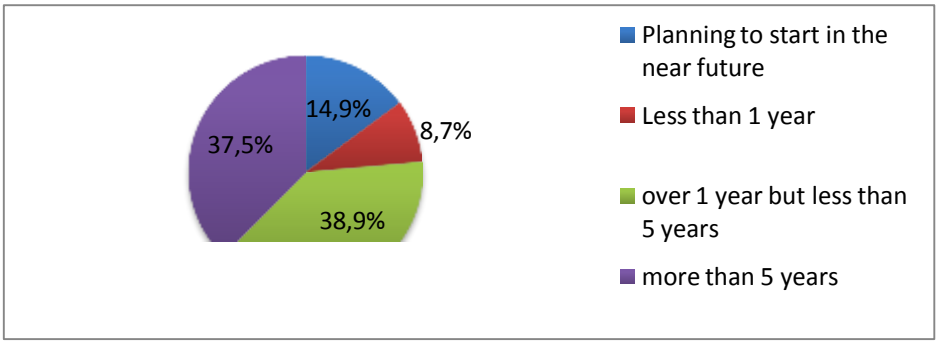
- Public sector providers tend to employ more teachers and a higher share of e-learning teachers.
- Commercial providers in the sample tend to employ a smaller number of teachers end are less likely to provide e-learning for five or more years. However, they are likely to have more e-learning students, while the share of female students is negatively correlated with this group of businesses.
- NGOs tend to have less e-learning students, but a higher share of female students.

- Being in the e-learning business for five or more years is positively correlated with the number of teachers employed, the number of e-learning students and the number of e-learning packages offered.

3.7 Provider e-learning specialization and market presence

Provider **presence in the e-learning market** (Q8) was measured by the number of years the provider offered e-learning courses (n=530). About 61% of the providers have been offering e-learning courses for no more than five years or planning to offer in the case of one provider. Only 38,9% of providers have been active in e-learning for more than five years.

Figure 16: Years of e-learning provision

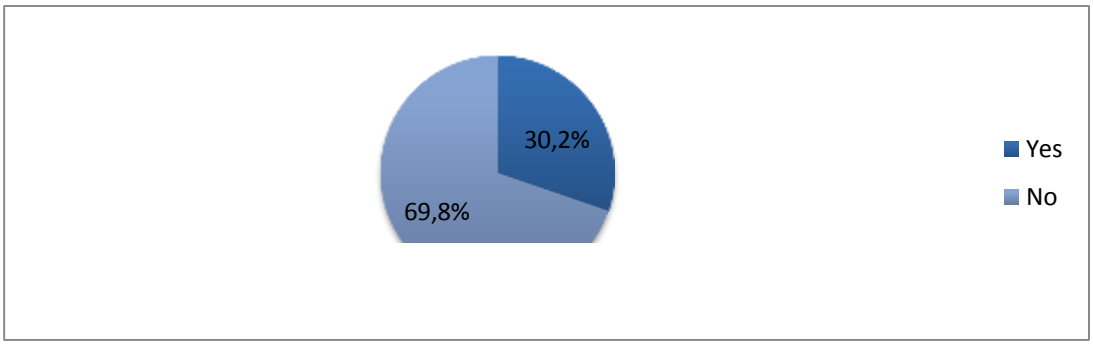


4. Provider market: rural orientation, client priorities, sources of funding

4.1 Rural orientation client priorities, sources of funding

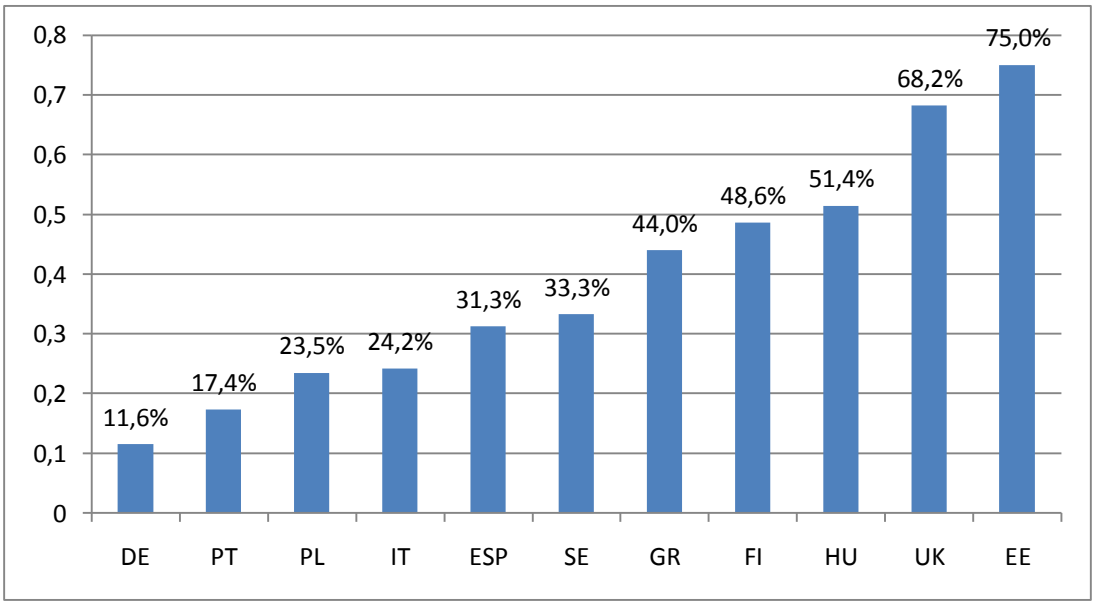
The rural orientation of providers was measured by asking providers whether they offer special e-learning packages for rural areas (Q7). Less than one third (30,2%) of the providers stated that they offer such e-learning packages; the rest would work in rural areas but offer standard e-learning packages.

Figure 17: Special packages for rural areas



Rural orientation of e-learning providers differs strongly between countries However, the two highest values have to be treated with care, since the samples in the UK and Estonia have been very small and thus a biased (self-) selection is possible, and rural orientation might be over represented. However, differences between countries with comparatively large samples (Germany, Hungary, Finland) suggest that differences are over all valid.

Figure 18: E-learning packages for rural areas per country (%)

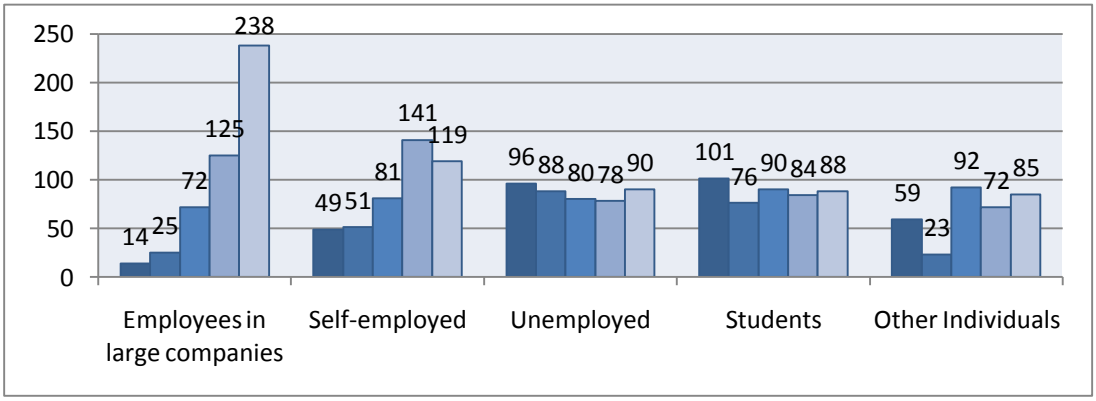


There is no clear evidence for any correlation of a rural orientation with any of the structural parameters described above.

4.2 Client orientation

Most providers in the sample prioritise employees of large companies highly while other user groups are ranked comparatively evenly. The "rural orientation" of providers is reflected in the client target group. Providers that offer special e-learning packages for rural areas significantly more often prioritise the self-employed (r=0,164**), the unemployed (r=0,148**), students (r=0,134**) as well as other groups (r=0,160). Thus, the focus of those providers appears to be broader. However, the overall effects are small.

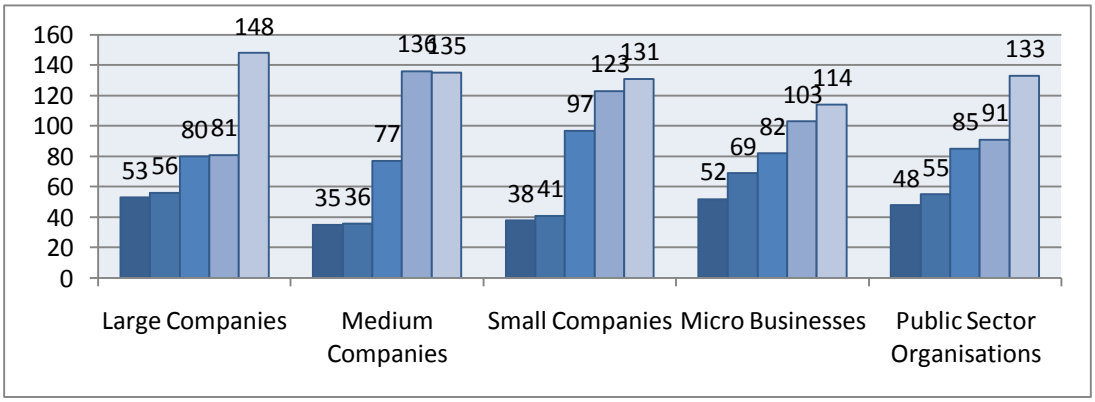
Figure 19: Provider client priorities: individuals



The client orientation with regard to the types of organisations is more evenly distributed, although there is a clear indication that larger organisations (Large and medium companies, public sector organisations) generally receive a higher priority than small and micro businesses. Again the rural orientation is reflected in the prioritisation. Providers that offer

special e-learning packages for rural areas significantly more often prioritise small (r=0,201**) and micro businesses (r=0,267**).

Figure 20: Provider client priorities: organizations

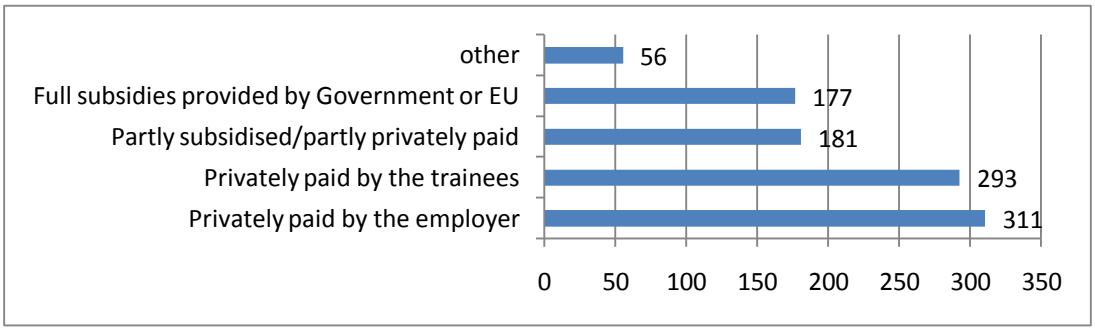


4.3 Funding

The providers have been asked to indicate sources of funding for e-learning courses. The providers could select multiple options. On average the providers opted for about two options (mean=1,988). If only single source of funding is reported all sources are mentioned evenly. If a combination of two sources exists private sources of funding (employer and/or trainee) are most common (r=0,337**).

Rural orientation is weakly positively correlated with the choice of funding. Fully subsidised e-learning courses are reported more often for providers that offer special packages for rural areas (r= 0,135**).

Figure 21: Funding of e-learning courses

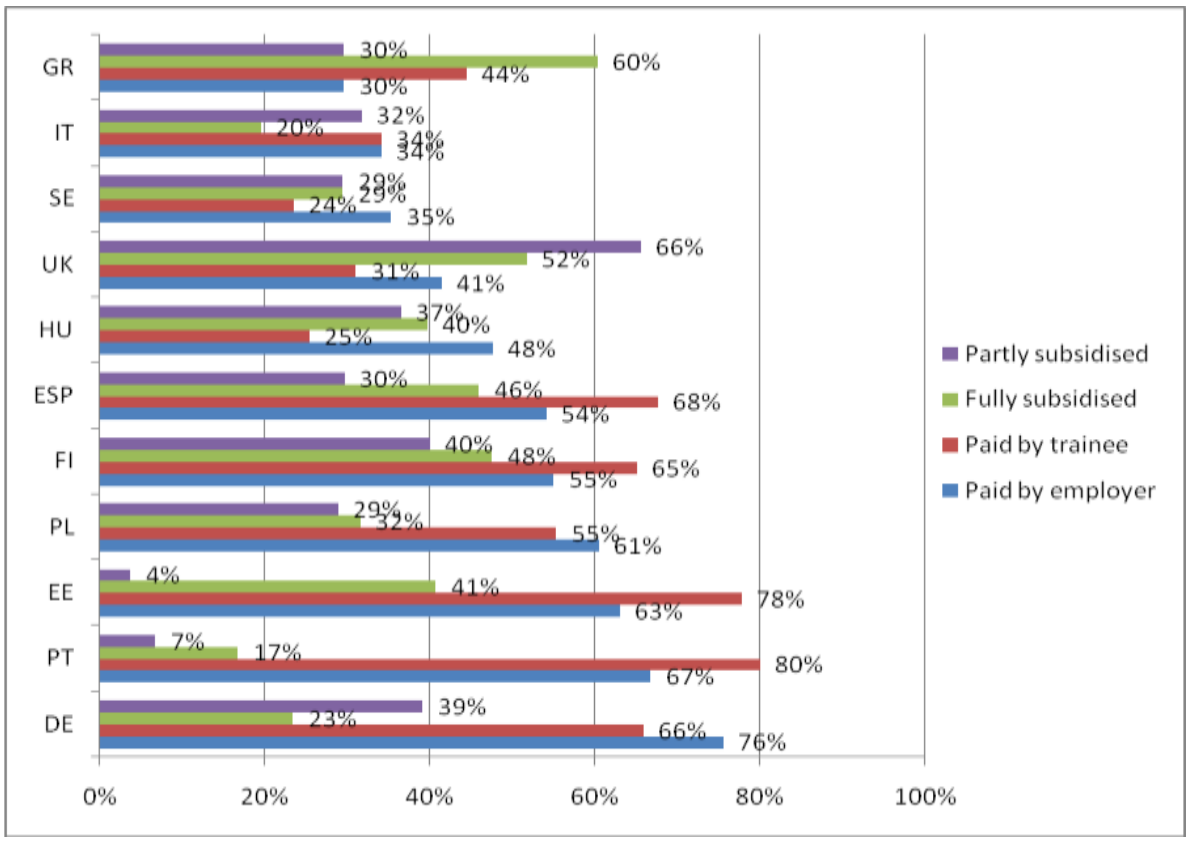


The use of individual funding sources differs significantly between countries. The largest difference can be observed for the item “private payments by the trainee” (χ^2= 70,074 (df=10), C=0,341, w=0,362). All other funding sources show similar medium effects with effect sizes ranging from w=0,267 (partly subsidised) to w=0,315 (paid by the employer).

However, the combination of funding sources shows three basic patterns. In Germany, Portugal, Estonia, Poland, Finland and Spain private funding sources are dominant, while in

the United Kingdom and Greece fully or partly subsidised training seems to dominate. In the remaining countries funding sources are more evenly used.

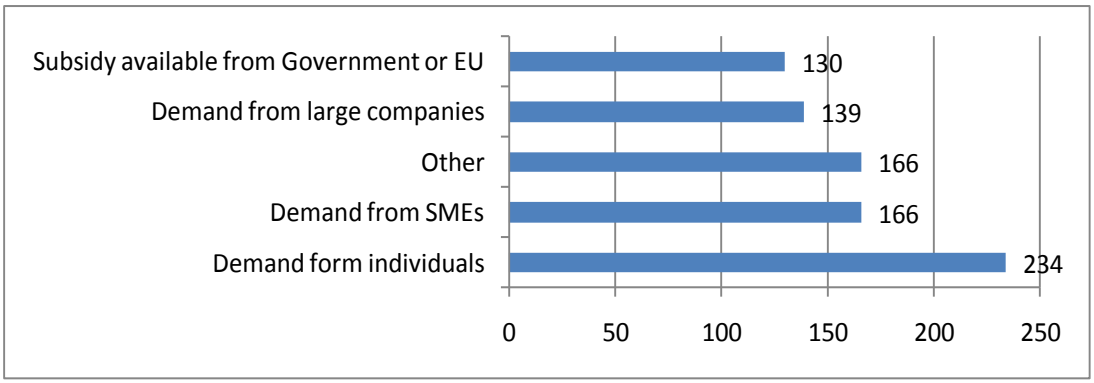
Figure 22: Funding of e-learning courses by country



4.4 Motivation

Providers have been asked for their motivation to start providing e-learning. The most important motivation is “demand by individuals”. In the category others providers regularly referred to competitiveness, strategic choices, market opportunities and interest in new technologies as other important motivations. Rural orientation again is again correlated with the motivations. Providers that offer special e-learning packages for rural areas report significantly more often “demand from individuals” as the as the main causes. Again the effect (r=0,134**) is weak.

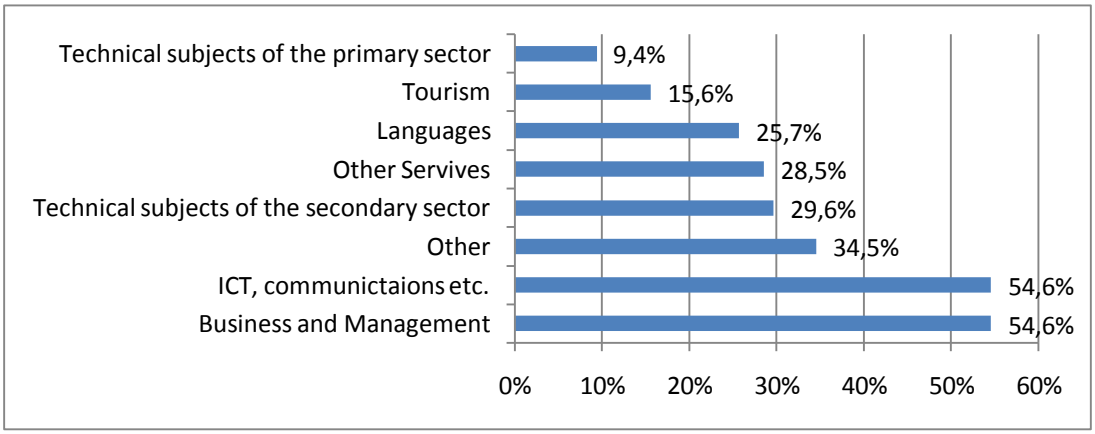
Figure 23: Motivation to start providing e-learning



4.5 Subjects offered

There is clear dominance of general subjects such as Business & Management as well as ICT and similar topics in the field e-learning. Technical subjects of primary sector and tourism as typical activities in rural areas are only offered by 9,4 % and 15,6% respectively of all providers. However, this reflects the overall significance of these economic activities. Providers that overall special packages for rural areas do not differ with regard to subjects offered, except those two specifically rural activities. These providers represent 28 of 50 providers that offer technical subjects for the primary sector and almost 50% of providers that offer courses for tourism, despite the fact that they represent less than a third (30,2%) of the sample.

Figure 24: Subjects offered

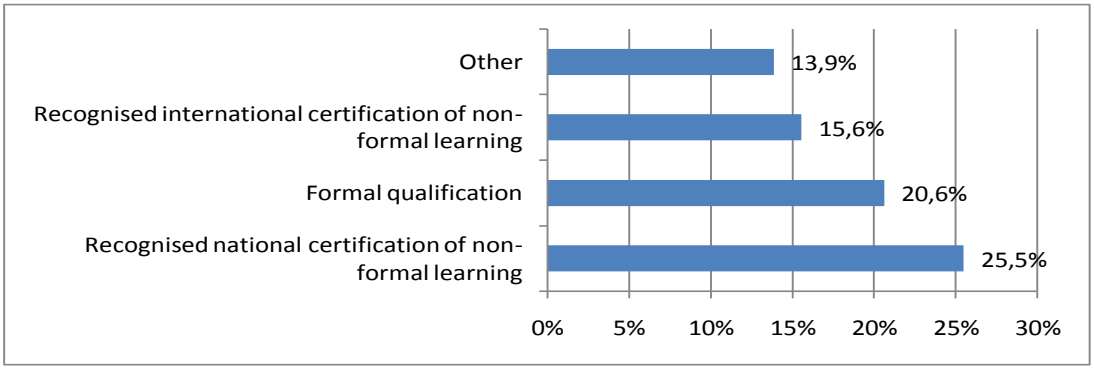


4.6 Qualifications/certificates

Almost all e-learning providers offer at least one type of certification. However, only 20.6% reported that they offer a formal qualification. Providers that grant a formal qualification, or a nationally or internationally recognised certification, usually also offer their own certification. The vast majority of providers (61.1%) offer only one kind of qualification. This is in more than two-thirds of cases (69.2%) the provider's own certification and in a further 14% of cases another non-formally recognised qualification.

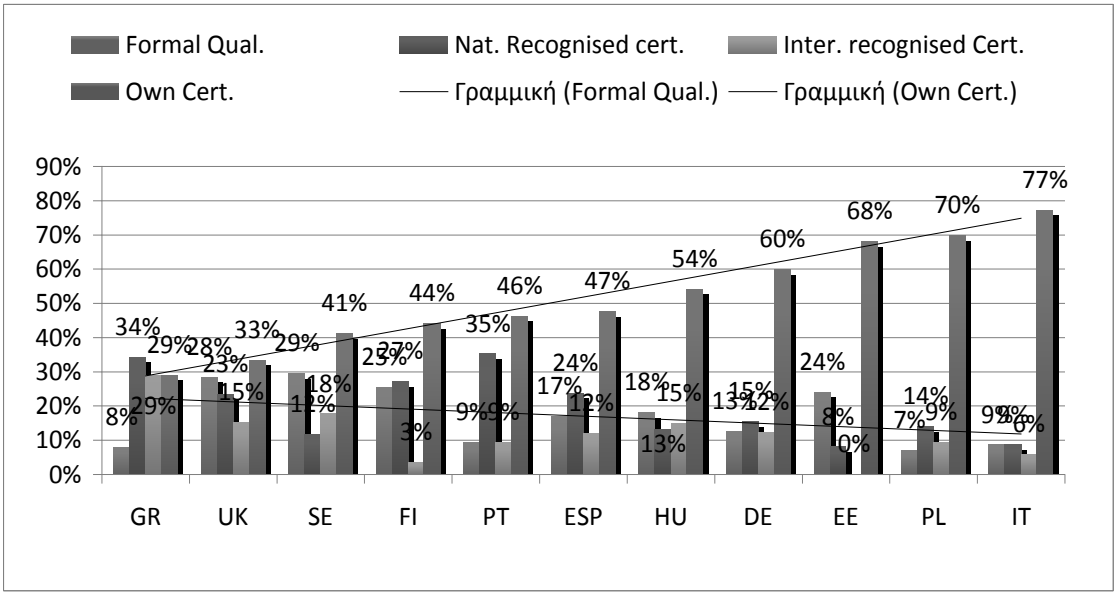
Providers that offer special packages for rural areas are significantly more likely to grant formal qualifications or officially recognised certificates. However, the effects are weak (r=0.109* respectively 0.105* and 0.093*). No correlations between the type and size of a provider and the nature of qualifications offered have been detected.

Figure 25: Qualifications offered



Qualifications and certifications offered by e-learning providers differ significantly between countries. The following diagram shows a strong counter trend of, on the one hand, an increasing share of provider that offer own certifications and, on the other hand, an decreasing share of providers that offer formal qualifications (r= - 0,352*).

Figure 26: Qualifications offered by country

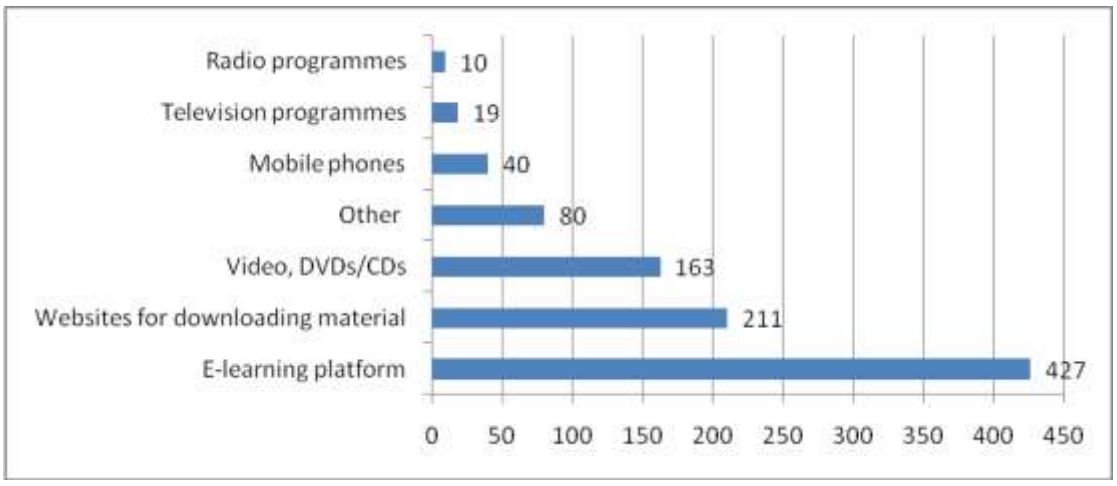


5 E-learning delivery methods, tools, pedagogies

5.1 Delivery methods

In this section 509 cases are included for which the answer of Q8 (years of e-learning provision) is *not* «planning to start in the future». There are 8 missing cases. The 501 remaining cases selected about two delivery methods each (ø = 1,86).

Figure 27: Delivery methods



Other delivery methods mentioned are Videoconferences/Skype/virtual classrooms and Webinars. Also MP3-file, Emails and WebTV are mentioned.

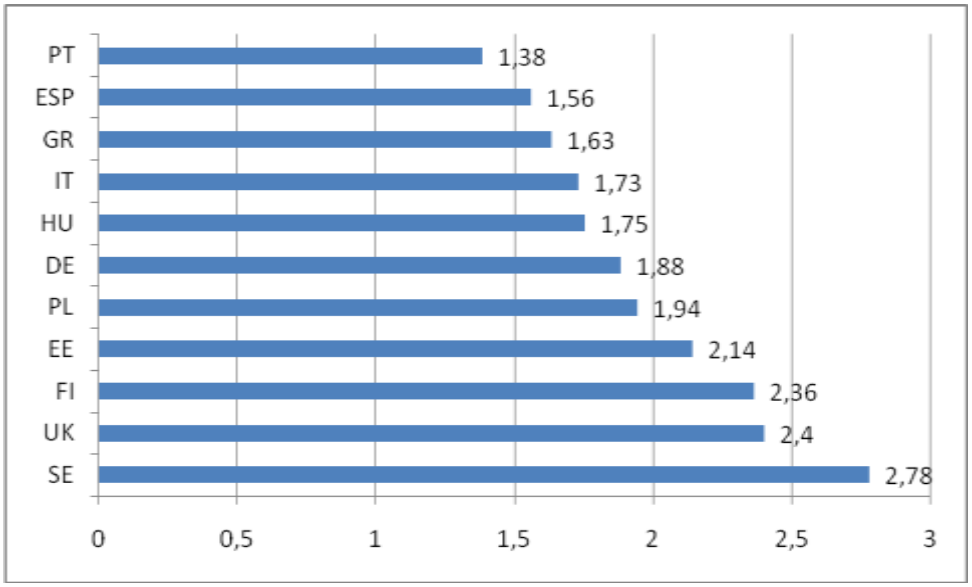
Almost half of the providers (44,9 %) use only 1 delivery method. This is usually a webpage or an e-learning platform. A small number of providers use Videos/DVDs or CDs as the only delivery method. Where more delivery methods are used other delivery methods are added successively. The order of appearance is mobile phones, television programmes, and radio programmes.

	E-learning platform	Websites for downloading material	Video DVDs/CDs	Television programmes	Radio programmes	Mobile phones	Other	total
Count	193	21	4	**0**	**0**	**0**	24	**242**
Row %	79,8%	8,7%	1,7%	,0%	,0%	,0%	9,9%	
Count	109	76	50	**0**	**0**	6	15	**128**
Row %	85,2%	59,4%	39,1%	,0%	,0%	4,7%	11,7%	
Count	87	79	72	3	**0**	11	27	**93**
Row %	93,5%	84,9%	77,4%	3,2%	,0%	11,8%	29,0%	
Count	23	20	22	5	1	12	9	**23**
Row %	100,0%	87,0%	95,7%	21,7%	4,3%	52,2%	39,1%	
Count	9	9	9	5	3	5	5	**9**
Row %	100,0%	100,0%	100,0%	55,6%	33,3%	55,6%	55,6%	
Count	6	6	6	6	6	6	0	**6**
Row %	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	,0%	
Total	**427**	**211**	**163**	**19**	**10**	**40**	**80**	**501**

*Percentages and counts are based on the number of cases.

There are considerable differences between countries with regard to the number of delivery methods applied. Despite the fact that variances in the countries are high and that the number of cases for some countries is small an analysis of variance (ANOVA) produces significant results (F =4,111, df=10). The results suggest that the means in Greece, Spain and Portugal are different from (lower than) those of other countries.

Figure 28: Mean number of delivery methods



In the following three countries (SE; UK; FI) are grouped in Country Group 1 and three countries (GR, ESP, PT) are grouped in Country Group 3. The remaining countries are grouped into Country Group 2.

It can be shown that the use of delivery methods is dependent on the experience of the provider, the size of the provider (number of students and/or teachers) and most importantly by the provider's country.

Stepwise logistic regressions (based on the Wald Test criteria) have been applied to analyse effects of selected variables on the use of less common delivery methods. In the following a logistic Regression on the use of DVD/CD/Video as delivery method is presented. The stepwise procedure has excluded most variables, but three variables remain in the final solution. The model is statistically significant, but pseudo R^2 parameters indicate a moderate effect (e.g. Nagelkerkes R^2 = 0,076).

Table 2: Logistic Regression: DVD/CD/Videos used as delivery method

Variable	Regression coefficient B	Std. error	Wald	df	Sig.	Exp(B)
years5andmore	,391	,234	2,795	1	,095	1,478
Number of e-learning students	,000042	,000	3,598	1	,058	1,00004
Country Group 3	-,981	,315	9,717	1	,002	,375
const	-,851	,153	30,934	1	,000	,427

A logistic regression is used for prediction of the probability of occurrence of an event. In fthis case the probability that DVD/CD/Videos are used as delivery method. The last table column (exp(B)) represents the odds of a variable. Thus, Exp(B)=1 means a 50% chance to

The results suggest the following:

1. The constant term signifies the probability of the use of DVD/CD/videos as a delivery method with regard to a reference situation. The reference are (fictive) providers that are *not* in Country Group 3 (GR, ESP, PT), that do offer e-learning courses for less than five years and which have zero e-learning students. In this case the estimated probability is about 30% that DVD/CD/videos are used as delivery methods. (The odds ratio is 0,427/1).
2. Training providers, that offer e-learning courses for five,or more years have a 60% higher likelihood of using DVD/CD/videos as delivery methods.
3. Per 1000 e-learning students the odds ratio increases only slightly to 1.043. That is an increase in probability of 1%.
4. If a business is located in a country of Country Group 3, the probability that DVD/CD/videos are used as delivery methods decreases to 13.8 %.

Table 3: Logistic Regression TV/Radio used as delivery methods

LogReg Radio Programmes	Regression coefficient B	Std. error	Wald	df	Sig.	Exp(B)
Country Group 1	2,811	,829	11,508	1	,001	16,627
const	-5,097	,709	51,639	1	,000	,006
LogRegTV Programmes	Regression coefficient B	Std. error	Wald	df	Sig.	Exp(B)
Percentage of e-teachers	,000	,000	7,762	1	,005	1,000
Country Group 1	2,582	,622	17,248	1	,000	13,220
const	-4,439	,511	75,570	1	,000	,012

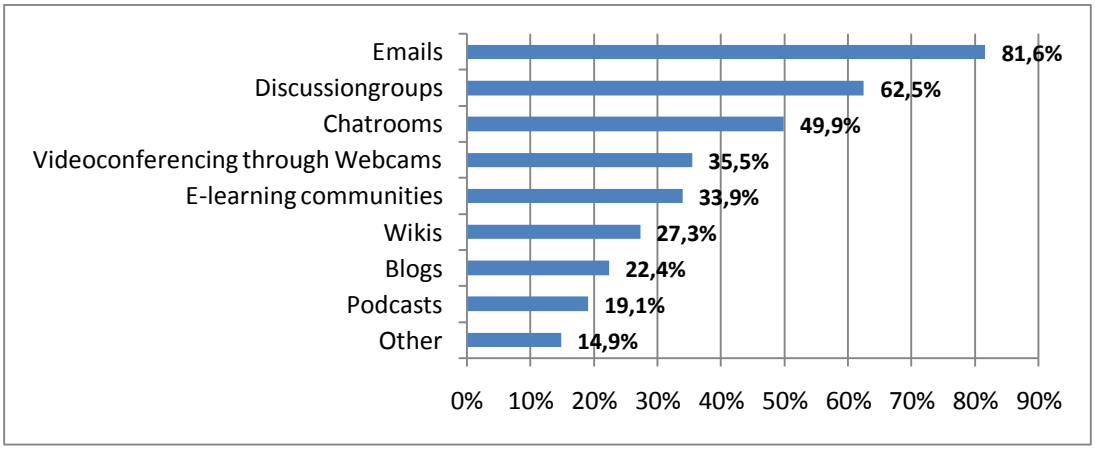
The same procedure has been applied to analyse the usage of TV or Radio programmes as delivery methods. The results suggest that both delivery methods are almost exclusively used in countries of Country Group 1 (SW, UK, FI).

It is noteworthy that the Finish report describes TV and Radio as "traditional" approaches of distance learning provision. This allows for two possible conclusions. The breadth of delivery methods reflects on the one hand the national traditions of distance learning and/or, on the other hand, the continuity of the actors in this field.

5.2 Tools

In this section cases are included for which the answer of Q 8 (years of e-learning provision) is *not* «planning to start in the future». The remaining 451 cases selected on average between 3 and 4 (3,6) technical tools (sd=1,958). The most common tools applied are emails, discussion groups and chat rooms.

Figure 29: Tools



The total number of selected items for this question can be considered as test scale for the technical standards of the training provider. The reliability of this scale (Cronbach's alpha) is α = 0,669, which is not good. The test scale improves, when two items (E-mails, Others) are dropped. After this the reliability is acceptable (α = 0,717). This test scale is used in the following.

It can be shown that the use of technical tools is dependent on the experience of the provider, the number of e-learning packages offered and the provider's country. The size or type of organisation is *not* relevant for the choices of technologies. To identify causalities that explain the *technical standard* of e-learning training providers a stepwise linear regression has been applied. The selection procedure is the change of R^2. The following model has been identified as the most suitable (Dependent variable Q17_010Sum2):

Table 4: Regression on Test Scale "Technical Standard"

Coefficients	Regressions coefficient B	Standard error	Beta	T	Sig.
Constant term	1,628	,283		5,777	,000
years5andmore	1,024	,321	,263	3,185	,002
years_1t05	,546	,316	,141	1,730	,084
E-learning packages offered (1000)	2,272	,726	,152	3,130	,002
country group 3	,555	,230	,115	2,410	,016

ANOVA	RSS	df	MSS	F	Sig.
Regression	125,454	4	31,613	9,162	,000
Non standardised Residuals	1414,718	410	3,451		
Total	1541,171	414			

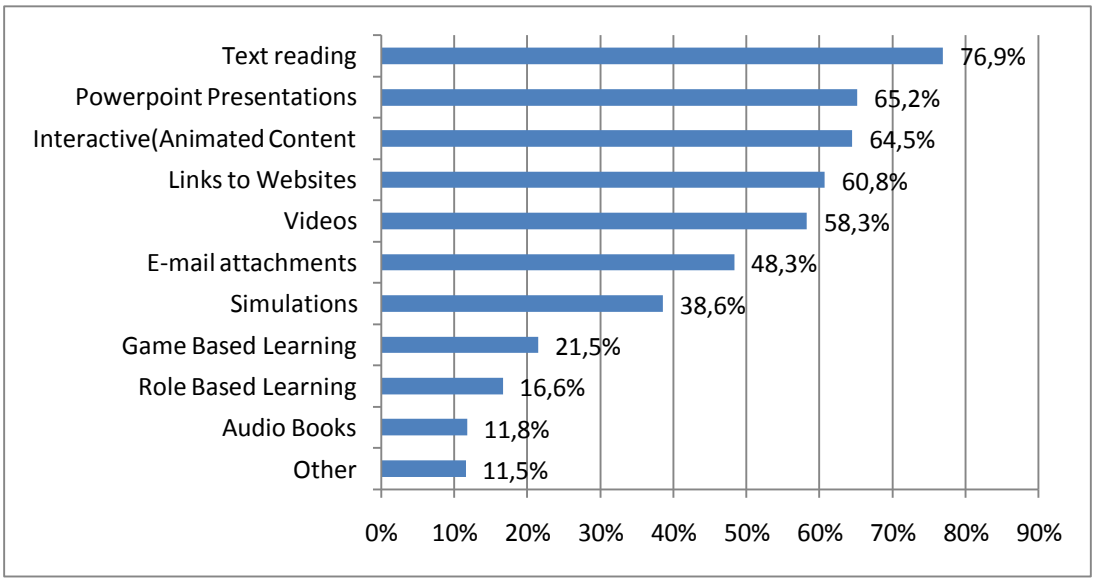
Three variables are included in model (number of years of e-learning provision, number of e-learning packages offered and percentage of e-teaching). The overall effect of these variables on the *technical standard* scale is medium to small (R^2 = 0,082; f^2= 0,089), and the model is highly significant. The regressions coefficients suggest the following:

1. The constant term suggests that about 1,63 items are scored generally.
2. If the provider offers e-learning courses for five or more years the score increases on average by 1,024 (in comparison to providers that started e-learning courses during the last year). If the training provider offers e-learning courses between one and five the score increases only by 0,546.
3. If the number of e-learning packages is 1000 the score increases by 2,272.
4. If the country is in the Country Group 3 (GR, PT, ESP) the sore increases by 0,555.

5.3 Pedagogical methods

In this section 451 cases are included for which the answer of Q 8 (years of e-learning provision) is NOT «planning to start in the future». The total number of answers to all items is 2387. Thus, on average each provider has selected 4,8 out of 11 items.

Figure 30: Pedagogical methods



An exploratory factor analysis (principal axis analysis, oblimin rotation) has been applied to test, if the items describe one latent variable. The factor analysis (FA) suggests that the items load on **more** than one factor.

Table 5: Results of Exploratory Factor Analysis of Pedagogical Methods

Muster matrix	Factor*	
Item	1	2
Text reading		,450
Powerpoint presentations		,546
Games Based Learning	,587	
Interactive/ Animated Contents	,478	
Simulations	,606	
Videos	,488	
Audio Books	,382	
Links to Websites		,556
E-mail attachments		,467
Roles Based Learning	,531	
Other		

*only factor loadings >0,3 are presented in the table.

The parameters in the table – the so-called factor loadings – suggest that “text reading”, “PowerPoint presentations”, “links to websites” and “e-mail attachments” are positively correlated. Thus, they can be combined to a common “factor”. The same applies to the other group of tools in the list. The two factors can be interpreted as “use of advanced methods” (factor 1) and “use of simple methods” (factor 2).

Based on this analysis a test score for factor 1 has been generated by applying a principal component analysis. The factor score is standardised with amean value of 0. Finally a stepwise linear regression on the test scores (factor values) has been applied. The following model provides the best results:

Table 6: Linear Regression on Test Scale "Advanced Pedagogical Methods"

Coefficients	Regression coefficient B	Std. Error	Beta	T	Sig.
(const)	-,394	,083		-4,738	,000
years5andmore	,270	,099	,135	2,717	,007
Commercial	,243	,096	,123	2,545	,011
Number of eLearning students (1000)	0,055	,016	,179	3,499	,001
Number of e-learning packages offered (1000)	1,521	,407	,188	3,740	,000

a. Dependent Variable «REGR factor score 1 for analysis 1»

The model is significant (F= 16,374, df=4), and the variables have a medium joint effect (R^2=0,145, f^2=0,169). The negative constant term suggests a reference situation[2], in which only little use is made of advanced e-learning methods. Thus, all other variables increase the factor. The coefficients suggest:

- E-Learning providers that offer e-learning courses for five or more years use significantly more advanced e-learning methods than other providers.
- Commercial providers use advance methods more often than public or non-governmental training providers.
- The size of e-learning activities and the number of students have a positive effect on the methods applied.

6 Problems and requirements for success

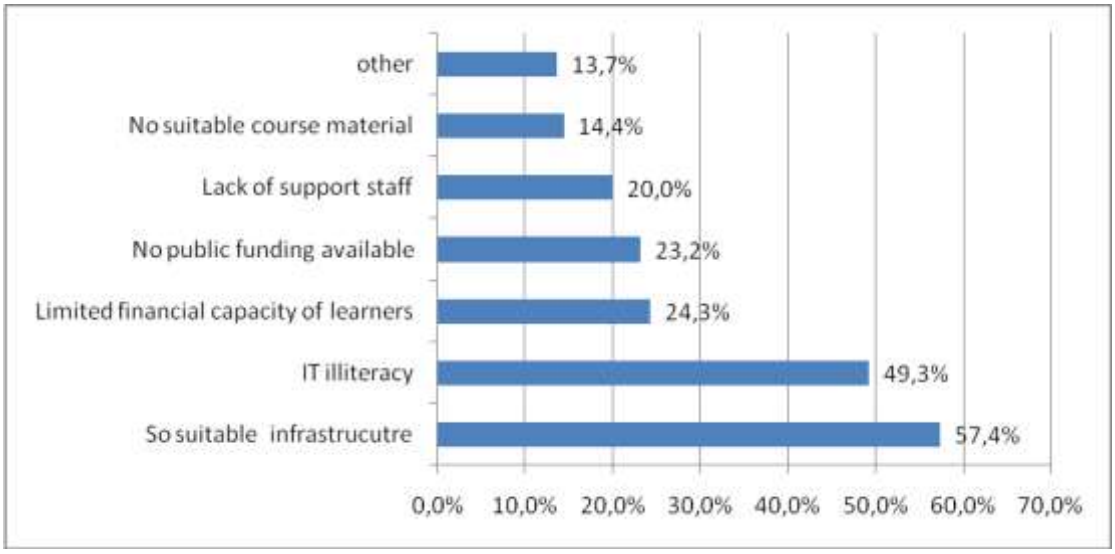
Providers were asked about the main problems associated with e-learning especially in rural areas, their expectations from students, and the factors necessary for successful delivery of e-learning.

6.1 Problems associated with e-learning in rural areas

According to the following diagram infrastructure remains the main problem for e-learning in rural areas. However, there are large national differences in the response to this question. The national share of a “Yes” answer to this item ranges between 29,4 % (Sweden) and 87,8% (Italy).

[2] The reference situation describes a hypothetical situation, in which the experience of e-learning provision is less than 5 year, the provider is either an NGO or a public sector organization, and the number of e-learning packages, students and teachers is zero.

Figure 31: Problems associated with e-learning in rural areas

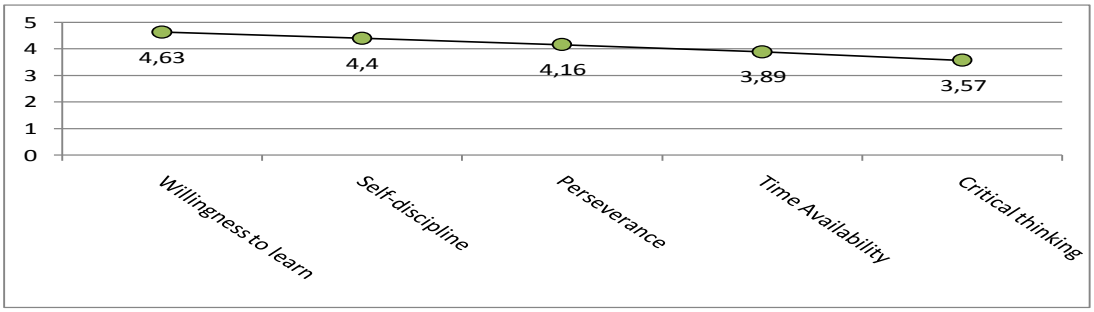


On average all providers have ticked about 2 items. There are almost no positive correlations between items. A weak positive correlation (r=0,165) exists between the items "No suitable infrastructure" and "IT illiteracy".[3] Interestingly the item "Other" is negatively correlated to five of the other six items. The strongest negative correlation is to the item "No suitable infrastructure". This indicates that the answer "other" contains additional, alternative aspects, which are not covered in the proposed items. The text analysis of the additional open questions for the item "other" reveals issues such as "lack of acceptance"," lack of knowledge about the technology" and also doubt about the distinctive advantage of e-learning in comparison to 'traditional' learning approaches. In sum, while the proposed items mainly address structural parameters, the item "other" often refers to subjective parameters/attitudes.

6.2 Expectations from students

Providers' expectations from students (Q25) were tapped by asking providers to rate the importance of 5 qualities that students are expected to possess in order to complete successfully an e-learning course. Mean values are reported in the following diagram. According to this all items are considered of medium (critical thinking) to great importance.

Figure 32: Provider expectations from students



[3] For two binary variables it is possible to calculate the correlation coefficient π, which is identical to Pearson's r.

Mean values of all items differ significantly between countries.[4] For instance, national average ratings for the item "self discipline" range from 3,69 (Hungary) to 4,89 (Estonia). Also, average ratings for the item "time availability" range form 2,93 (Poland) to 4,29 (Finland). Mean values of the item "Willingness to learn" differ significantly, when data is grouped according to "rural orientation" (Q7) and "years of e-learning provision" (Q8). Providers that offer special packages for rural areas rate this item slightly higher. There is also a significant linear trend for this item with regard to years of e-learning provision. The longer the experience the higher the providers rate this item.

Size parameters of providers do not seem to have much of an effect on these items. A small negative correlation between the number of e-learning students and the items "self-discipline" (r=-0,12*) and "perseverance" (r=-0.165**) exists. While the effect of the number of e-learning students remains in a multiple regression, the effect of the rural orientation vanishes.

Table 7: Linear Regression on item „self-discipline"

Model		None (??) stand. Coeff.		Standardised coefficient	T	Sig.
		b	Std. error	β		
1	(const)	4,226	,122		34,556	,000
	Q10_1000[a]	-,030	,011	-,123	-2,834	,005
	Greece	,356	,188	,102	1,894	,059
	Germany	,304	,133	,191	2,287	,023
	Hungary	-,554	,153	-,236	-3,612	,000
	Poland	,268	,164	,098	1,631	,104
	United Kingdom	,298	,180	,093	1,660	,098
	Portugal	,507	,175	,166	2,895	,004
	Estonia	,768	,183	,230	4,188	,000
	Finland	,207	,168	,073	1,234	,218
	Sweden	-,065	,229	-,014	-,283	,777
	Spain	,454	,165	,164	2,755	,006
R^2 = 0,199, F(11,443)=10,001***; f^2 = 0,248. Italy is reference. a. Number of students/1000						

The hypothetical reference situation for linear regression in Table 8 is a provider in Italy with zero students. The estimate for such a provider is a rating of 4.226 (constant) for the item "Self-discipline". For every 1,000 students the rating would decline by 0.3. If the provider is located in another country the ratings would increase (decrease in the case of Hungary) according to the coefficients in column 2. Only for Sweden and Finland might there be no differences, since the estimated coefficients do not depart significantly from zero.

The multivariate regression on the item "Willingness to learn" confirms the univariate analysis except for the rural orientation. The model which shows the best results takes a group of countries as the reference with less than fivey ears of e-learning provision experience and hypothetically zero teachers. Per 100 teachers the rating decreases by 0.023,

[4] To analyse mean differences one way ANOVA has been applied.

while it increases for businesses with five or more years of e-learning provision by 0.156. National variations are also possible for the countries listed in the table.

Table 8: Linear Regression on item „Willingness to learn“

Model		None Stand. Coefficient		Standardised Coefficient	T	Sig.
		b	Std. error	β		
1	(const)	4,579	,040		114,099	,000
	years5andmore	,156	,056	,124	2,787	,006
	Q05_100[a]	-,023	,013	-,076	-1,708	,088
	Greece	,324	,121	,118	2,674	,008
	Poland	-,205	,102	-,089	-2,017	,044
	Portugal	,238	,115	,091	2,071	,039
	Estonia	,268	,120	,099	2,239	,026
	Finland	,205	,101	,090	2,038	,042
	Spain	-,466	,104	-,200	-4,493	,000
R^2 = 0,100 , F(8,480)=6,658***; f^2 = 0,111					a. Number of teachers/100	

The multiple regression model on the item “Perseverance” looks more simple, since only two countries depart significantly from the average. Again, an effect of the number of e-learning students is confirmed, while the rural orientation is dropped.

Table 9: Linear regression on the item „perseverance“

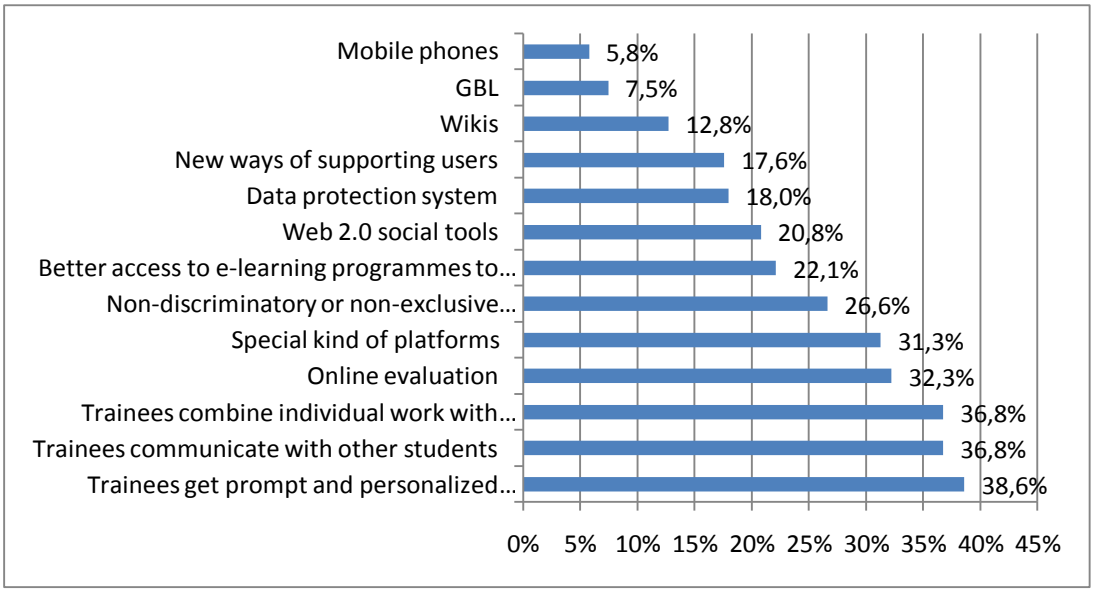
Model		None stand. Coeff.		Standardised coefficient	T	Sig.
		b	Std. error	β		
1	(Const.)	4,312	,043		99,262	,000
	Hungary	-,288	,115	-,111	-2,495	,013
	Italy	-1,006	,147	-,307	-6,860	,000
	Q10_1000	-,038		-,138	-3,104	,002
R^2 = 0,126 , F(3,447)=21,460***; f^2 = 0,144						

7 Provider perceptions of innovativeness

Providers were asked whether they offer any new e-learning courses that they would consider as innovative (Q27). Just over half (55,7%) responded positively and these were then asked to indicate in what respect they consider their e-learning courses as innovative, regarding aspects of: new e-learning tools and technologies, new e-learning pedagogical methods, access of e-learning programs to vulnerable groups, new organizational and institutional solutions, new ways of supporting users. Provider responses on aspects they consider innovative in new e-learning courses offered are presented in the table below.

It should be noted though that provider responses reflect their subjective view as to what is innovative and therefore they may not coincide with their responses as to the e-learning tools and pedagogical methods they actually use, which are reported in section v above. So for example providers may report the use of mobile phones in the e-learning courses offered but may not consider mobile phones as innovative.

Figure 33: Innovative e-learning



The diagram suggests that new pedagogical methods (e.g. evaluations, personalised response) are adapted fairly frequently, while some newer learning tools (GBL /game based learning, mobile phones, wikis) are rarely implemented.

The items in Question 27 collect different types of innovation. The use of mobile phones and game based learning is positively correlated (r=0,365**). Both items reflect a focus on **technical innovation** that is connected with e-learning specialisation. But the association is comparatively weak (w=0,124).

Table 10: Use of Game-based learning by share of e-learning

		up to 20%	more than 20 to 80	more than 80%	Total
GBL	No GBL	230	95	83	408
	GBL	17	11	16	44
Total		247	106	99	452

As one would expect, the use of these technologies is also associated with the experience of the provider measured in the number of years a business in engaged in the market. However, again the effect is weak (w=0,129). Rural orientation does not have any effect on the use of GBL.

There are a number of items which are correlated, such as the “use of wikis”, use of “Web 2.0 social tools”, “trainees communicate with other students” and “trainees combine individual work with discussion and knowledge exchange”. These items broadly reflect what one could call **pedagogical innovation** towards an approach to learning as a social practice. For these items the results are similar to the former group. The specialisation and the experience of a provider have a positive yet weak effect (w=0.147respectively w=0.125), while rural orientation does not.

Table 11: Item "Trainees communicate with other students" by share of e-learning of provider

		up to 20%	more than 20 to 80	more than 80%	Total
Trainees communicate with other students	No	132	44	36	212
	Yes	115	62	63	240
Total		247	106	99	452

The items “Non-discriminatory or non-exclusive recruitment” and “Better access to e-learning programmes to vulnerable/excluded groups” reflect a focus on **social inclusion innovation.** For these items the picture is changing quite clearly. While specialisation and experience seems to have no e fect on these items, rural orientation is positively correlated with both (r=0.168** respectively r=0.178**).

8 Conclusions

This report presented the results of an e-learning provider survey in 11 European countries. The survey was conducted during 2010 and covers over 500 individual data sets. This data set is large enough to allow for detailed statistical inference. However, conclusions have to be drawn carefully, since the sampling has been confronted with some challenges, such as difficulties to access the target community, low response and in some cases high drop-out rates. Still, the data allow for a detailed insight into current state and trajectories in e-learning provision in Europe in general, but also national specifics.

The survey has covered the profiles of e-learning training providers as well as their market orientation, subjects offered and methodologies applied. In addition, a special focus has been given on the rural orientation and the aspect of e-learning innovation.

National differences are particularly important with regard to the institutional profiles, funding of courses as well as qualifications and certifications offered. This reflects the fact that markets for continuous education and training in the EU are nationally organised and structured by heterogeneous national regulations.

There are also huge national differences with regard to the rural orientation of e-learning providers. Rural orientation has been measured by the existence of special e-learning packages offered for rural areas. Rural orientation is reflected in the provider’s target group, the subjects offered, the qualifications and certificates obtainable, and, interestingly, in a stronger interest in innovation aspects that are oriented towards social integration.

Attitudes and practices with regard to e-learning delivery methods, technical and pedagogical aspects of innovation and expectations from students show a mixed picture of influence factors. On the one hand the size of e-learning activities, years of experience with e-learning provision and the degree of specialisation in this field have a positive impact on these items. On the other hand, national differences prevail reflecting specific national cultures and traditions in the area of continuous education and training. These findings suggest that national difference will maintain strong in future, e-learning innovation continuous to spread among training providers with their growing experience in this area. However, the findings also suggest that social inclusion appears to be an area, where this rule cannot be easily applied. Thus, this area needs further attention.

Annex 1: Statistical Analysis: Some Methodological Considerations

Population parameters

It is a common yet still faulty assumption that representativeness is mainly associated with the sample size. Representativeness can only be ensured by *random sampling*. Only when the conditions of a random sampling are fully met, an increasing sample size can improve the estimate of population parameters. It is difficult to asses, which share of the population is represented in this sample. The main reason is that the population of training providers differs between countries due to differing education and vocational systems. Further, e-learning is unevenly applied in member states of the EU. Also, there are no databases from which random samples could have been drawn. Every partner has sought to overcome this constrain in a different manner based on individual partner's access to the required information. Consequently, it is very likely that the sample is biased, since the criterion of a random sampling is not sufficiently fulfilled. Drawing a conclusion from sample parameters on population parameters must be taken with care.

In principal, confidence intervals for population parameters can be estimated based on the sample parameters. Confidence intervals are approximately calculated according to the formula:

$$CI = paramete \pm 2 * \frac{standard\ deviation}{\sqrt{n}}$$ (with n = sample size)

The parameter can be a mean value or population share. In the following confidence intervals are not calculated, but mean value, standard deviation and sample size are provided for interval scaled variables. The standard deviation for a percentage is can be calculated with the following formula:

$\sigma_{\%} = \sqrt{\frac{p*(1-p)}{n}}$ with p = population share; n = sample size

Accordingly, n is provided for all tables and diagrams.

As an additional criterion the calculation of confidence intervals requires that the condition

$n*p*(1-p) \geq 9$

is fulfilled. Thus, with n= 533 confidence intervals can be estimated for population shares p≥ 1,7%.

Causalities and correlations

While the sample may not be fully representative with regard to the population of training providers, the sample still allows for the exploratory statistical inference of causal relationships and associations of sample parameters.

Tables

For the analysis of tabled, nominal data (e.g Country, Legal Form of a Provider) possibilities of statistical inference are limited. The most common statistical test for such tables is the χ^2-test. χ^2-values are difficult to interpret, since they are growing with the size of the table and the sample size. Thus, it is useful to calculate additional standardised measures. The *Contingency Coefficient C* is the most widely used measure of association in contingency tables.

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

C ranges between 0 and 1. Since C offers an easy way to calculate the effect size w (see below), it will also be calculated, when the χ^2-test is applied.

Comparison of mean values

A way to analyse the association of interval scaled data and nominal/categorical data is to compare group mean values. To test for significant differences between means an (one-way) analysis of variance (ANOVA) can be applied. Here, an F-test is used to compare the variance caused by the mean differences with the remaining variance. When an ANOVA is applied for variables with more than 2 categories, a significant F-value only signals that the group means differ. In order to identify, which group means have been the cause further analysis is necessary (e.g. a Scheffé-Test). In this report findings of further analysis are mentioned without going into methodological detail.

Correlation coefficient r

A most common statistical measure is the correlation coefficient r. For interval data the *Pearson product moment correlation* is calculated. Also, additional correlation coefficients are available than can be used in a similar way. The *point biserial correlation* is a special case of the Pearson product moment correlation applied to dichotomous and continuous variables. Examples for bivariate variables are Yes-No Questions, which have been widely used in the questionnaire. For some nominal data (e.g. type of organisation) dichotomous dummy variables (O,1) have been created, and the point biserial correlations have been calculated. To measure the association of two binary variables the *phi coefficient* (π) has been calculated. It is identical to the Pearson product moment correlation for two dichotomous variables. As a convention, in this all correlations coefficients will be reported as "r".

Regressions

Regressions are calculated to analyse combined effects of several independent variables (x_i) on a single dependent variable(y). In the most common case of a linear regression the model takes the following form:

$y = a + b_1*x_1 + b_2*x_2 \ldots b_i*x_i$ where *b* are the regression coefficients and *a* is constant term.

The joint effect of such a model is measured by a *determination coefficient* R^2. Individual effects of can be described by b_i.

For a linear regression model with some manipulation nominal, ordinal and interval scaled data can be used as independent variables, but dependent variables should be interval scaled.

To regress on nominal scaled data logistic (for binary data) and multinomial regressions are commonly applied. The statistics behind this are fundamentally different to linear regressions. Here, not the number of counts is estimated, but the *probability of occurrence of an event* is predicted. For instance, in a logistic regression the dependent variable y takes the form of a so-called *logit*, which is log(p/(1-p), where p is the probability of an event. The *determination coefficient* R^2 cannot be calculated directly for such models, since there a based on a different estimation technique. Statistical programs calculate similar so-called Pseudo R^2 measures, but, they have to be interpreted with care. These group of tools is

powerful, but parameters of sometimes difficult to interpret. In this report we will make use of logistic regressions in an exemplary way, without going into too much detail of the statistics behind it.

Significance and Effect sizes

Statistical significance is a convention based on the so-called α-error. The α-error is probability to reject a true null hypothesis. A convention for significance is to define the error probability to 5%. If the error probability is less than 1% this is considered as to be highly significant. In this report these two significance levels are marked with (*) for α < 5% and (**) for α<1%.

Statistical significance is a necessary, but not a sufficient condition for the analysis of causal effects and or the strength of associations. The main reason for this is that statistical significance is dependent from the sample size. The larger the sample size, the more likely is that variables that have only weak effects become significant. Therefore, so-*called effect sizes* will be calculated, which allow to assess if a significance also signals relevance. If the effects are small they are most likely practically irrelevant.

The following table compiles the effect sizes used in this report. They are taken from Cohen (1988):

Table 12: Effect sizes

Statistical Test/Parameter	Effect size	Large effect	Medium Effect	Small effect
X^2/ C	$w=\sqrt{\frac{C^2}{1-C^2}}$	w=0,5	w=0,3	w=0,1
F (ANOVA)	$f=\sqrt{\frac{\eta^2}{1-\eta^2}}$	f=0,4	f=0,25	f=0,1
r	r	r=0,5	r=0,3	r=0,1
R^2 /Regression	$f^2=\frac{R^2}{1-R^2}$	f^2=0,35	f^2=0,15	f^2=0,02

For instance, the correlation coefficient **r** is a commonly applied effect size. Cohen (1988) has suggested that r = 0,1 can be interpreted as small, r= 0,3 as a medium, and r=0,5 as a strong effect. The sample size off 533 is sufficient to identify small effects (r≈ 0,1).

The parameter η^2 , which is used to calculate the effect size f for ANOVA, describes the ratio of variance explained in the dependent variable by a predictor.

Effect sizes are also calculated if applicable. As an orientation, it can be assumed that a medium or larger effect is relevant. For the statistical tests, which are applied in this analysis, the sample size is sufficient to identify medium effects.

Annex 2: Data

Annex 2.1: Organisation Type per Country

		Organisation Type				Gesamt
		Public	Commercial	NGO	Others	
Country	GR	3	14	3	5	25
	DE	22	117	21	9	169
	HU	5	33	12	10	60
	PL	2	30	3	3	38
	UK	10	9	6	2	27
	PT	1	22	4	2	29
	EE	4	17	2	3	26
	FI	13	1	9	16	39
	SE	9	3	0	5	17
	ESP	1	26	6	3	36
	IT	8	17	6	9	40
Total		78	289	72	67	506

Annex 2.2: Correlations between Structural Parameters

		Q03_DumPublic	Q03_DumCom	Q03_DumNGO	Percentage of e-teachers	Number of teachers for eLearning	Years 5 and more	Percentage of female e-L. students	Number of eLearning students?	Num. of e-lear. packages offered?
Q03_DumPublic	R	-	-	-	,094*	,212**	,075	,,025	,052	,062
	Sig. (2sided)	-	-	-	,040	,000	,082	,739	,251	,170
	N	-	-	-	484	505	533	355	484	487
Q03_DumCom	r	-	-	-	-,012	-,106*	-,132**	-,113*	,090*	,006
	Sig. (2sided)	-		-	,796	,017	,002	,033	,048	,894
	N	-	-	-	484	505	533	355	484	487
Q03_DumNGO	r	-	-	-	-,036	-,055	,069	,149*	-,097*	-,043
	Sig. (2sided)	-	-	-	,424	,217	,109	,005	,034	,339
	N	-	-	-	484	505	533	355	484	487
Percentage of e-teachers	r	,094*	-,012	-,036	1	,176**	-,015	,011	,020	,006
	Sig. (2sided)	,040	,796	,424		,000	,740	,847	,670	,902
	N	484	484	484	484	474	484	332	448	442
Number of teachers for eLearning	r	,212**	-,106*	-,055	,176**	1	,235**	,098	,311**	,420**
	Sig. (2sided)	,000	,017	,217	,000		,000	,069	,000	,000
	N	505	505	505	474	505	505	344	466	462
years5andmore	r	,075	-,132**	,069	-,015	,235**	1	,057	,277**	,244**
	Sig. (2sided)	,082	,002	,109	,740	,000		,285	,000	,000
	N	533	533	533	484	505	533	355	484	487
Share of female students	r	,,025	-,113*	,149*	,011	,098	,057	1	,008	,,27
	Sig. (2sided)	,739	,033	,005	,847	,069	,285		,885	,616
	N	355	355	355	332	344	355	355	355	337
Number of eLearning students?	r	,052	,090*	-,097*	,020	,311**	,277**	,008	1	,327**
	Sig. (2sided)	,251	,048	,034	,670	,000	,000	,885		,000
	N	484	484	484	448	466	484	355	484	456
Number of e-learning packages offered?	r	,062	,006	-,043	,006	,420**	,244**	-,004	,327**	1
	Sig. (2sided)	,170	,894	,339	,902	,000	,000	,931	,000	
	N	487	487	487	442	462	487	414	456	487

PART II E-LEARNING DEMAND: E-LEARNERS AND CONTROL GROUP SURVEYS

1. Methodological considerations

This report covers e-learners and control group surveys in 11 countries. The control group survey has targeted individuals that participated in continuous education and training (CVT) courses, which did not offer e-learning. It also contains a subsample of respondents that did not participate in any CVT course after school.

The national surveys have made use of two questionnaires, which have jointly been developed by the partnership and which are based an earlier project. The questionnaires have been translated into national languages and have been made accessible as online questionnaires on the project webpage. Both questionnaires cover a range of common socio-economic criteria and a set of identical questions to identify differences in the attitudes and opinions of both groups. In addition, specific questions are asked for both groups. In the case of e-learners the aim of this set of questions is to compare their views with the perceptions of training providers, while the control group has been asked to address their knowledge and their willingness to make use of e-learning. The e-learners survey covers a total of 1737 cases, while the control group survey covers 1679 cases. The national sample sizes range from 41 to 474 (mean 157,91) in the e-learners survey and from 35 to 368 (mean 152,64) in the control group survey.

The sample of e-learners was constructed by approaching e-learning providers who participated in the provider survey and asking them to forward the invitation to take part in the survey among their current or past students. In the case of the control group, the sample was constructed by approaching potential respondents through several channels, including: training providers offering conventional training courses and asking them to forward the invitation to take part in the control group survey among their students; SME chambers, professional associations and asking them to forward the invitation to take part in the survey among their members and/or upload the questionnaire on their website; individual companies (micro enterprises and SMEs) and inviting them to participate in the survey.

The sampling procedure for both groups was not designed to construct representative samples. Consequently, inferences from the given data set on the parent populations have to be taken with great care. However, the quasi-experimental research design allows testing the difference hypothesis between e-learners and the control group regardless. In order to increase the validity of the results of non-randomised samples several techniques can be applied. (1) The comparison of sub-samples with similar characteristics (e.g. middle-aged women with a low educational degree)(2) Matching of samples, that is to reorganise a sample either pair wise, so that the individuals selected for analysis share all properties except that under investigation, or group wise, so that group parameters of both groups very similar (also called parallelisation).(3) Control of confounding by measuring the known confounders and including them as covariates in multivariate analyses.

Technique (3) will be applied in this report, particularly in form of multiple (logistic) regressions. Multiple regressions allow including both the group variable and other cofounding variables in a singular analysis. The regression coefficient of the grouping variable can directly be interpreted as the mean difference between the groups. It is also possible to test, if these coefficients (and thus the mean differences) are statistically significant, even if other, cofounding variables are taken into consideration. Thus, since the latter is the main interest of the analysis in this report, the individual, estimated regression equations are not presented. Rather, it is only highlighted, if the grouping variable and other cofounding variables prove to be statistically significant. Since most questions,

which will be subject of multivariate statistical analysis, are coded as binary (0;1) variables, logistic regressions, a special regression technique, is applied. An example is described in Annex 2.

In addition, meta-analytical approach is used to compare the results of the eleven national surveys. Here, all national samples are treated as separate, individual studies. For common statistical tests so-called effect sizes are available, which can be used to compare the findings of several studies with heterogeneous results, and to test the proposition that a certain pattern, which can be observed in some, but not all studies points to a true effect rather than being random. Since all national surveys used identical questions a statistical analysis of the results is straightforward.

The downside of such a meta-analytical approach is that national differences are treated as variations of common parameters and not as true differences between countries. To control this assumption a so-called test of homogeneity will be applied (for details see Annex 1). If the test fails, the characteristics of the national samples vary too much to allow for a European wide generalisation.

2 Socio-economic characteristics

The socio-economic profile of the surveyed respondents: e-learners and control group, was recorded with three sets of variables:

- gender, age, education,
- place of residence and place of work,
- work status and sector of work.

Profiles of the two groups are presented and compared in the histograms that follow. The following statistical procedures are applied to test the hypothesis that observed structural differences between e-learners and the control group are significant, so that the zero hypothesis (no difference) has to be rejected.

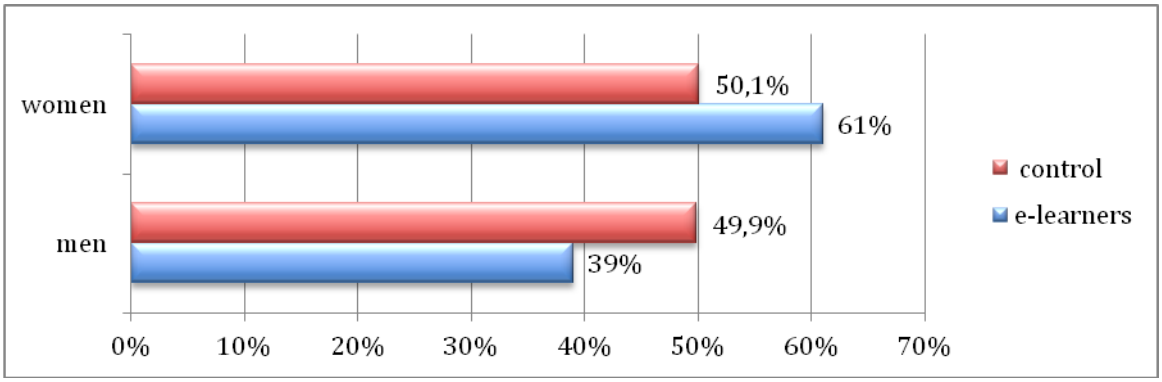
Chi-square test is applied for all tables of the whole sample. Since results of the former may be biased alternatively a meta-analysis is undertaken, in which all national surveys are treated as independent studies. The test procedure is described in Annex 1. It includes (1) a statistical test, if the results confirm the conclusion to reject the zero hypotheses and (2) a test of homogeneity. If the test of homogeneity fails, it suggests that the differences in the national samples do not allow for a general conclusion for all countries.

2.1 Gender

The gender relations differ between both groups. While in the control group sample the shares of both genders are almost equal (men 49,9% women 50,1%), the share of women is much larger (61%) in the e-learner sample. Chi-square statistics (χ^2= 40,0, (df=1)**)[5] of the aggregated samples suggest a strong and highly significant difference between learners and the control group.

[5] χ^2 are rounded to 1 the first decimal point. The degrees of freedom are signified as “df”. “**” is used to indicate highly significant differences (error probability < 1%), while “*” indicates significance at a probability of errors <5%.

Figure 1: Gender

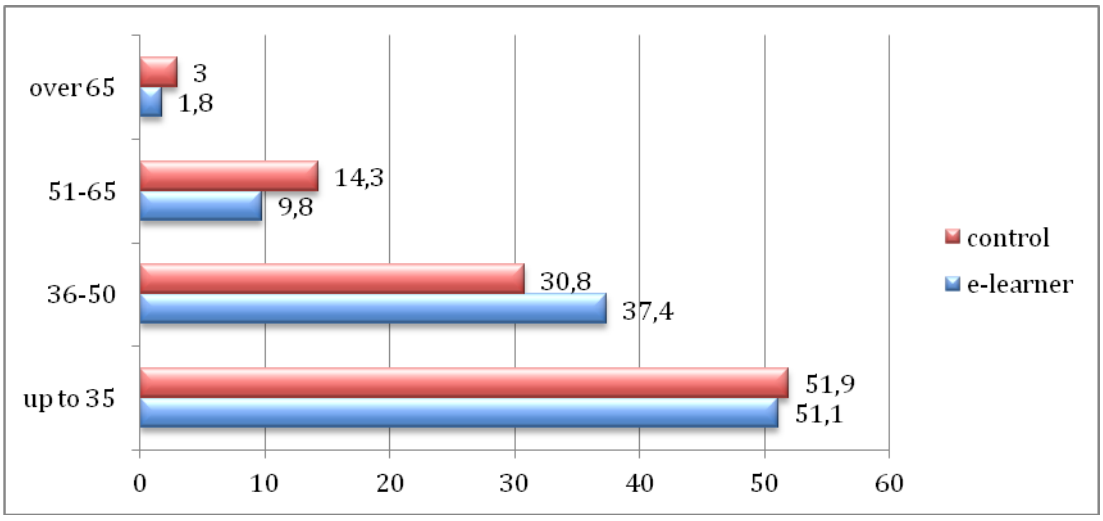


To confirm this result, meta-analysis is applied on the basis of the 11 national surveys. There is an average difference of 10,9% for the share of women between both groups. Only 3 countries report a larger difference, while 6 report a smaller positive difference, and two countries even report a smaller share of women in both groups. The weighted mean effect, size (ES_m=0,314) suggests a moderate positive effect. The 5% confidence interval ranges from 0,160 to 0,468, so that the comparison of all studies seems to confirm the result of the simple chi-square test. However, the test of homogeneity fails (Q = 41,694 (df=10)**). This suggests that the differences of the share of woman between the groups are country specific. In particular, the German and the Estonian findings, both reporting a higher proportion of women in the e-learning group, deviate strongly from the results of all other countries. However, the findings are stable, when these extreme cases are dropped. Then the estimated difference of the share of women between the groups is smaller. The estimated odds ratio is 1,2. Since the gender distribution appears to be even in the control group, this indicates a 4,5% higher share of woman in the e-learners group.

2.2 Age

Both samples only partly reflect the experiences of other CVT surveys. The group „up to 35“represents about half of the participants in both samples. In general, the participation in CVT of this group is similar to the group „36-50.“ (Kailis and Pilos, 2005) so one would have expected a more even participation in the survey. Thus, the group „up to 35“seems to be overrepresented in both samples. This might have been caused by the use of online questionnaires.

Figure 2: Age structure



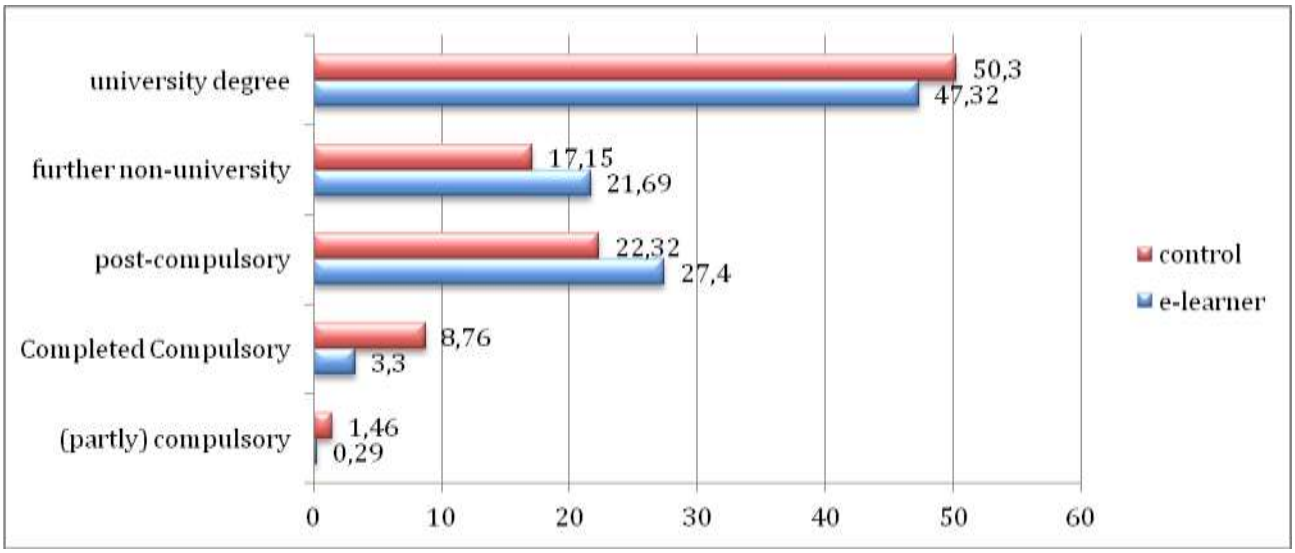
E-learners and the control group differ significantly with regard age structure (χ^2 = 29,5 (df = 3)**). The share of learners aged 36-50 is 7,4% higher in the e-learners group, while it is lower in all other

groups. The weighted mean effect size is significantly positive (odd ratio =1,241) and confirms the results, although the estimated difference value is lower than the aggregated value (~4,8%). National surveys differ. Two countries show a decline in the share of this age group. In four countries the increase is less than 7,4%, while in six countries the increase is higher. However, the homogeneity test does not reject the null hypothesis. Thus, national samples do not deviate too much. In sum, meta-analysis confirms the higher proportion of respondents aged 36-50 in the e-learning group.

2.3 Education

In both samples higher educational degrees are over-represented in comparison to general population. This is in line with the general experience that those with higher educational degrees also are more actively engaged CVT to improve professional skills. However, the large shares of higher educational degrees are still surprising, since the university degrees are less common. Thus, both samples are not representative towards higher degrees of education.

Figure 3: Educational degrees



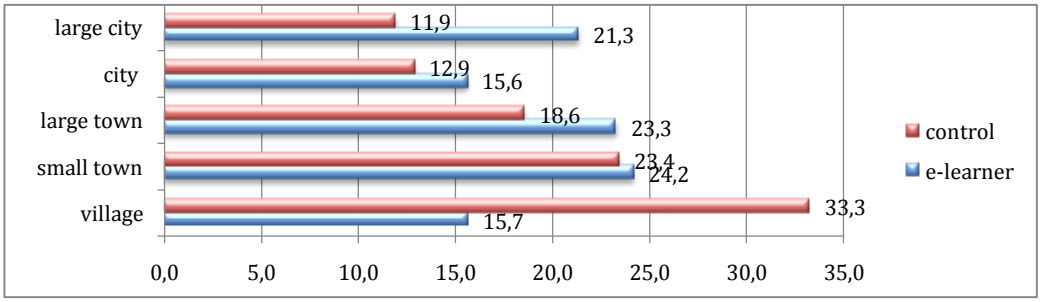
Since the category „partly compulsory education“ is under-represented in the sample it has been merged with the category „completed compulsory education“ for further statistical analysis. The e-learners and the control group sample differ significantly with regard to educational levels with regard to both, the highest and the lowest levels of school education. (χ^2= 73,6, (df = 4)**).

Meta-analysis has been applied to test the changes of proportion of the groups „post-compulsory education“, „further non-university education“ and the newly merged group „(partly) compulsory education“ on the basis of the 11 national surveys. For the former two groups an increase in proportion has not found to be statistically significant. Effect sizes do not divert much from zero, and are both positive as well as negative. For both categories four of eleven samples show negative changes of the proportions. Meta analysis for „(partly) compulsory education“ failed the test of homogeneity. Thus, national samples differ strongly in this regard. In sum, differences in the educational national between the control and e-learners group appear to be random and specific to national samples.

2.4 Living and Work Location

The aim of the project was to target rural population. Respondents were asked to indicate the size of the community, in which they are living and also the size of the community, in which they work.

Figure 4: Living Location[6]



There is a significant difference in the shares of the village population between the e-learner and control group. However, meta-analysis of the national data did not confirm this as a general trend. The homogeneity test has failed. Thus, national samples diverge too much. In some countries (Finland, Sweden, Italy) the „village“ group is very small. This may be due to the way local authorities are institutionalised in different countries. Therefore, the perception of in the definition of the living location's size may have been different (in sense of the settlement or in sense of the political municipality).

Work location is not necessarily identical to the living location (commuting). The theoretical assumption is that rural dwellers that work in an urban environment may have better access to e-learning provision and thus may have a higher chance to participate in e-learning courses. As the following table indicates, work location and residence correspondent strongly (r=0,5**).

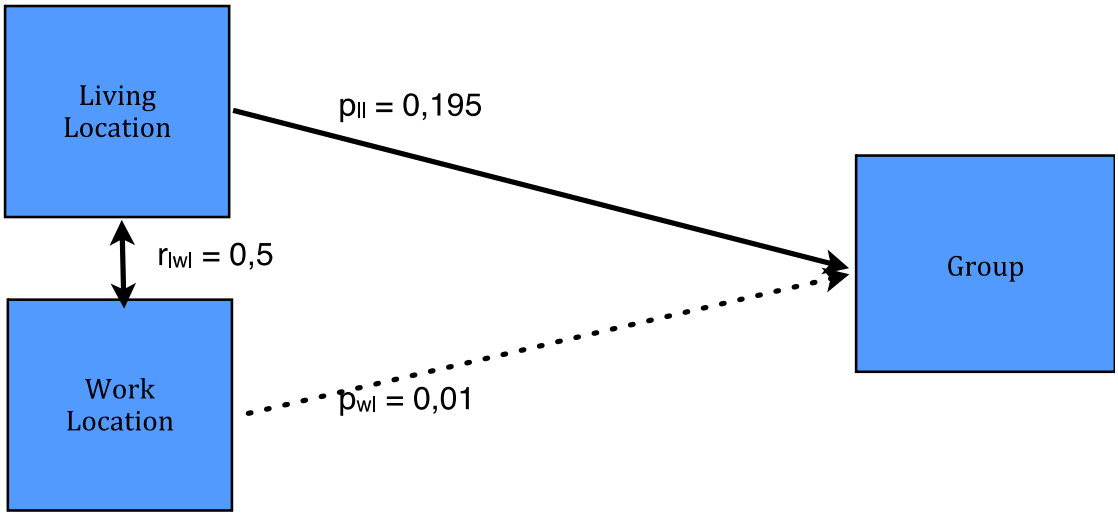
Table 1: Living and Work Location

	Work Location					
Living location	**Up to 2000 residents**	**From 2001 to 20 000**	**From 20 001 to 100 000**	**From 100 001 to 300 000**	**More than 300 001**	**Not working**
Up to 2000 residents	**45,4%**	15,8%	12,9%	5,5%	5,9%	14,5%
From 2001 to 20 000	4,4%	**50,5%**	16,1%	6,4%	9,4%	13,2%
From to 20 001 to 100 000	4,0%	7,5%	**64,3%**	4,4%	9,3%	10,6%
From 100 001 to 300 000	2,8%	5,0%	4,1%	**66,7%**	7,8%	13,5%
More than 300 001	1,3%	2,1%	3,0%	2,1%	**78,3%**	13,3%

Also, the larger the living location the larger the local labour market and the more likely it is that people find a work place in their home town. Thus, it is not surprising those values in the diagonal increase from villages to large cities. The variation of unemployment rates between living locations is statistically not significant.

[6] For the applied definition of village, small town, etc. see the following table.

Figure 5: Effect of Living Location on Chance beeing in the e-learners group

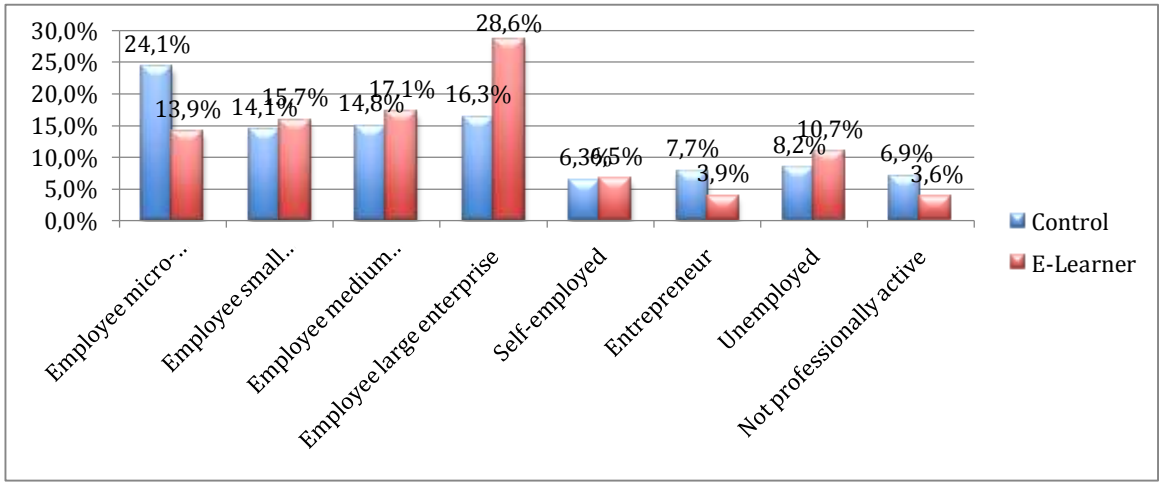


The binary correlation of both, living as well work location with the variable "group" is significantly positive (r_{ll}= 0,2; r_{wl} = 0,107). Thus, the larger the living/work location size is the more likely is the chance to be an e-learning participant. A simple path model has been created to analyse, if one of the effects of work location and living location remain, when both variables are considered altogether in the analysis. The path coefficients (p) shown in the graph can be interpreted like correlation coefficients. The results suggest that, while the effect of the living location on e-learning participation remains, when the correlation between living and work location is included in the analysis, the effect of the work location vanishes almost completely. It turns out to be a spurious correlation. Thus, for further analysis only one of both variables (living location) will be considered.

2.5 Work status

E-learners and Control Group differ significantly with regard to the work status. Entrepreneurs and employees of small businesses are significantly less represented in the e-learners group (relative change of group shares -49,9% reps. -42,4%), while the proportion of employees of large companies and also the unemployed is higher in the e-learners group (relative change + 75,1% and +30,1%).

Figure 6: Work status

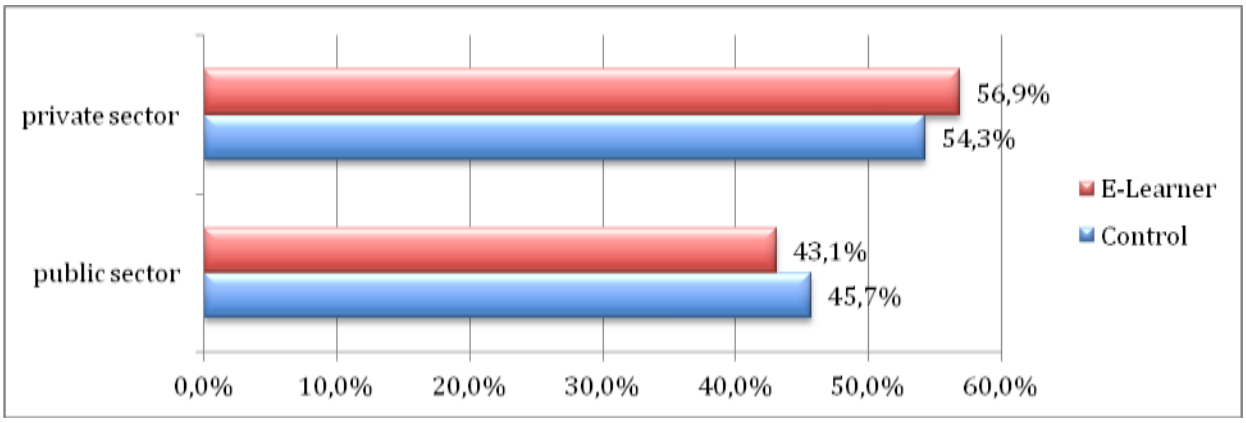


Meta-analysis has been applied to compare national samples in respect to group differences for employees of micro-businesses and employees of large enterprises. (1) National findings are very consistent with regard the employees of large companies. Based on the weighted effects the odds ratio is estimated as OR_{emplc} = 1,72. Thus, the chance to participate in an e-learning group is 1,7 times higher, when a person is employed in a large company. (2) For employees in micro-companies the chance to participate in e-learning courses is only half that of any other person (OR_{emplmb} = 0,498). However, the heterogeneity test has failed. The findings in the national surveys vary strongly. In particular, Finland and United Kingdom differ very much in this regard. Thus, low participation of micro-business employees appears to be an issue in most, but not all countries.

2.6 Economic sector

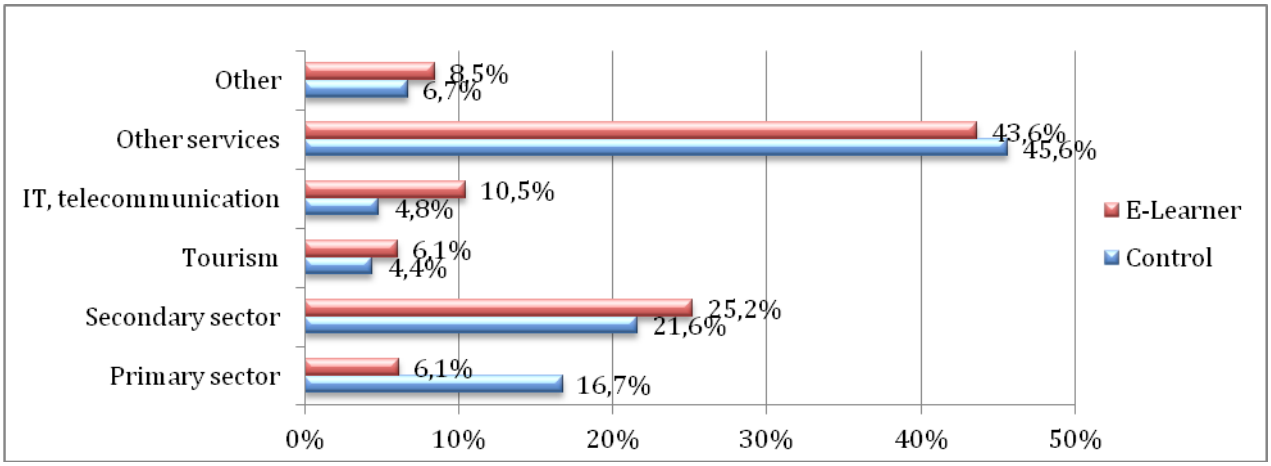
The share of public sector employees is comparatively large in both samples. In the European Union, public employment remained roughly constant over the last decades and fluctuated around 17% (Handler et al. 2004). Thus, the sample is not representative in this regard. There is a small, but significant difference between the e-learners and the control group with regard to the share of public sector employees. However, the meta-analysis of the national samples does *not* support the conclusion that employees from the public sector are less likely to participate in e-learning courses. Six of eleven countries even report a higher participation of public sector employees in the e-learner sample.

Figure 7: Private/Public Sector



The occupational structure of both samples is characterised by a comparatively high share of respondents, who work in the primary sector. Also, IT and telecommunications is overrepresented in both samples in comparison to European Labour Force data. While other economic activities are close to European averages, the service sector is also underrepresented. The structure of economic sectors on the hand reflects the rural focus of the survey, but, on the other hand, may point to a self-selection biased by actors, who show a greater interest in the research objectives.

Figure 8: Sector of Employment



Control and e-learner group show particular differences, with regard to respondents working either in the primary sector or IT and communication sector. While the relative share of respondents working in the primary sector is considerably lower in the e-learner than in the control group, the share of respondents working in the IT and communication is much higher. Also, the higher share of respondents working in the tourism sector in the learners group appears to be significant.

Meta-analysis of the national samples only partly confirms these findings. (1) The comparison of the differences of the proportion of respondents working in the *primary sector* suffers from a low number of cases in some national samples, and a great heterogeneity between the samples. The analysis rejects the assumption of a general pattern. (2) In contrast, the meta-analysis does confirm the difference in the share of respondents working in *the IT & Communication sector* in the e-learners sample. However, the weighted effect is somewhat smaller than the estimate based on the aggregated sample. A person working in the IT & Communication sector has a 1,8 (Odds ratio = 1,791) times higher chance to take part in an e-learning course than a person working in other sector. (3) The differences in the proportions of the *tourism sector occupation are not confirmed*.

3 Learning experience of the e-learner and the control group

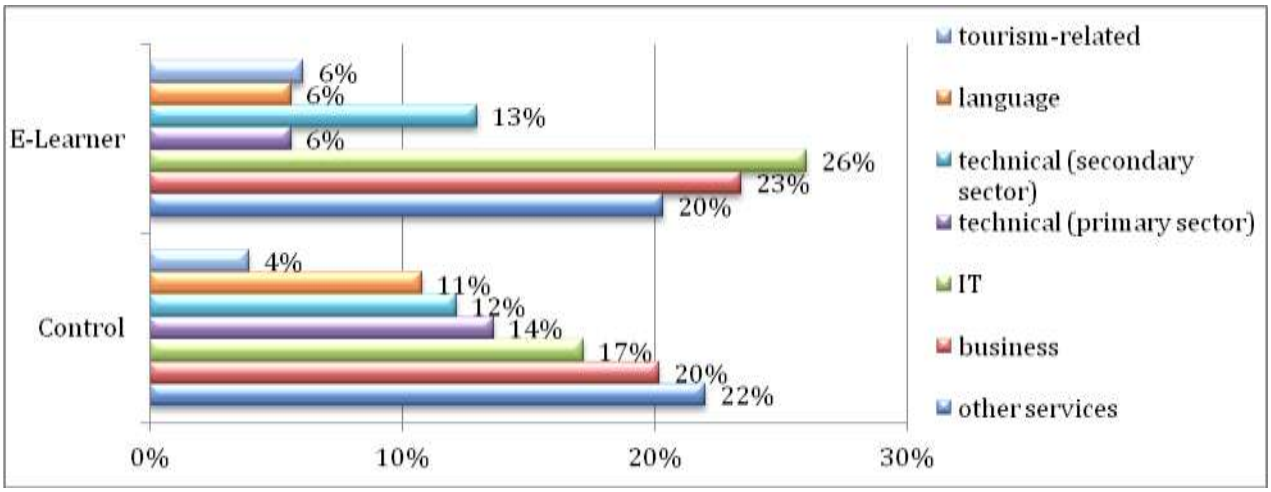
The learning experience of the e-learner and the control group was recorded on the basis of the most recent course attended with tree variable sets:

- course participation
- course funding
- course value

3.1 Course participation

In this section three questions (the subject of the course, individual motives of participation, and course duration) are analysed, which have been asked in the e-learners survey, and those respondents of the control group, who recently participated in a training course.

Figure 9: Course subject



The main training subjects in both groups are to improve business skills, IT skills and skills connected with other services. E-learning and control group differ significantly with regard to their course objectives. To better assess the differences, differences and rankings have been summarised in the following table. Relative differences are particularly large for technical skills in the primary sector, IT skills (+), languages (-).

Table 2: Differences and Change of Ranking of economic sector

	Business	Technical (primary sector)	Technical (secondary sector)	IT	Tourism-related	Other services	Languages
Abs. between Control and E-learners Group	3,2%	**-8,0%**	0,8%	**8,8%**	2,1%	-1,7%	-5,2%
Rel. between Control and E-learners Group	15,9%	**-58,8%**	6,5%	**51,2 %**	**53,9%**	-7,7%	**-48,2%**
Change direction	**+**	**-**	**+**	**+**	**+**	**-**	**-**
Ranking Control	2	4	5	3	7	**1**	6
Ranking E-learners	2	6	4	**1**	5	3	6

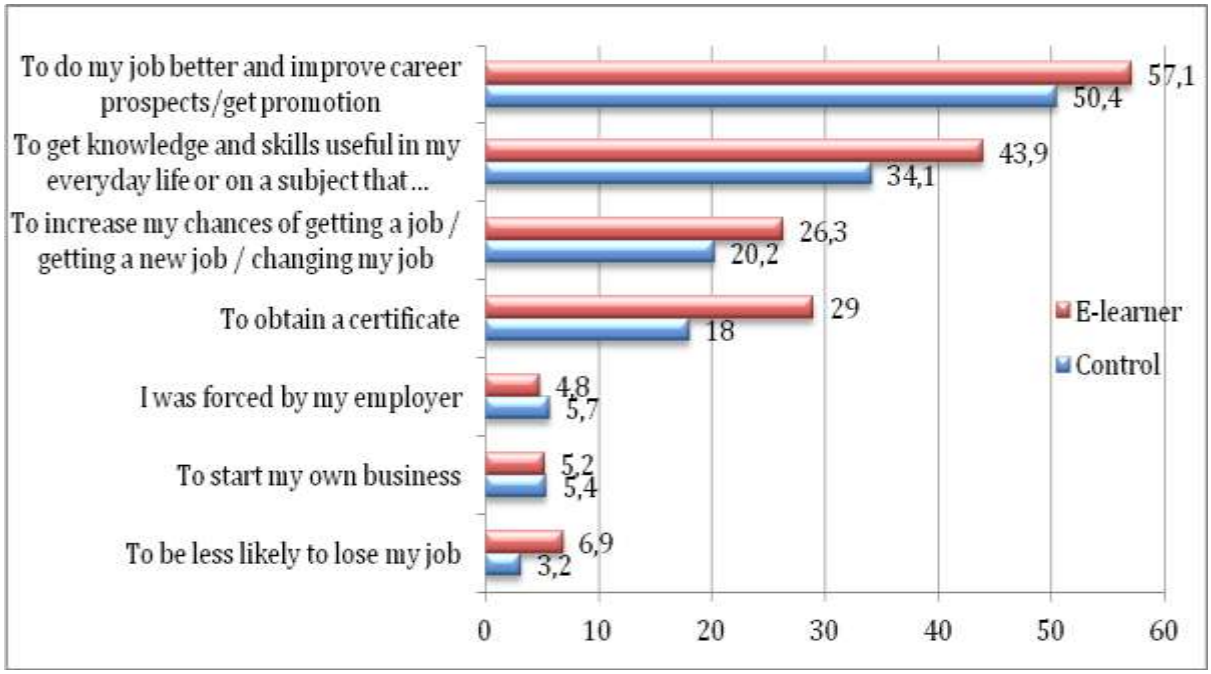
It is important to note that learning objectives are correlated with the occupational structure of the samples. Thus, the findings corresponds with the fact that people working in the *primary sector are less likely* and *respondents working in the IT and Communication* as well as the *tourism sector are more likely to participate in an e-learning course*. Yet, causalities are unclear. Is the reason for a lower uptake of e-learning in the primary sector caused by a lack of courses offered or a negative attitude of the people working in this sector? The results of the provider survey point to a lack of training offers.

Table 3: Skills aimed at by economic sector of respondents' employment

	Skills						
Economic Sector	business	technical (primary sector)	technical (secondary sector)	IT	tourism-related	other services	language
Primary sector	15,2%	**57,0%**	4,0%	9,0%	3,6%	6,7%	4,5%
Secondary sector	23,9%	4,0%	**38,2%**	15,3%	1,9%	11,1%	5,5%
Tourism	19,4%	2,8%	1,9%	25,0%	**33,3%**	10,2%	7,4%
IT, & Com	29,5%	1,2%	3,6%	**45,2%**	6,6%	10,8%	3,0%
Other services	20,4%	4,5%	7,3%	23,3%	4,4%	**30,6%**	9,5%
Other	33,8%	0,0%	9,7%	6,5%	1,9%	**42,2%**	5,8%

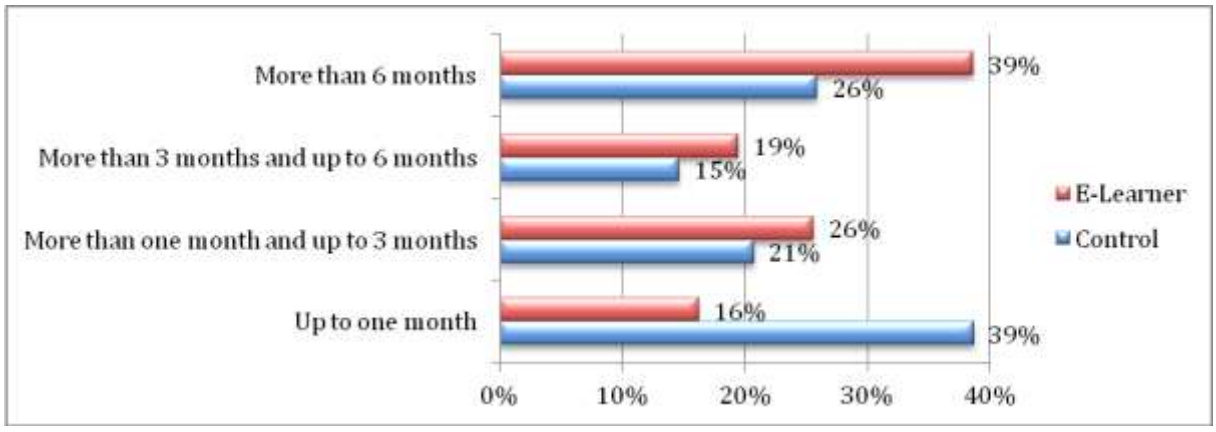
The main study objectives and their ranking for participating in vocational training are similar in both groups. The highest approval has been given to the statement „To do my job better and improve career prospects/get promotion" followed by „To get knowledge and skills useful in my everyday life or on a subject that interests me." Thus, strategic perspectives and personal development are rated highly. Further statements, which have found medium approval, were „To increase my chances of getting a job / getting a new job / changing my job" and „to obtain a certificate", which are highlighting more direct individual benefits. The differences in the percentages are largely due to different answer behaviour of the e-learners group and the control group. While e-learners selected on average 1,7 options, the control group respondents only selected 1,3 answers that is about 26% less. If this is taken into consideration the differences between the groups shrink with regard to the three main individual motives. Only the difference to the item "to obtain a certificate" remains significant.

Figure 10: Motivation for course participation



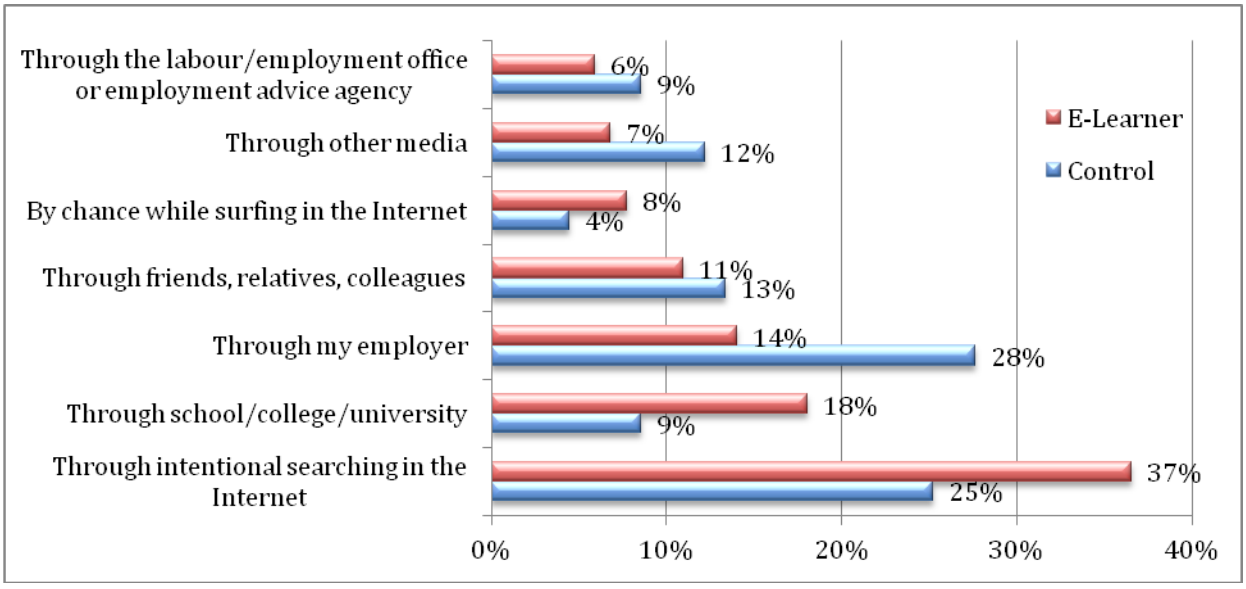
E-learner and control group differ significantly with regard to the duration of the last training course. About 60% of the e-learners reported that their last training course lasted longer than 3 months, while this applied only to 41% of the control group.

Figure 11: Course duration



The information sources to find training courses differ between the groups. While information provided by the employer and intentional Internet search rank almost equally at the top of information sources for the control group, the latter is by far the most important source of information for e-learners. At the same time e-learners use other media less frequently and information provided by the labour offices are ranked as the least important source of information. Both even fall behind the item "by chance while surfing the internet".

Figure 12: Sources of information

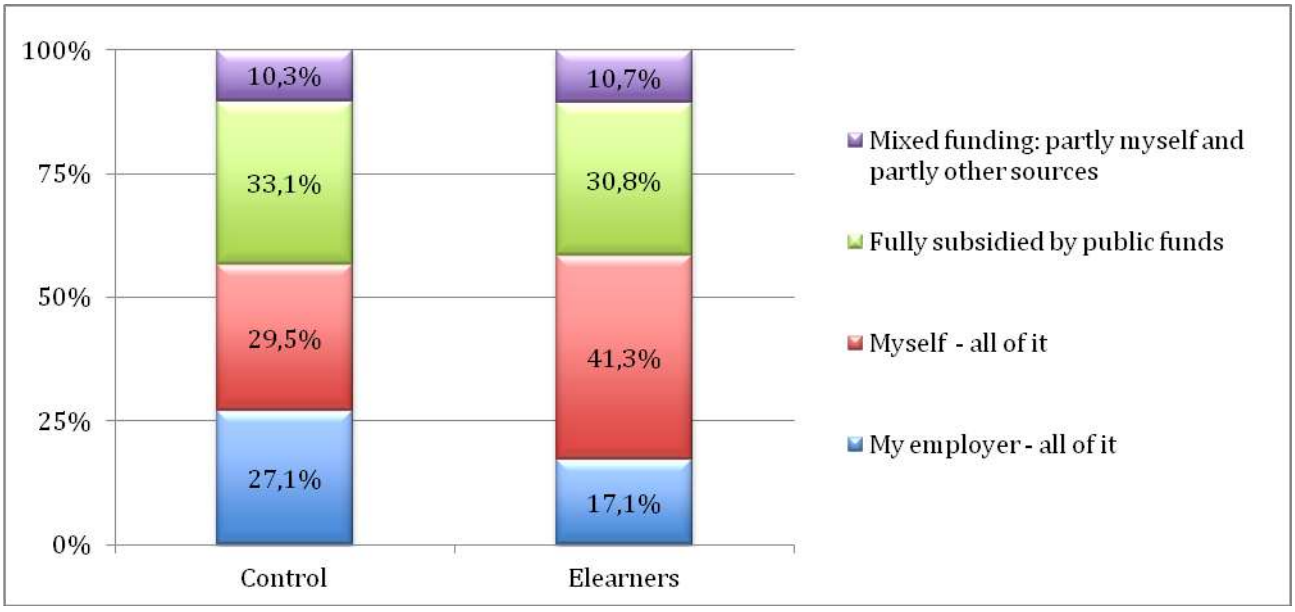


However, sources of information vary according to the work status. Labour offices are the most important source of information for the unemployed in the control group und still ranks second behind "intentional Internet search" also for the e-learner group. For employees in businesses of all sizes information provided by the employer is th e most important source of information in the control group, while again "intentional internet search" is by far the most important source of information for the e-learners group. While "intentional Internet search" becomes the most important source of information for e-learning, it is interesting to note that the relevance of social networks (family, friends, colleagues) remains stable in comparison of e-learners and control group, but also among occupational status groups.

3.2 Course funding

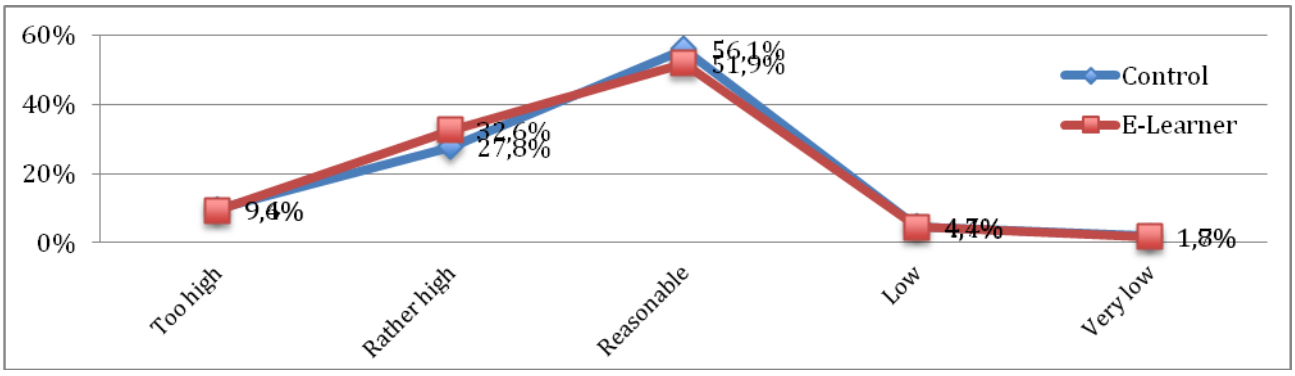
Participations have been asked to name and assess the funding sources. The following figure highlights that a significantly higher share of e-learners financed the course themselves.

Figure 13: Course Funding



Meta-analysis confirms this result for all countries except Poland. Poland is the only country, in which e-learning participants are less likely to fully pay the training course. Meta-analysis results are homogeneous for all other countries, when Poland is excluded. The estimated odds are $Odds_{myself}$ = 1,7. Thus, the "chance" that an e-learning participant has to fully pay the course fee himself/herself is 1,7 times as large than the chance for participants of other training courses.

Figure 14: Rating of costs

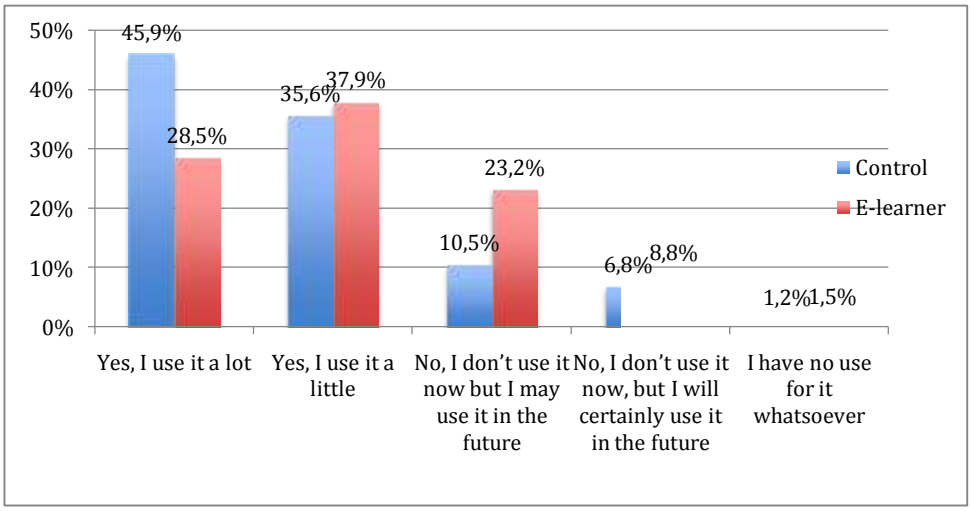


Survey respondents have also been asked to assess the course fee on a five point scale, when they paid fully or partly the fee. As the above figure shows the distributions of answers are almost identical for the e-learners and the control group. A statistical test for mean differences has also not rejected the zero hypotheses (no difference between the groups).

3.5 Course Value

E-learners and control group with conventional training experience were asked to assess the benefits of the most recent course they attended and whether they actually use what they have learnt.

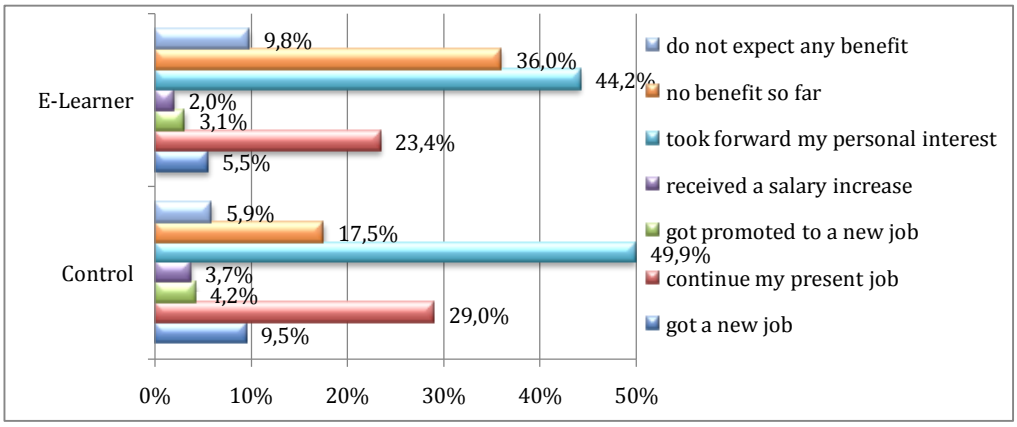
Figure 15: Usage of learning content



While in both groups the majority of respondents say that they can make use of the newly learnt content, it is evident that the results are better for the control group with conventional training experience. For a larger share of e-learners the learnt content is rather an option value that may or will be used in the future, rather than in the current situation.

The picture changes, when the course participants are asked for concrete benefits of training. Compared with the expectations outlined in figure 10, concrete benefits are rare. Indeed, there seems to be a gap between expectations and perceived benefits, although the categories are not identical.

Figure 16: Benefits of training



The answer to the item "I have no benefits so far" does confirm the results of the former figure. While about a third of the e-learners agreed to this item, it has been only less than a fifth of the control group. Also, the share of those e-learners, who do not expect any benefits, is almost twice as high than the share of the control group. Subsequently, the control group seems to have higher individual benefits. However, there are only modest, direct - income or employment related - benefits. "Taking forward personal interests" is stated as the main benefit in both groups. Overall, conventional learning seems to create higher benefits.

Stepwise logistic (binominal) regressions on the answers (Yes/No) have been used to identify effects of socio-economic variables and country effects on selected benefits, and to separate it from the group effect (Annex 2 for a description of this technique). In order to improve the statistical analysis the work status categories "not professionally active" and "others" have been excluded from the analysis. The results of these regressions are summarised in the following table.

Firstly, the results of the logistic regression confirm that e-learners rate the benefits of their most recent training course less positively than the control group respondents, which received conventional training. Secondly, neither the living location nor the sectors of employment have shown to have any effect. Thirdly, country differences are evident for all benefits.

Table 4: Perception of training benefits by socio-economic characteristics, country and group

	New job	Promotion	Salary increase	No benefits so far
Gender		Men are more likely to be promoted		Men slightly more often see no benefits
Age				65+ do not see benefits more often
Education	The higher the less likely to get a new job			
Living Location				
Work Status		Employees in small to large businesses		Unemployed often do not see benefits
Economic Sector				
Country	Large Differences between countries	Large Differences between countries	GR, UK, SWE depart strongly negatively from all others	Large Differences between countries
E-learning	Less likely to get a new job	Less likely to be promoted	Less likely to receive salary increase	More likely to see no benefits

A new job is a more likely benefit, if the educational level obtained at school is low. This is plausible. Somebody, who is already well trained, will not necessarily get a new job by attending one additional course. In economic terms, the individual marginal benefit of training is decreasing the better somebody is already educated.

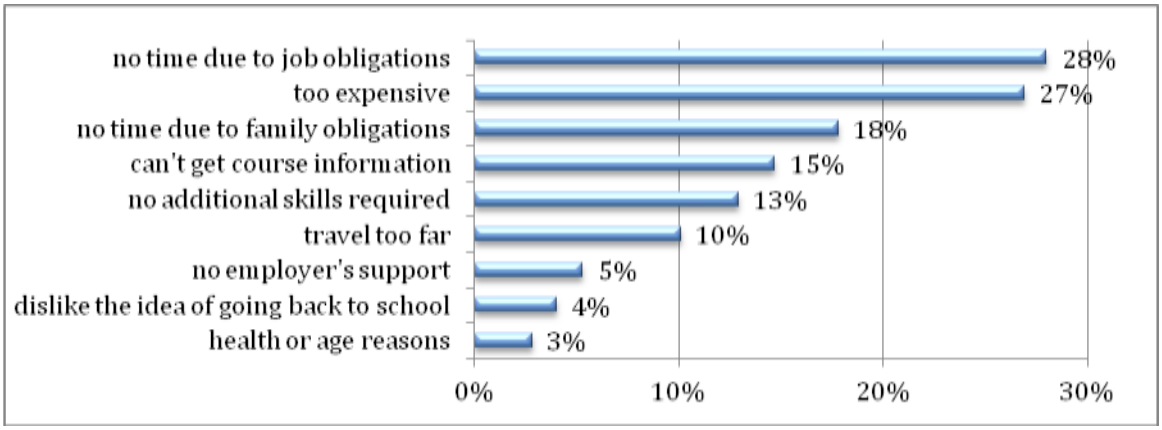
Promotion is only possible for employees working in hierarchically organised businesses. This is confirmed by the regression. It is interesting to see that men seem to benefit more from promotion after attending a training course than women.

Men, respondents older than 65 and the unemployed are more likely to seen no benefit after attending courses. Since the unemployed are often obliged to attend training courses, if they receive employment benefits, it is not surprising that they assess the results more critically, in particular, when they did not receive a new job. This confirms the supposition of a gap between expectations and benefits for this group.

4 Control group respondents without any training experience

A total of 548 respondents of the control group (32,6 %) has not participated in any form of continuing education and training after completing school. This group was asked a set of questions to investigate, why they have not participated, whether they were interested to take-up training, and if yes, what they would like to learn.

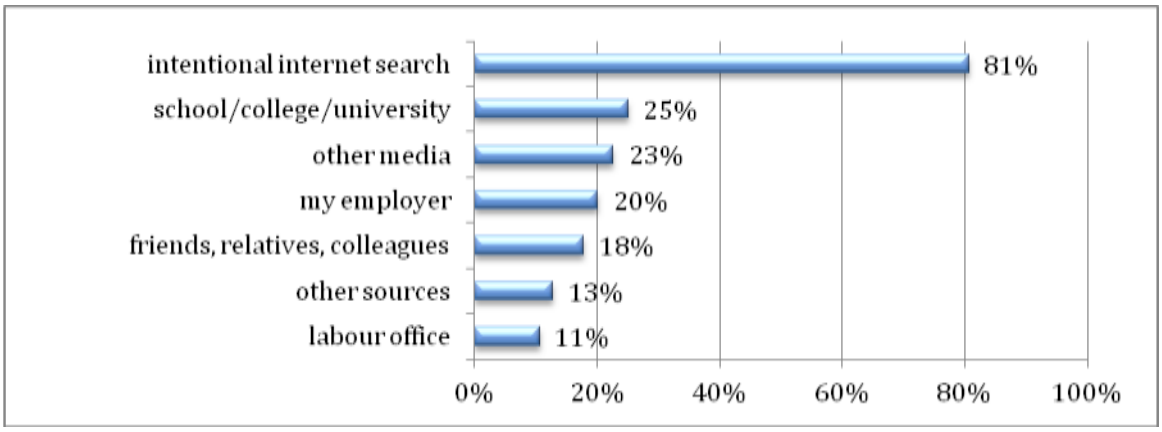
Figure 17: Reasons for non-participating



The item "I have not had the time because of job obligations" received the greatest approval. High costs of training are mentioned as the second important reason not to participate in CVT. Time constraints due to family obligations follow on third.

From this group 354 respondents (64,6%) stated that they would be interested in participating to training now or in the near future, of which 255 (46,5%) also stated that they have already searched for training possibilities.

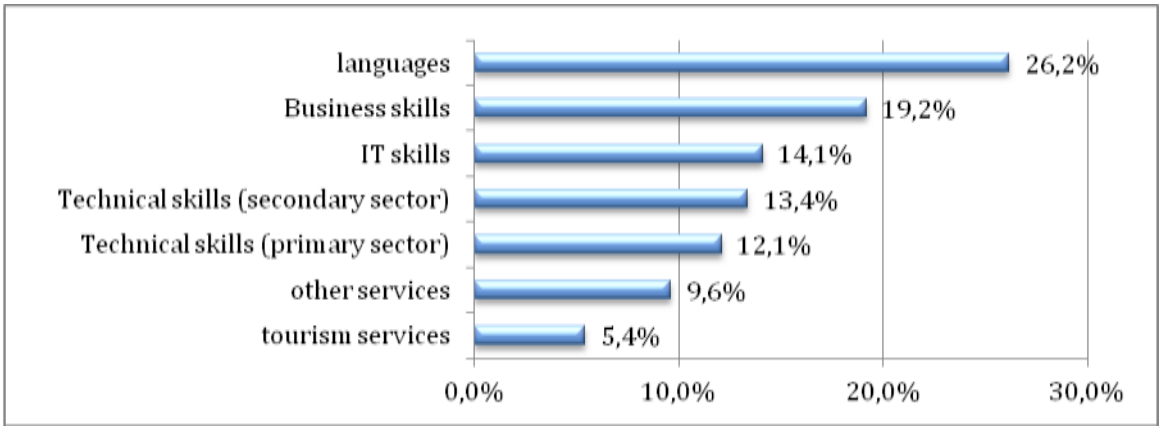
Figure 18: Sources of Information (control group without training experience)



Those, who have already searched for training possibilities have been asked to indicate their sources of information. Here, it is obvious that the Internet has become an outstanding importance as a general source of information. Other sources are far less significant. However, it is interesting to compare the answers with those given by e-learners and those respondents in the control group with CVT experience in the former section. In comparison to this, the Internet has been far less important as a successful search strategy for e-learners and control group with CVT experience, despite the fact that it is still mentioned at first. The same applies for information provided by schools (colleges/universities). At the same time, the information provided by the employer is more

frequently mentioned as a successful search strategy, in comparison to information sources used by control group respondents without any training experience.

Figure 19: Skills looked for

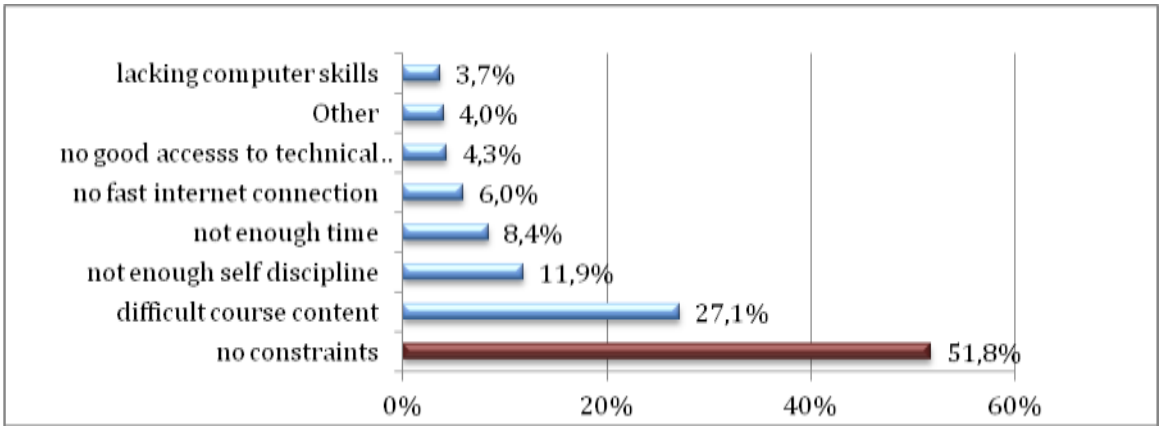


Finally, this group of respondents has also been asked to point to the field of interest, in which training is looked for.

5 Constraints and motivation for participating in e-learning for e-learners and control group

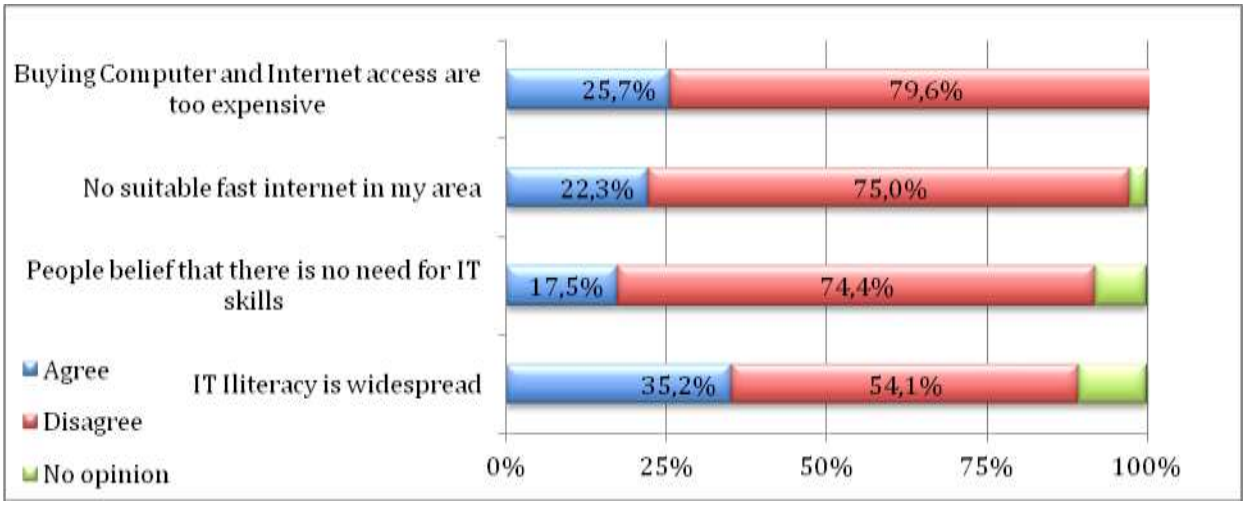
E-learners were asked whether they faced any constraints in getting the maximum benefit from the last e-learning course attended. More than half of e-learners stated that they did not have any constraints in participating the e-learning course. The difficulty of the course content was seen as the biggest constraint followed by "not enough self discipline". However, national samples varied considerably with regard to perceived constraints.

Figure 20: Constraints of e-learning (e-learners)



The control group has been asked whether they agree or disagree to four formulated constraints. All four statements only received support by minorities. The biggest support was given to the item “IT illiteracy is widespread”.

Figure 21: Constraints of e-learning (control group)



However, national samples varied strongly with regard to the perception of these statements (see figure 20 to 23). It is obvious that constraints, which were asked for, cumulate in some countries and are almost negligible in others.

Figure 22: Buying computers is too expensive

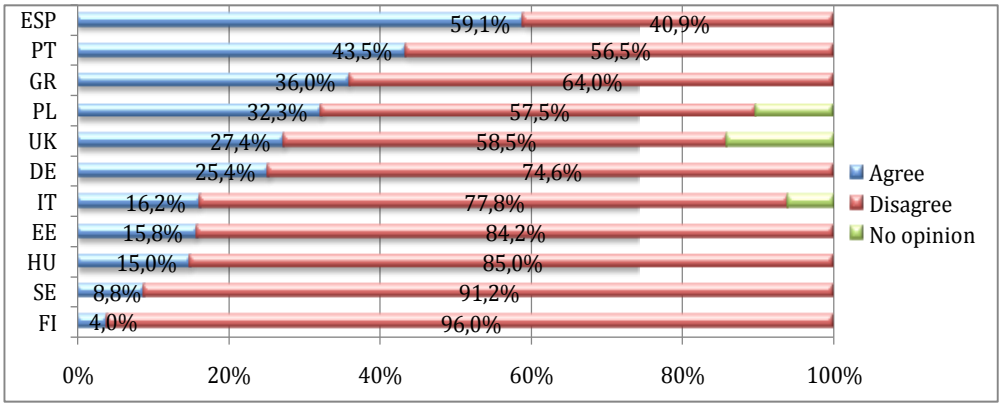


Figure 23: There is a belief amongst people in my area that there is no need for IT skills

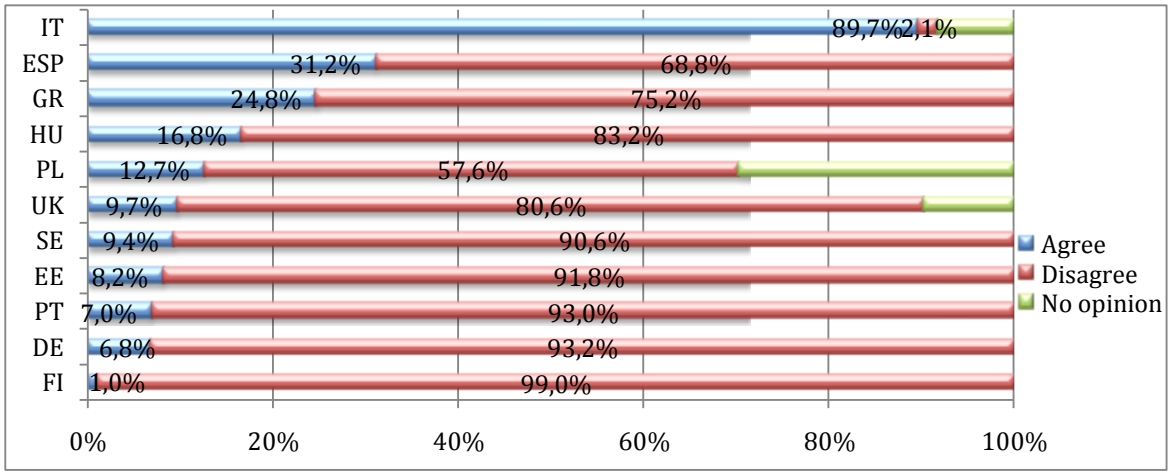


Figure 24: There is no suitable infrastructure for fast Internet in my area

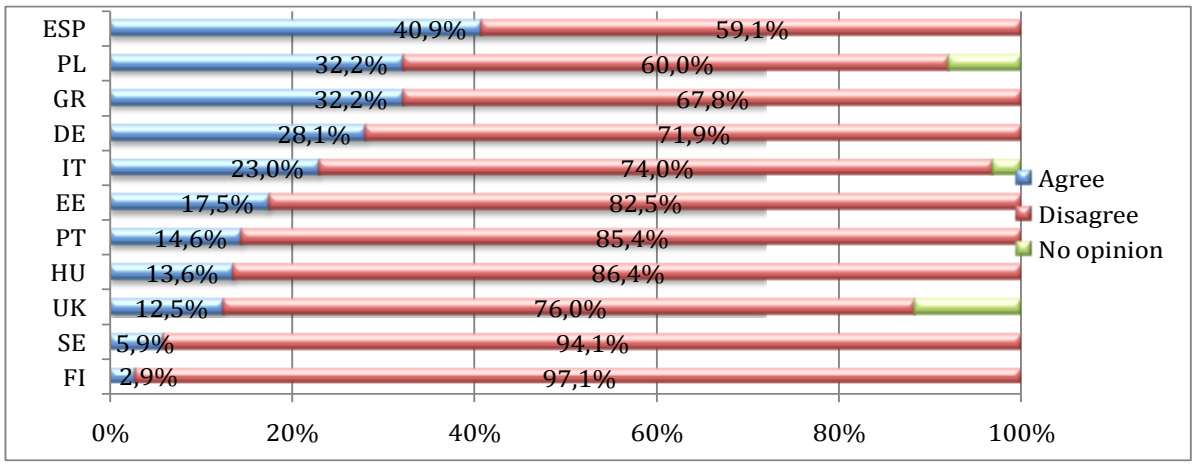
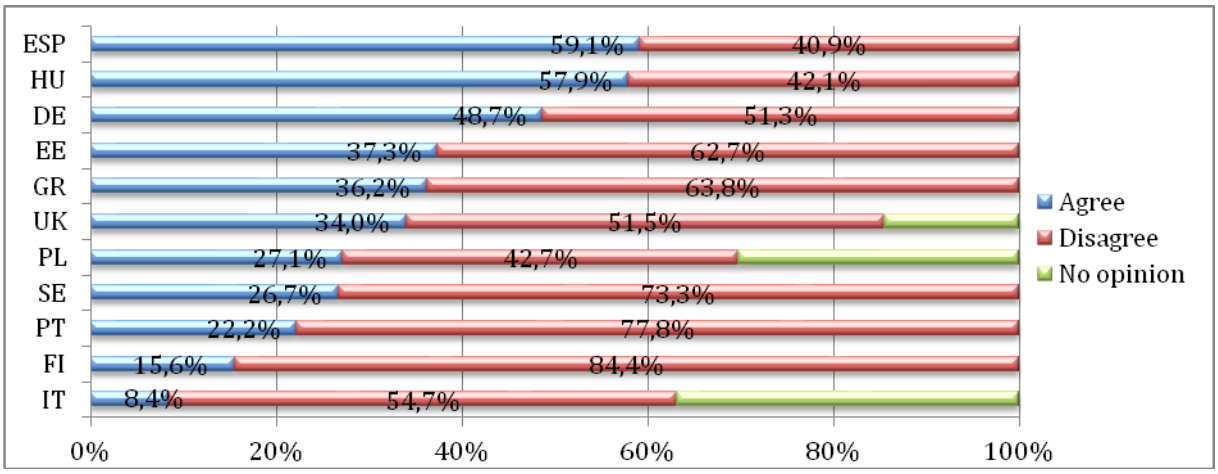


Figure 25: IT illiteracy is widespread



Socio-economic characteristics also influence these answers. Stepwise binary regressions on the answers (agree/not agree) have been used to identify effects of socio-economic variables and country effects. In order to improve the statistical analysis the work status categories "not professionally active" and "others" have been excluded from the analysis. The results of these regressions are summarised in the following table.

Table 5: Perception of constraints by socio-economic characteristics and country

	High costs	No internet infrastructure	No need for IT skills	IT illiteracy widespread
Gender			Women are more likely to agree	
Age	The older the more likely to agree		The older the more likely to agree	The older the more likely to agree
Education	The higher the less likely to agree		The higher the less likely to agree	The higher the less likely to agree
Living Location		The smaller the more likely to agree	The smaller the more likely to agree	The smaller the more likely to agree
Work Status	Unemployed agree more than all other groups			
Economic Sector	IT/Other Services less likely to agree			IT/Other Services more likely to agree

The most influential socio-economic characteristics are *age and education*. Perception of the younger generations is generally more positive. Education may also be seen as proxy for income. It is interesting to note that, when socio-economic characteristics are included in the analysis, national differences partly vanish. While country differences for the answer to the item "There is no suitable infrastructure for fast Internet in my area" simply reflect objective differences in countries' infrastructure, it is interesting to note, that also national differences with regard to the perceived need of IT skills remain.

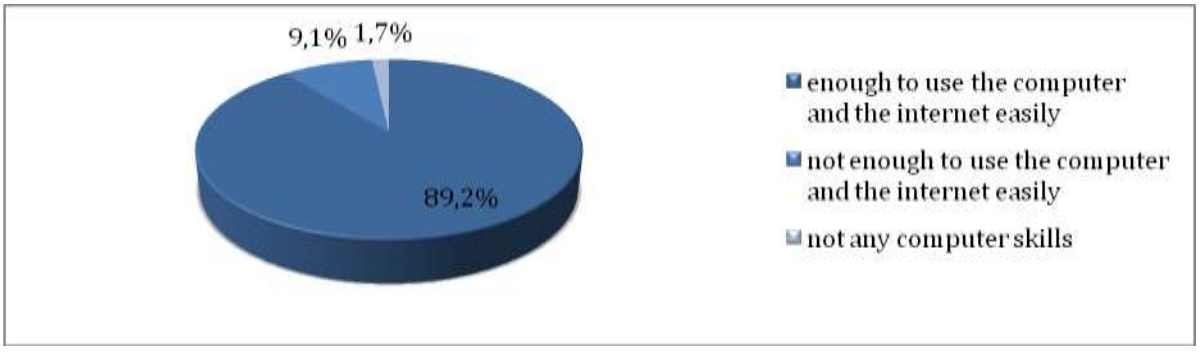
6 E-learning experience of the e-learning Group

The e-learning experience of e-learners was studied in terms of IT skills available, IT facilities available, the e-learning delivery modes, methods, tools and pedagogies in that course. Finally, e-learners were asked to assess their experiences.

6.1 Individual Requirements

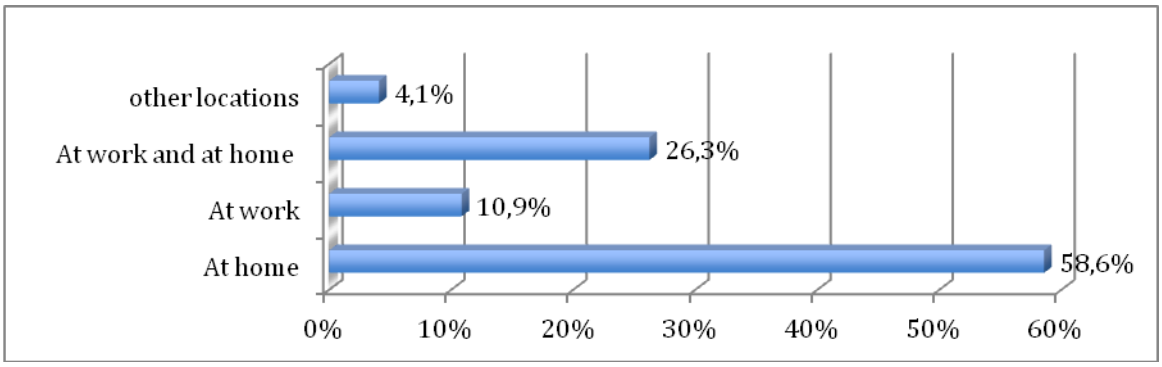
Most E-learners (89,2%) stated that they have had at least basic IT skills before attending an e-learning course.

Figure 26: IT Skills (e-learners)



About 80% of the respondents suggested that they required broadband connection to attend the course. Most of the respondents stated that they were able to use a broadband access from home, while a further 26,3 % were abele to you broadband access both at home and at work. Only 4,1% stated that neither have had access at home nor at work.

Figure 27: Broadband Access (e-learners)

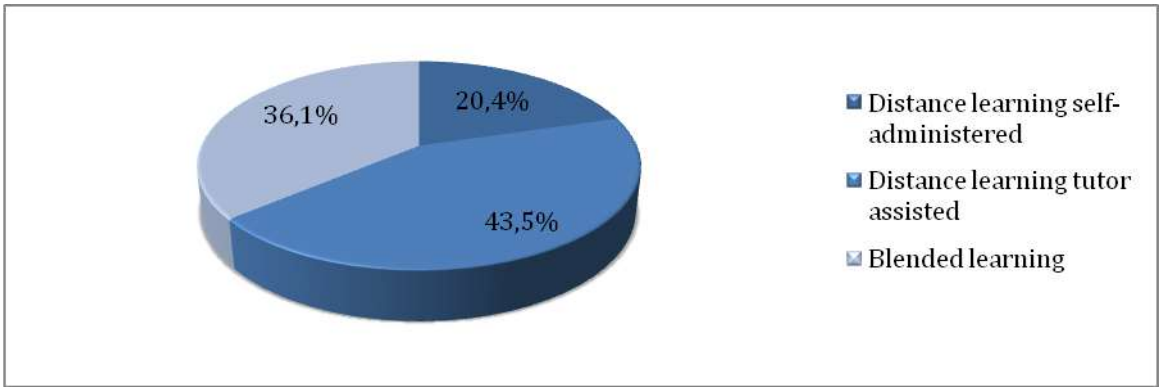


6.2 Course characteristics

Respondents were asked a set of questions to describe the most recent e-learning course, in which they participated.

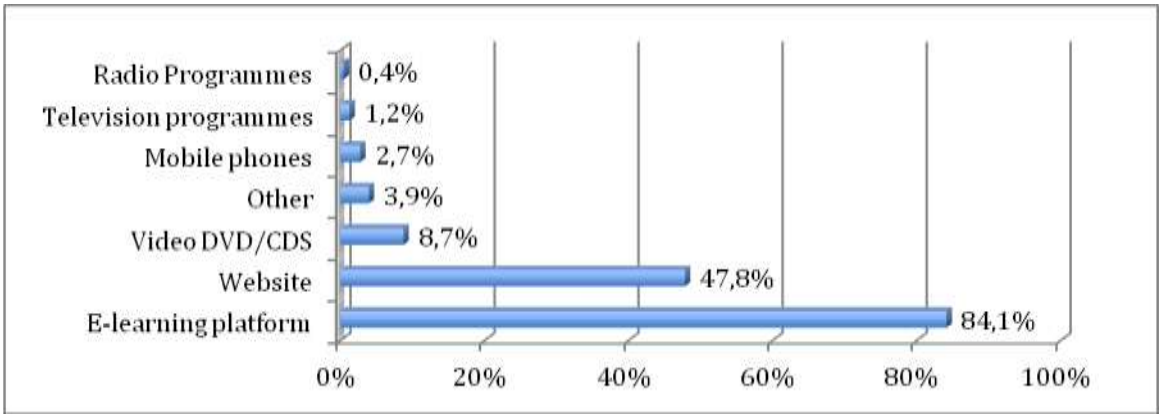
Less than 50% of the respondents characterised their e-learning course as blended learning, which is a combination of online and traditional classroom training. About a third of the respondents participated in a tutored distance learning course, while a further fifth participated in a self-administered distance learning course.

Figure 28: Mode of e-learning



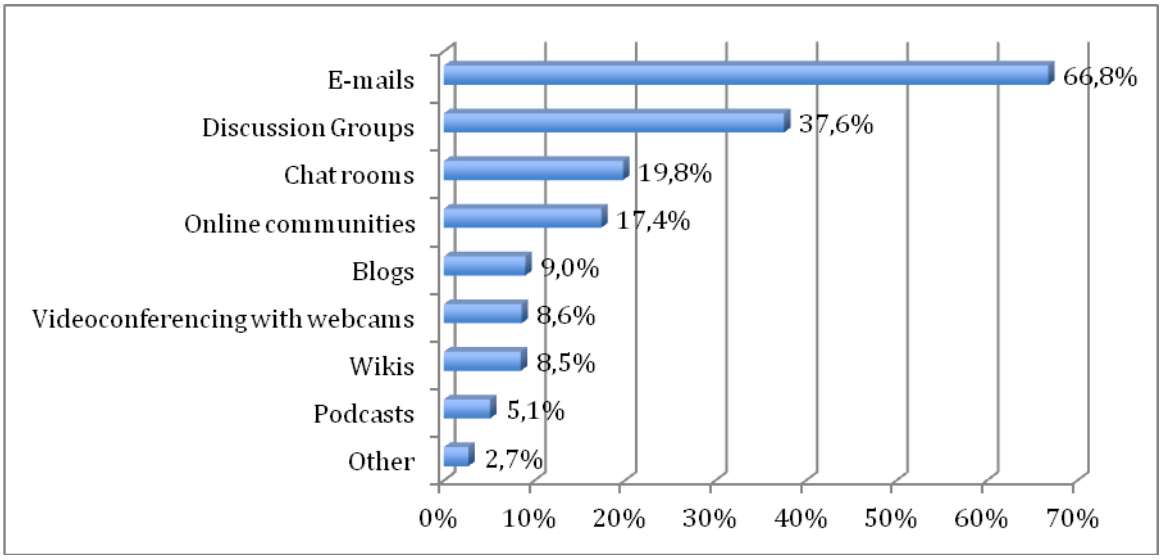
The vast majority of e-learners participated in an e-learning course, which was delivered through-learning platforms. Websites are also mentioned by about half of the respondents. Other delivery methods are of minor importance, which is in line with the results of the provider survey.

Figure 29: E-learning delivery method



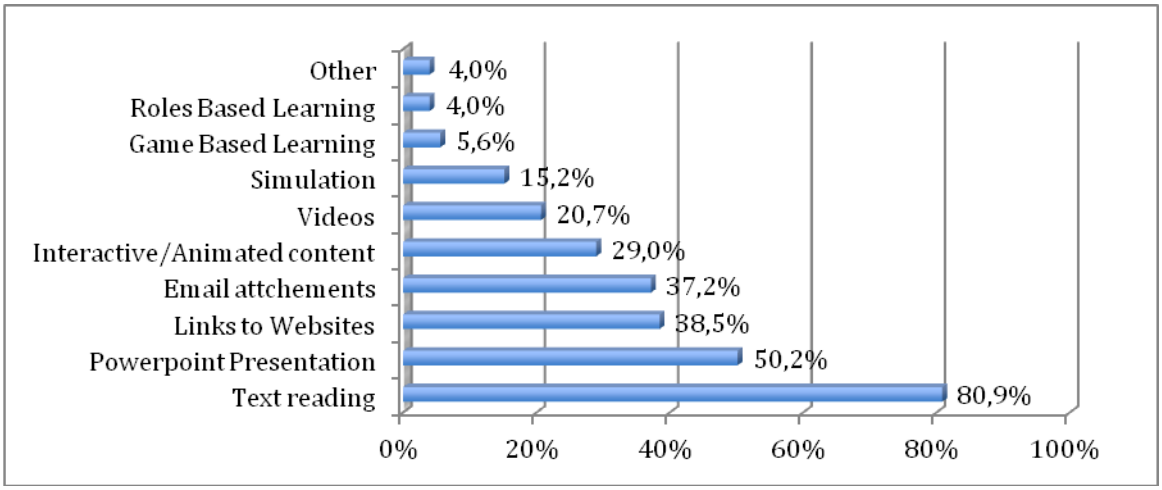
Emails are mentioned as the most common communication tool. Except discussion groups, which have been mentioned by about a third of the respondents, other interactive technologies are hardly mentioned. Common e-learning platforms generally offer most of these technologies. Despite the fact, e-learning courses seem not to make much use of these options.

Figure 30: Tools



A similar picture is drawn for e-learning methods. In practice, e-learning courses primarily are focussing on rather traditional methods (text reading/power point presentations), while interactive forms of learning such as role based or game based learning as well as simulations are only mentioned by a minority of e-learners.

Figure 31: Learning methods

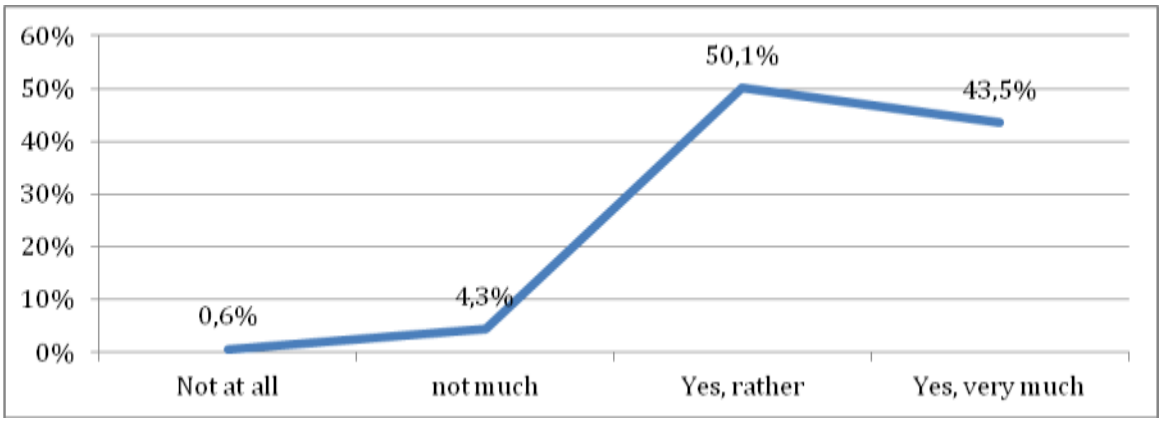


6.3 Assessment of e-learning experience

E-learners were also asked whether the methods and tools used in their last e-learnig course were easy to use and whether they considered them innovative. They were also asked to assess whether the course covered their learning needs and which aspects they would like to see improved.

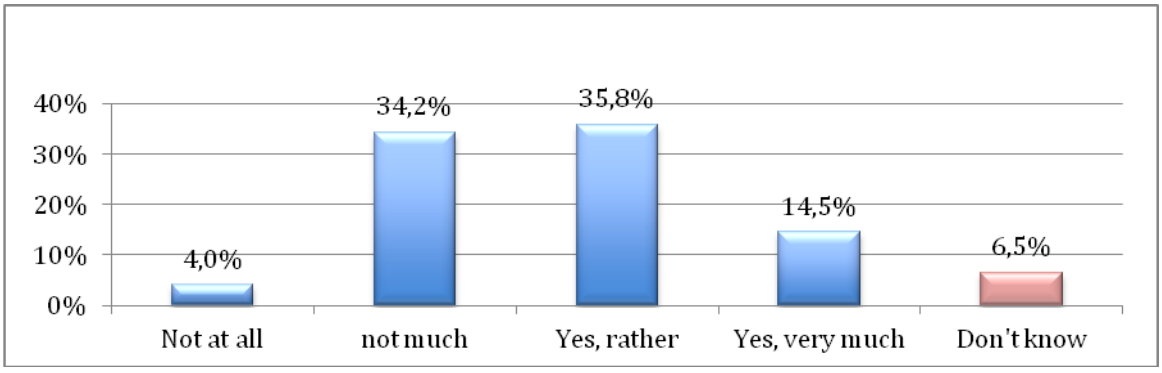
The vast majority (93,6%) of the respondents considered the applied e-learning tools and methods easy to use.

Figure32: Easiness of applied tools and methods



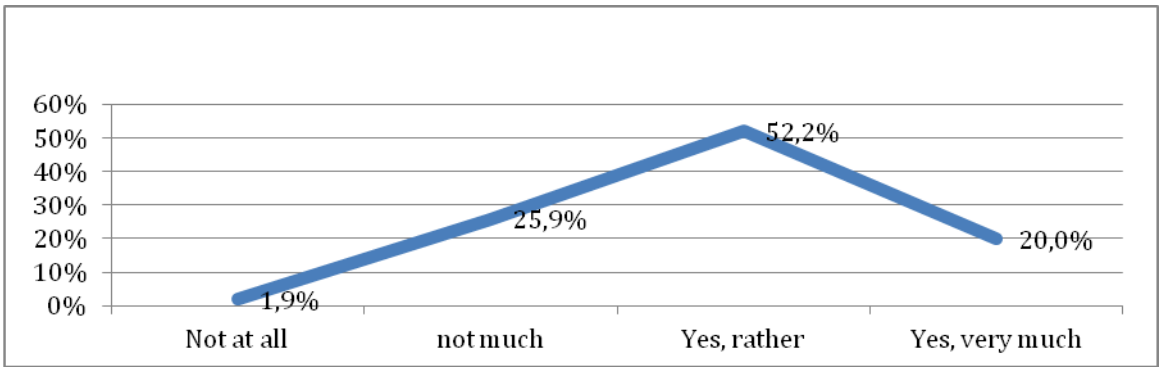
In contrast, only about half of the respondents considered the course rather or very innovative.

Figure 33: Innovativeness of applied tools and methods



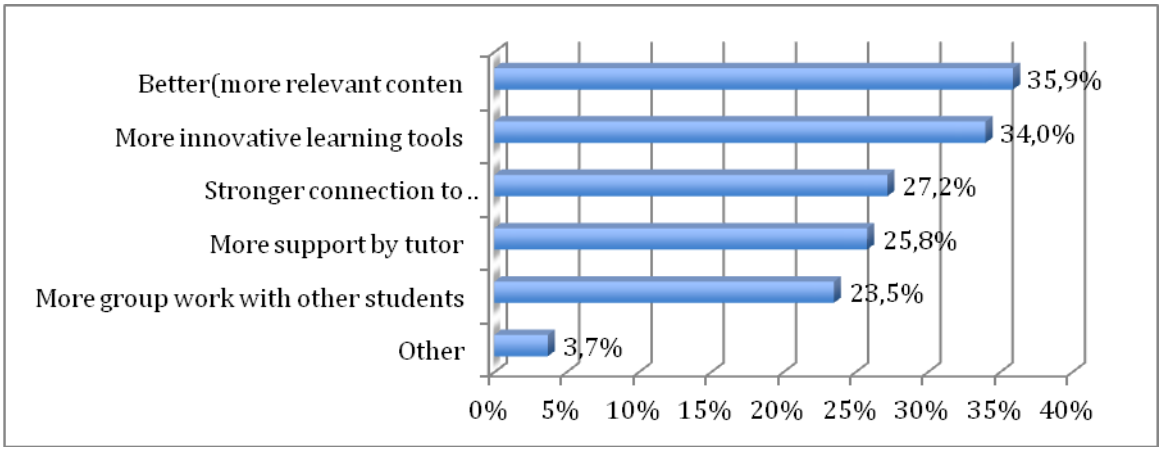
The assessment of the fulfilment of learning needs is rather positive.

Figure 34: Fulfilment of learning needs



This rating is closely related to the possibility to make use of the learnt content. Accordingly, suggestions for improvement focus on better and more relevant learning content.

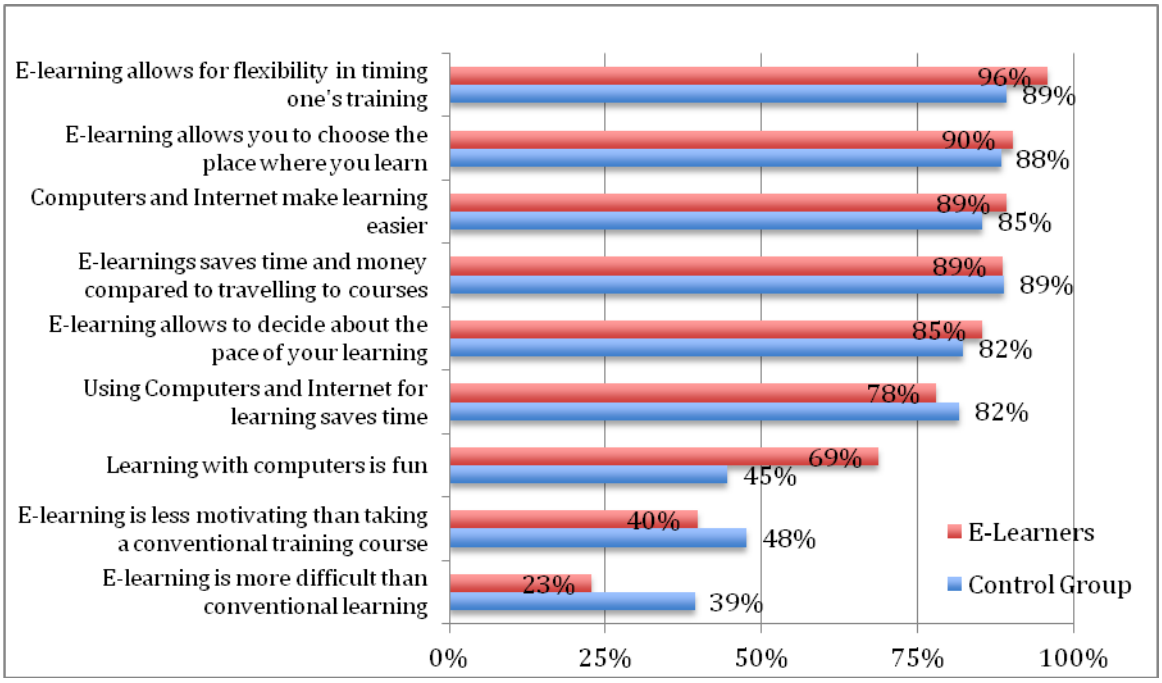
Figure 35: Suggestions for Improvement



7 Opinions on e-learning

Both the e-learner and control group were asked whether they agree or disagree to a set of statements about e-learning.

Figure 36: Opinions on e-learning



The overall attitude to e-learning expressed by both by e-learners and control group is generally very positive. E-learners approval rates are commonly slightly higher than those of the control group with only one exception ("saving time"). Larger differences only occur for the last three items "fun", "motivating" and "difficulty." The last two items are negatively framed. Thus the low rates of agreement for the last item is in line with the high agreement rates of the e-learners group to the other items. It is also noteworthy that about 40% of the e-learners neither consider e-learning to be "fun", and also agree to the statement that "e-learning is less motivating than taking a conventional course". Besides rating the difficulty of e-learning higher, Control Group respondents are even more critical with regard to the items "motivating" and "fun".

In order to control for effects of socio-economic characteristics and country differences stepwise binominal regressions have been applied. The results are summarised in the following table. In order to improve the statistical analysis the work status categories "not professionally active" and "others" have been excluded from the analysis. The results of these regressions are summarised in the following table.

Table 6: Effects of group, socio-economic characteristics and country on opinions on e-learning

Item	Variables that have an effect
Computer and Internet make learning easier	**E-learning Group (+),** Country
Using computer and Internet for learning saves time	Education (~), Living Location (~), Country
E-learning allows for flexibility in timing one's training	**E-learning Group (+)**, Education (+), Country
E-learning saves time and money compared to travelling to courses	Age (~), Country
E-learning allows to decide about the pace of your learning	Men (-), Country
Learning with computers is fun	**E-learning Group (+),** Men (-), Education (~), Unemployment (-)
E-learning allows to choose the place where you learn	Men (-), Work Status, Country
E-learning is less motivating than taking a conventional course	**E-learning Group (-)**, Age (~), Education (~)
E-learning is more difficult than conventional Learning	**E-learning Group (-)**, Men (+), Country

For binary/ordinal variables: (+) positive linear effect, (-) negative linear effect, (~) nonlinear effect.

The regression results only partly confirm a group effect on the opinions on e-learning. For four of the 9 items no group differences remain (if they existed) after additional variables are included. Still, e-learners rate “easiness”, “flexibility”, “fun”, “motivating” and “difficulty” more positive than the control group.

The analysis also highlights that country differences are important. The variable country has a significant effect on seven of nine items.

Effects of ordinal variables (education, age, [size of] Living location) are not always linear. E.g. answers of middle age groups may be more different to both younger and older groups.

8 Conclusions

In this report the results of a comparative survey of e-learners and a control group are presented, which have been undertaken in 11 European Union member states. The national surveys are not representative. However, the quasi-experimental design allows for some generalisations with regard to group differences, in particular, when techniques are applied to improve the validity of the statistical analysis. Thus, in this report meta-analysis and logistic regressions have been used in particular to critically investigate parameter differences between both groups.

In section 2 the structure of the e-learners and the control group sample is compared. Since the overall, aggregated sample size is comparatively large, even small group differences are statistically significant. However, since the condition of random sampling is not fully fulfilled in this survey, results may be biased. Thus, a meta-analytical framework is applied, in which all national samples are treated single studies, in order to validate the simple test. The results of the meta-analysis only in part confirm the results of the direct comparison of the aggregated sample. It could be shown that proportion of women in the e-learners is group is higher than in the control group. The same applies to the proportion of the age group “36-50.” Both results appear to be surprising, since it is a common perception that IT is the domain of male and the younger generation. A possible explanation is the gender division of labour; women are more commonly employed in contexts, in which e-learning training is offered (secondary sector (in the administration) service sector, large businesses). The age group is also a particular target group for professional qualifications in large companies (update learnt skills).

E-learning is positively correlated with business size and also offered for the unemployed. In contrast, employees of micro-businesses, the self-employed and entrepreneurs are less likely to participate in an e-learning course than a conventional training course. Training subjects of e-learners are more likely to be IT or business related and less likely to have a primary sector, technical focus.

Rural location is also negatively correlated with the chance to participate in e-learning courses. Thus, the comparison of the socio-economic characteristics of e-learners and the control group confirm that assumption of a disadvantage of the rural population to participate in e-learning courses. This disadvantage is composed of a combination effects such as the living location, sector employment and size of business.

E-learning, on average, take a longer time and participants are more likely to find e-learning courses through intentional internet search. Though, motivations to participate at e-learning courses differ not much from motivations to participate in a conventional training course, with one notable exception. E-learners are significantly more often interested in obtaining a certificate. In addition, the proportion of e-learners, which have fully paid their most recent courses themselves, has found to be

much large than the equivalent group of training participants in conventional training. However, e-learners rate the benefits of their training lower than participants.

Those respondents of the control group, which did not participate in any kind of training after their initial qualification, stated that this was mainly reasoned in perceived time constraints or the costs involved. Also, control groups respondents rated costs of IT and Internet not as a high constraint, and the vast majority of all respondents agreed to statements the pointed at time-saving potentials of e-learning. Thus, one could follow that e-learning offers a chance to reach out also for those groups, which do not participate in any form of training. However, 40 % of the e-learners (and an even higher proportion of the control group respondents) agreed to the statement that e-learning is less motivating than conventional learning.

The survey also investigated the e-learning experiences of the e-learners. Neither IT infrastructure, the availability of computer and broadband nor (lack of) it skills have found to be a major issue. The vast majority of respondents also stated that offered tools and methods were easy to apply. However, more substantial critic has been stated with regard to a lack of innovativeness of the applied tools and methods and an insufficient fulfilment of learning needs. A lack of innovativeness is supported by the fact the “text reading” and “PowerPoint presentations” are still the most important applied teaching methods. Other learning methods, and also the use of Web 2.0 applications find surprisingly little recognition in practice. Thus, despite the progress, which has been made in recent years with regard to the understanding of the design of e-learning courses and the widespread availability of appropriate technologies, the practice of e-teaching is still lagging behind. In addition, a comparatively large proportion of e-learning courses appear not to be well target.

However, the experience of e-learning is overwhelmingly positive. Subsequently, e-learners opinion on the potential of e-learning are more positive than views of the control group respondents.

With regard to rural areas this allows the conclusion that the lower participation of rural people in not based in negative attitudes towards e-learning, but simply in a lack of adequate supply of e-learning courses, which are targeting rural sectors and micro-businesses, which count for the vast majority of rural businesses and employees. Still, EU member states differ substantially with regard to such a “rural E-learning gap.” Finally, beyond the urban-rural divide social inclusion remains an issue.

Annex 1: Meta-Analysis

Meta-Analysis is a methodology to compare the results of different studies, which use a similar approach and comparable statistical measures. The comparison is based on the calculation of so-called effect sizes and a weighting procedure, which consider different sample sizes and variances. Thus, meta-analysis means a two-step procedure. Firstly, the effect sizes and weights are calculated for every sample and aggregated. Secondly, a test of homogeneity is applied to measure the differences or similarities between the several studies.

In the case of this study the parameter to be assessed is generally group percentage, e.g. in order to compare the share of women in the e-learners and the control group. Here, a generally applied effect size is the so-called odds ratio. The odds are the ratio of the probability that an event will happen to the probability that it will not happen. E.g., in the e-learners group the share of man is 39%. Thus, the odds are $odds_m$ = 0,39/(1-0.39) ≃ 0,64. This means that the chance that a randomly selected participant of an e-learning course is a man is only about 2/3. An alternative way to calculate the odds is simply to divide the absolute number of cases of both groups. The e-learners sample included 659 man and 1030 women. Thus, $odds_m$ = 659/1030 ≃ 0,64.

	[e-learners]	[control]
[male]	659	820
[female]	1030	823

To compare the difference between two groups - here the e-learners and the control group - the odds for both groups are calculated. The odds ratio is the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. In this case the odds ratio for man is OR_m = (659/1030)/(820/823) ≃ 0,64. An odds ratio less than one indicates that the event (being a male student) is less likely in the e-learners sample than in the control group. For the comparison of the samples the odds ratio is not used directly. Instead, the natural log of the odds ratio [log(OR)] is calculated (so-called “logit”). One effect of this transformation is that the natural logarithm is positive when OR>0 and negative when OR<0. Hence, positive/negative signs of the effect size (ES) indicate positive/negative relationships. Effect sizes are calculated accordingly for all samples and are weighted by the inverse variance (v) with

v =1/se = 1/sqrt(1/a+1/b+1/c+1/d),

where a,b,c,d are the cell values in the table.

The total ES is calculated as the sum of weighted individual ES divided by the sum of weights. Therefore, the total ES is also called the weighted mean effect size (ES_{wm}). In the case of the gender differences the weighted mean effect for woman is

ES_{wm}= 50,987/162,466 ≃ 0,314.

This equates an odds ration of OR_{wm} = exp(0,314) ≃ 1,37. The statistical tests onfirms a value greater than 1 (we skip the calculation of the test here).

	Control		E-Learner								
Country	**Male**	**Female**	**Male**	**Female**	**Δ % women**	**odds women**	**se**	**ES**	**w**	**w*ES**	**w*ES^2**
GR	36,1%	63,9%	38,6%	61,4%	-2,5%	0,899	0,221	-0,106	20,390	-2,168	0,231
DE	61,9%	38,1%	39,6%	60,4%	22,3%	2,482	0,270	0,909	13,689	12,444	11,311
HU	45,5%	54,5%	39,3%	60,7%	6,1%	1,287	0,165	0,252	36,664	9,241	2,329
PL	72,5%	27,5%	66,7%	33,3%	5,8%	1,317	0,226	0,275	19,546	5,380	1,481
UK	36,4%	63,6%	29,6%	70,4%	6,8%	1,362	0,316	0,309	10,044	3,104	0,959
PT	56,3%	43,8%	50,5%	49,5%	5,8%	1,261	0,285	0,232	12,320	2,857	0,663
EE	39,0%	61,0%	18,2%	81,8%	20,8%	2,871	0,258	1,055	14,998	15,818	16,684
FI	16,8%	83,2%	11,9%	88,1%	5,0%	1,503	0,390	0,408	6,589	2,686	1,095
SE	64,7%	35,3%	62,5%	37,5%	2,2%	1,100	0,485	0,095	4,247	0,405	0,039
ESP	49,5%	50,5%	35,0%	65,0%	14,5%	1,823	0,290	0,601	11,913	7,154	4,296
IT	43,4%	56,6%	55,7%	44,3%	-12,2%	0,611	0,288	-0,492	12,065	-5,935	2,920
Total	**49,9%**	**50,1%**	**39,0%**	**61,0%**	**10,9%**	**1,557**	**0,070**	**Sum**	**162,466**	**50,987**	**42,008**

The homogeneity test is based on a test statistic Q, where Q is the sum of the weighted squared effect sizes minus the weighted mean ES.

Q = sum(ES^2 *w) – [sum(w*ES)^2/sum(w)]

Q_{women} = 42,008 – [50,987^2/162,466] ≃ 26

Q is chi-square distributed with degrees of freedom (df) equal to the number of studies (k) minus 1.

df = k-1 ; k= number of studies

If the test of heterogeneity is significant (Q larger than a critical value, which is dependent from the df) than the different samples vary too much with regard to the parameter in question. For df=10 (11 countries minus 1) the critical value is:

X^2_{crit}= 18,307

Since $Q_{women} > X^2_{crit}$ we have to reject the homogeneity assumption. Thus, we conclude that national characteristics exist that do not allow for a European wide generalisation with regard to the share of women.

Further reading:

Lipsey, Mark W./ David B. Wilson (2001), Practical Meta-Analysis. Sage: London/New Delhi.

Annex 2: Binomial Regression

Regressions are calculated to analyse combined effects of several independent variables (x_i) on a single dependent variable(y). In the most common case of a linear regression the model takes the following form:

$y = a + b_1*x_1 + b_2*x_2 \ldots b_i*x_i$ where *b* are the regression coefficients and *a* is constant term.

To regress on nominal scaled data logistic (for binary data) and multinomial regressions are commonly applied. Here, the probability of occurrence of an event is predicted. For instance, in a logistic regression the dependent variable y takes the form of a so-called logit, which is log(p/(1-p), where p is the probability of an event. In the following logistic regression is illustrated for the statement "e-learning is more difficult than conventional learning." Data has been recoded to a binary (1 = agree, 0 = others).

Table 7: Frequencies Agree (not agree) item "E-learning difficulty"

		Häufigkeit	Gültige Prozente
Gültig	not agree	1798	69,4
	agree	791	30,6
	Gesamt	2589	100,0

Only 30,6 % of the respondents have agreed to this statement. Thus, the odds to agree are $odds_{agree}$ = 30,6/69,4 = 0,44. The respective logit is $logit_{agree}$= -0,819.

A backward stepwise procedure has been applied based on the Wald Criterion. This means that at first all variables are included in the analysis and variables are excluded based on a common criterion (in this cases the Wald statistic), if the overall estimation improves. The procedure ends, when the exclusion of a variable does not generate any further improvement of the estimation. The following table gives the final solution for the Logistic Regression on the item "e-learning difficulty."

In this estimation only categorical variables are used, which have been coded as so-called "Dummy" (0,1). Thus, ten Dummy-Variables (for each country except one) have to be created. The remaining one serves as the reference. Since three categorical variables are integrated in model, which are all "Dummy" coded, the constant term in the bottom line is the estimate for the combination of these three references (Country = Italy, group = Control Group, gender = woman).

Table 8: Logistic Regression on opinion "e-learning difficulty"

	Coefficient B	Standard err.	Wald	df	Sig.	Exp(B)
group(1)	-,724	,096	56,483	1	,000	,485
gender(1)	,181	,094	3,705	1	,054	1,198
Country			70,649	10	,000	
Greece	,549	,260	4,471	1	,034	1,732
Germany	1,561	,271	33,097	1	,000	4,766
Hungary	,449	,253	3,162	1	,075	1,567
Poland	,758	,251	9,135	1	,003	2,135
United Kingdom	,405	,307	1,743	1	,187	1,500
Portugal	1,117	,287	15,144	1	,000	3,056
Estonia	1,019	,258	15,537	1	,000	2,770
Finland	1,058	,289	13,366	1	,000	2,880
Sweden	,154	,397	,151	1	,698	1,167
Spain	1,003	,290	11,958	1	,001	2,726
Const	-1,100	,235	22,011	1	.000	0,333

The last table column (exp(B)) represents the odds of a variable. Thus, Exp(B)=1 means an even, 50% chance. In this case Exp(B)=1 may be interpreted that the chance of a person to agree is the same not to agree. A constant value of $Exp(B)_{const}$ = 0,333 means that an Italian woman is less likely to agree than other respondents, since according to table 6 the odds to agree are 0,44.

For Dummy-Variables the coefficient B is the added change of the logit, when the value of this variable is changed. For instance, if we change the nation from Italy to Spain B (the logit) increases by 1,003 to -0,097. Since -0,097 is greater than -0,44 this group is also more likely to agree than the average. $Exp(B)_{Spain}$=2,726 suggest that Spanish respondents have an 2,7 times higher chance to agree than the reference respondent.

The Dummies for gender suggests that shifting from women to men increases the chance to agree, while shifting from control to e-learners group will substantially decrease the chance to agree. Since, the question is framed in a negative way ("e-learning is more difficult than conventional learning") this suggests that e-learners are less likely to find e-learning more difficult than conventional learning. Thus, Italian women in the e-learners group appear to be the most positive about the difficulty of e-learning in comparison to conventional learning, while the most sceptical are German man in the control group.

However, these estimates should not be over- interpreted, since the quality of the fit is very low. So-called pseudo R-squareds range from 0 to 1 (though some pseudo R-squareds never achieve 0 or 1) with higher values indicating better model fit. For this model, the pseudo R^2 values are all close to zero.

Pseudo-R^2	Cox & Snell R-squared	Nagelkerkes R-squared
Value	0,062	0,088

PART III OVERALL CONCLUSIONS

The results of the surveys imply that the e-learning market is diversified and fast-developing, including public and private, small and large providers, without having achieved however a satisfactory "match" between supply and demand. The number of "young" commercial organisations and new entrants signify a dynamic market, the competitiveness of which appears to be strung on innovativeness and specialisation. Although these providers offer a wide range of learning content, there is a strong concentration on IT and business skills, thus limiting the range of learners that could be attracted. The demand appears to be supply-driven to a large extent, although the latent demand (as revealed by the control group) calls for a wider range of training offers, which in rural areas include various subjects of the primary sector and languages.

It is very encouraging that most e-learning providers place great importance on content development and training of staff. It seems that they would benefit from a policy that would support providers in these respects, especially regarding the e-learning inclusion of rural workers and communities, which at present do not seem to benefit as much as their urban counterparts. A wider range of learning subjects and the additional resources to tailor the content to the needs of the target learners appears to be an important consideration, shared by learning providers and appreciated by learners.

It is also encouraging that 5 out of 10 e-learning providers pay attention to innovation and perceive their products as innovative. Moreover, such innovation appears to stem more from student-centred, interactive and creativity-based pedagogical methods rather than technological innovations, such as game-based learning or use of mobile phones. This attention to learning methods is in line with current European policy, but technological innovation should be also supported by policy, to enable providers not only to deliver learning in a better and more effective way, but also to take learning to those who have no access to it because of infrastructure constraints or unfamiliarity with ICT. Alternative media, and especially social media may have also a positive effect, as shown by the e-ruralnet study and recent work of IPTS (Redecker, Ala-Mutka, Punie, 2010).

Indeed, major constraints for developing the e-learning market in rural areas, according to the providers, is IT illiteracy and limited infrastructure for fast internet. Thus, policy measures are necessary to tackle this problem which still remains critical for equitable access to learning opportunities, although the assumption was that it would have been resolved much earlier[7] (Ala-Mutka, 2011).

Public subsidies have been an important motivation for e-learning providers to enter the market, and this definitely varies between countries. However, for the majority of e-learners private means are resourcing their studies, while the contribution of employers and public subsidies are significant but considerably smaller. Moreover, the gap between job-related expectations of learners and actual benefits achieved by learning also leaves a lot to be wished: career benefits are enjoyed only by minorities of learners whether they attended e-learning or face-to-face (conventional) courses.

Employers appear to be rather sceptical of e-learning, as implied by their tendency to support conventional learning at a higher rate compared to e-learning, although public subsidies are equally available for both types of learners. The apparent reluctance of employers to support staff training through e-learning is reflected in the lack of actual results or in the limited results of e-learning in job promotion and career development of the e-learners. Public subsidies (which are available and used in all countries) could contribute to a better linkage between e-learning and career development, by creating a "bridge" between employers and learners linked to the learner's job prospects.

The profile of students though leaves a lot to be done to widen the scope of e-learning: the recruitment of e-learners from the better educated and younger segments of society implies that ICT-supported learning has not reached equitably all citizens of Europe. The reasons for this, as already hinted above and as several European policy documents have analysed, are complex. A combination of policy measures are necessary to tackle this problem, including infrastructure and keys skills related to ICT, but attitudes play a major role as well. It remains to be seen if *a new learning culture* created within a digital and networking environment will allow to widen the student body and the benefits of e-learning.

However, the control group survey has indicated that even amongst those better educated and younger groups, there is latent demand that awaits to be tapped: the attitudes towards e-learning are positive, there are expressed skills needs by these individuals and their wish to take up learning from a distance is declared. By looking more carefully at the stated skill needs of the control group, it seems that the content of the available e-learning offer must be further developed, as already mentioned above, and the range of subjects enlarged, to include more technical and focused skills, linked to specific economic sectors and occupations.

The proof of the success of e-learning is that the majority of learners are willing to try e-learning again; and that most e-learners fund their studies from own sources, either wholly or partly; moreover, a huge majority admit that they get the benefit of personal development through such learning, whether it is accompanied by job-related gains or not. These positive experiences, coupled with the positive attitudes stated by both e-learners and control group members, confirm the significant prospects of e-learning to be an important channel of inclusive learning, once the constraints from the supply side are removed and access to ICT services is assured.

REFERENCES

European Commission, “Employment in agriculture and in the other sectors”. http://ec.europa.eu/agriculture/agrista/2010/table_en/C5-1-3513.pdf (2010)

Handler H.einz, Koebel B., Reiss P., SchratzenstallerM, “The Size and Performance of Public Sector Activities in Europe” (2004)

Kailis E., Pilos S., “Lifelong learning in Europe”, Eurostat Statistics in Focus 8 (2005)

Redecker, Ch., Ala-Mutka, K., Punie, Y., “Learning 2.0 - The Impact of Social Media on Learning in Europe”, Policy Brief, IPTS-JRC 56958, European Commission, Luxemburg (2010)

Ala-Mutka , K., Mapping Digital Competence: Towards a Conceptual Understanding, IPTS-JRC 67075, European Commission, Luxemburg (2011)

LIST OF FIGURES AND TABLES

PART I

LIST OF FIGURES

LIST OF TABLES

PART II

LIST OF FIGURES

LIST OF TABLES