THE TRANSFER OF EU RESEARCH INTO UNIVERSITY EDUCATION

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ABSTRACT

Two projects funded by the European Union, PORTAL and TRKC, have investigated the link between transport research and university education in Europe. The paper reports on the findings of these investigations. Interviews and workshops are the tools used. The analysis is focused but not restricted to EU-funded research. The practice of take-up of research results by university teachers into the range of education activities is explored. The interests and preferences of the teachers for the inputs from research that should feed education are highlighted. Recommendations to overcome the barriers that currently hamper the take-up of research results are provided. In particular, actions are suggested to tailor dissemination of research to education. The insights of the paper contribute to help the teaching community reflect research results in education programmes.

Keywords: research, university education, dissemination, European Union

INTRODUCTION

One form of exploitation of research in general and of research funded by the European Union (EU) in particular is the use in university education. Research results are an important input of education programmes as knowledge, at both theoretical and empirical levels, need to be up-to-date and in line with societal and market needs. The vital importance of the link between research and education was recognised in the past: the university institutions pursue both streams of activities, research and education.

To help the providers of education reflect the results of latest research it is useful to deepen the understanding of the functioning of the transfer of research into education and find solutions to meet needs and overcome barriers. A key related issue is the way research projects disseminate their achievements. The paper investigates the practice of transfer of results from research into university education and provides suggestions for actions that can be taken to improve such practice.

The analysis considers research and education within the broadly defined subject of "transport". The boundaries of this subject vary because of the relevance of a multiplicity of disciplines. Traditionally, the transport subject has been regarded as synonymous of traffic engineering and transport planning which sprang from civil engineering. Usually the engineering education in transport is integrated with subjects from civil engineering (physical infrastructure design) and industrial or mechanical engineering (Intelligent Transport Systems - ITS, and propulsion systems). Courses in transport economics and transport policy are part of the syllabus of social sciences degrees.

Increasingly university institutes and departments specialising in transport have acquired a multi-disciplinary character including engineering, mathematics, economics and, more recently, due to the relevance of behavioural aspects, psychology. The courses, and degrees, offered reflect such variety. Passenger transport has been traditionally the priority subject in education; today courses addressing specifically freight transport, and extending to logistics and supply chain management, are offered.

The analysis in the paper is based on the insights that were achieved by two EU-funded projects: PORTAL (Promotion of Results in Transport Research and Learning) of the European Commission's Fifth Framework Programme, and TRKC (Transport Research Knowledge Centre) of the Sixth Framework Programme. A special focus was given to the transfer of EU-funded research because the European Commission is committed to optimise the exploitation of the research they are funding. The next section of the paper describes the investigation activities carried out within the two projects. The subsequent section reports on the findings of these investigations. A few remarks on the impacts of the findings conclude the paper.

METHODOLOGY

PORTAL (2000-2003) aimed primarily at producing education material derived from EU-funded projects, with particular regard to transport at local and regional level (PORTAL Consortium, 2003). TRKC (2007-2010), which is the successor project of the projects EXTRA (1997-2001) and EXTR@Web (2002-2006), aimed at producing systematically information on EU-funded research, dealing with transport at any level (Delle Site and Leiss, 2004; Stantchev et al., 2010). TRKC also covered selected research funded at national and local level in European countries. The TRKC dissemination products, including programme and project summary forms and thematic research summaries, are available on a portal (at the address http://www.transport-research.info/web/index.cfm). Additionally, the portal makes available documentation from projects, in particular the project final report.

Both projects conducted activities, where users of research results in universities were involved, which help deepen the understanding of the link between research and education. The aim of these activities was to gather inputs useful for the design of the education and dissemination products, respectively, that the two projects had to deliver. At the same time, the activities made it possible to collect knowledge, of both descriptive ("what is done") and normative ("what is to be done") character, about the processes involved in the transfer of

research results into education. Insights were provided about the habits and preferences of the users in universities, and recommendations could be made for ensuring integration of results of EU-funded research into education.

PORTAL carried out in 2001 surveys on the demand for education and on education activities. Students, organisations employing transport professionals, individual professionals and university providers of education activities from 24 European countries were involved. In total around 3000 questionnaires were received back from them. Subsequently PORTAL developed education material including summaries, presentations, audio CDs, photo CDs and distance learning material. A first release of this material was discussed within 12 workshops held in Autumn 2001 which could provide recommendations for improvements. The final release of the education material was tested in courses and finally evaluated by teachers and students. The results of the surveys of education demand and of education activities are found in a workpackage report (PORTAL Consortium, 2001). A synthesis of the overall results is in the project final report (PORTAL Consortium, 2003).

TRKC devoted a specific workpackage to the investigation of the link between research and university education. Such investigation is part of a broader set of activities which the European Commission assigned to TRKC in order to explore the range of targets for research dissemination. These include, in addition to transfer into education, policy making and market take-up. An on-line survey among teachers in European universities was carried out in 2007. More than 1000 teachers were contacted, working predominantly in the teaching areas of transport engineering and transport planning, transport economics and policy, logistics and freight transport, ITS. 129 questionnaires were received back from teachers from 21 European countries. Additionally, 4 face-to-face interviews and an email inquiry which obtained 9 replies were carried out involving two Italian and one UK university. The results of these surveys were discussed in a workshop held in September 2007. Finally, based on the outcome of both PORTAL and TRKC and following a specific request of the European Commission, a mini-roadmap aimed at improving the transfer of research into education was developed. Detailed results of these activities are found in a project report (TRKC Consortium, 2007).

RESULTS

The use of research in education

The university teachers who responded to the TRKC survey show an interest in EU research as 33% of them say they don't use EU research but would be willing to do it. The percentages of those not at all interested in the transfer of research into courses is very low in both cases (EU-funded and non-EU funded research).

The PORTAL survey had found a low familiarity of teachers with EU-funded research, with many even ignoring the difference between EU "programmes" like INTERREG and "projects" like PORTAL. A comparison between the PORTAL survey and the TRKC survey shows that the share of respondents taking up EU-funded research in university courses rose over time

from a small 20% (2001 PORTAL survey) to 62% (2007 TRKC survey). This result is indicative that EU-funded research has significantly increased its impacts on education. The TRKC survey shows that non-EU funded research is transferred into courses more than EU-funded research (88% of respondents vs 62%). The detailed list of topics transferred from research into education by teaching area that resulted from the TRKC survey can be found in TRKC Consortium (2007).

Ways in which research is included in the courses are investigated in the TRKC survey. Figure 1 shows that the majority of respondents have used research "as case study for illustration of theory". The second most used option is "as additional reading". The results do not differ significantly between EU-funded and non-EU funded research.

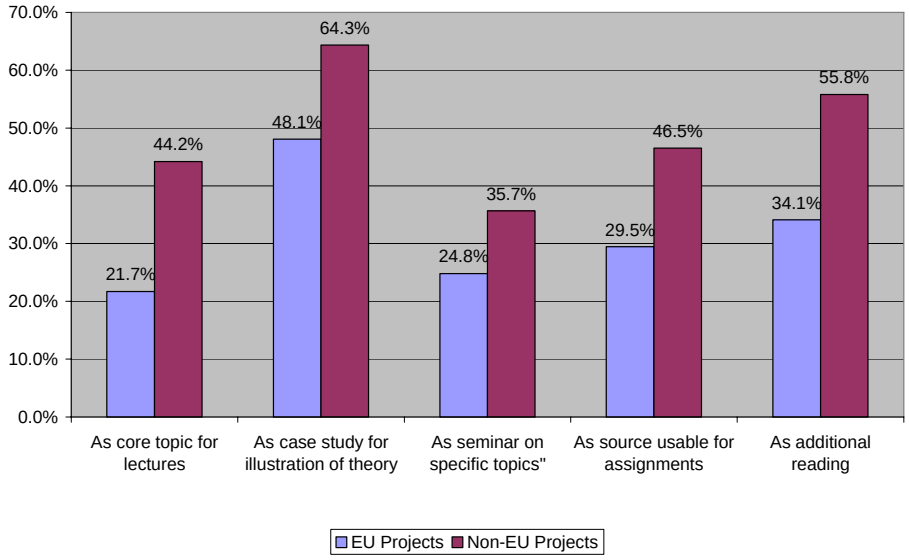

Figure 1 – Use of EU-funded and non-EU funded research (TRKC survey)

The TRKC survey investigates the products from research which are used in the courses. The first most used product from EU research is "results of demonstrations of new technologies/systems/policies", followed by "surveys". The first two most used products from non EU-funded research is "results of demonstrations of new technologies/systems/policies" and "policy recommendations", followed by "mathematical modelling and decision support tools".

The products used by teaching area are as follows. "Results of demonstrations of new technologies/systems/policies" is the most used product in the areas of transport engineering and transport planning, and in that of logistics and freight transport. "Policy recommendations" is the most used product in the area of transport economics and policy. In the ITS area the most used products are "mathematical modelling and decision support tools" and "results of demonstrations of new technologies/systems/policies". There is no difference in this respect between EU-funded and non EU-funded research.

The dissemination tool used by the teachers resulting from the TRKC survey is in Figure 2. It is shown that for EU-funded research the dissemination tools most used by teachers are “personal experience” and “deliverables and reports from projects”. A different result is found for non EU-funded research. The most used tool is “papers in scientific journals”. Second is “personal experience”.

The importance of personal experience as tool for taking up results from EU projects is stressed by both the PORTAL and TRKC survey. One reason which is mentioned is that teachers tend to be sceptical about research findings of other researchers. In this respect it needs to be taken into account that teachers are often also researchers but not in all areas where they teach. Therefore the transfer to them of research results is an issue.

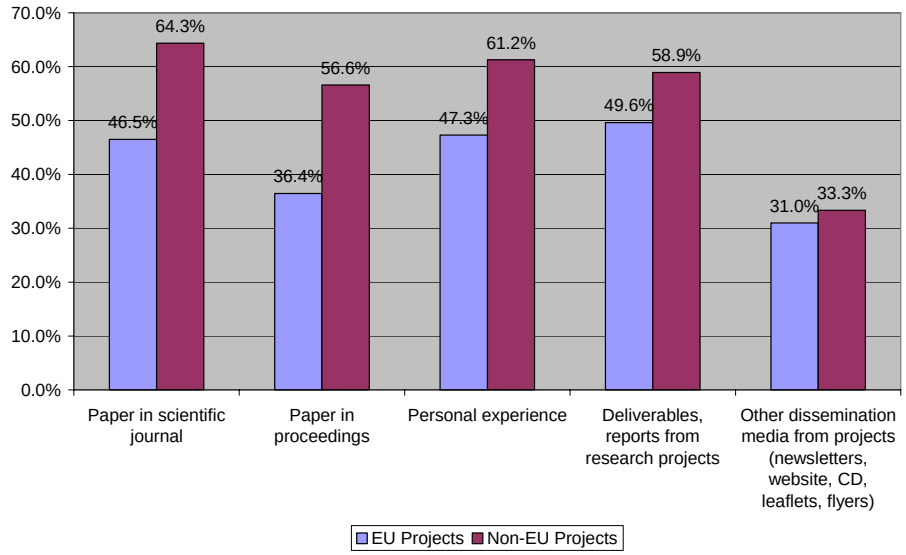

Figure 2 – Dissemination tool used from EU-funded and non-EU funded research (TRKC survey)

Results from research are found to be used increasingly as courses become more specialised. i.e. more in graduate and post-graduate than in under-graduate courses. Results from research are used particularly for the development of theses and dissertations. The topics of seminars often derive from research projects. The transfer of research results into education cannot be seen as a one-way communication from researchers to teachers: it is rather a complex process of interaction between researchers, teachers and students.

A few cases are mentioned where research, and in particular EU-funded research, is essential for courses. This is the case of courses in applied economics where current policy developments, and associated international comparisons, are the core. Another case is that of courses which have a highly innovative character and are motivated by emerging policy priorities, such as certain courses in road safety which rely heavily on research of EU-funded projects.

EU-funded research is often applied research. In some cases lack of theoretical content is

mentioned as a limitation for take-up in courses. This is true in particular for basic courses where the primary aim is skill formation and information provision is regarded only as a second priority.

It is relevant here to mention research on the development of new technologies which is of interest to a greater extent for advanced courses. This reflects also the fact that basic courses in degrees with a transport orientation tend to prioritise the functional design aspects rather than the design of technologies. On the other hand, EU-funded research is found to be particularly suitable for courses targeted at practitioners. Such courses are increasingly offered by universities which tend to adopt a more commercial approach as a consequence of the more competitive environment.

Preferences in the transfer of research into education

The preference of the teachers for the dissemination tool to be used to learn results from research, resulting from the TRKC survey, is in Figure 3. Teachers in the majority prefer papers in scientific journals. Project reports are the second preferred tool. Also, the availability of project results in the form of slide presentations is mentioned as desirable. Reasons for the preference for journal papers are essentially peer review-guaranteed credibility, having taken into account the usual scepticism towards research by other researchers, and concise and stylised format which is not found in research reports which, instead, are often lengthy and sometimes patchy.

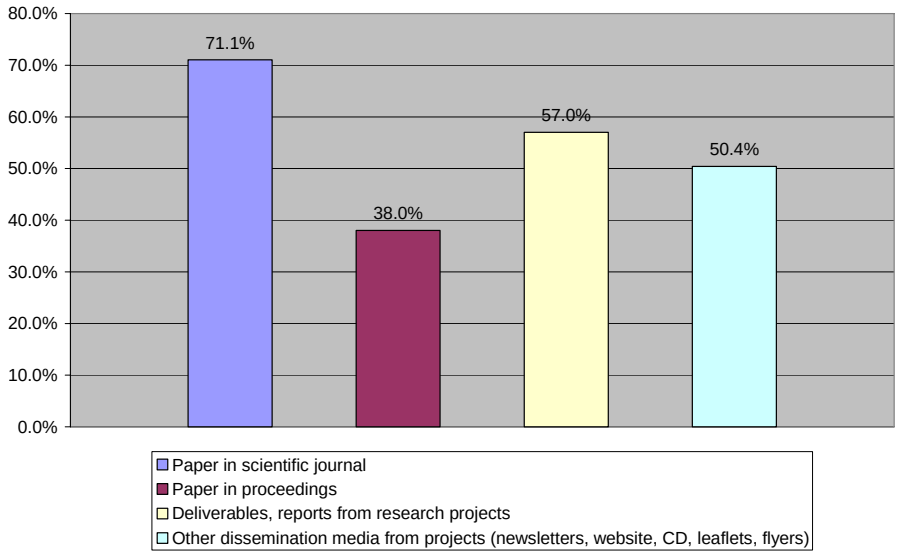

Figure 3 – Preferences for dissemination tools (TRKC survey)

There is a need to keep distinct two stages: first teachers learn from research and then knowledge is transferred from teachers to students. This second stage requires a further processing of the inputs from research projects for a twofold reason. One reason is that each teacher has his own preferences and style and will need to adapt the inputs to these. The

main lesson learnt from the PORTAL project is that it is extremely difficult to develop teaching material that fits all possible expectations. Another reason is that often it is necessary to pool and systematically organise the knowledge which has been produced by different research projects. In this latter respect thematic networks and coordination actions have the potential to play a useful role.

Regarding the content, the interest of teachers is in having detailed and usable information about all the products developed within the life of a research project: these include in particular methodologies, case studies and good practice. Information on methodologies needs to be well documented in order to make application of the methodologies in other contexts feasible. This holds in particular for mathematical models used in transport planning. Also, some teachers find desirable to have available the full databases, in the proper electronic formats, which research projects have developed rather than a report which only describes their main elements and the use made. Charts and photos in electronic form are considered very useful for the preparation of teaching material.

The topics of interest for transfer from research into education that have been mentioned by the respondents to the TRKC survey are in Table I.

Table I – Topics of interest for transfer from research into education by teaching area (TRKC survey)

Transport engineering and transport planning	*Transport economics and policy*
Demand responsive transport – DRT - systems: when they are convenient compared to conventional public transport	Cost-benefit analysis reports on urban infrastructure
Driving behaviour	Evidence on impacts of measures
Dynamic assignment models	Social costs derived from transport externalities
Dynamic Origin-Destinaton - OD – matrix estimation	*ITS*
Effects of pricing on mode choice	Geographical information systems used for route optimising, route navigation
Environmental impacts of transport	Implementation issues of telecoms infrastructure
Impacts of measures	'Road user charging – RUC - policy, RUC requirements and technologies
Interaction between signal settings and traffic flow patterns	Positioning and navigation system integrity (vital for liability and safety critical services),
Land use impacts	Impact of advanced technologies on the environment
Land use and transport interaction modelling	Telecommunication systems in transport and logistics
Land use and public transport system relationships	Traffic identification systems (such as Radio Frequency Identification - RFID, location based services)
Mobility management tools: implementation	*Freight transport and logistics*
Network design	Assessment from the point of the firm of logistics and supply chain management solutions
Public space	Green logistics
Regeneration impacts	Supply chain management issues
Social impacts	Intermodal transport
Spatial development theories and practice	*Other*
Stated preference methods: applications and technical issues	Innovative tools and methods to design Man Machine Interfaces – MMIs (ergonomics)
Traffic generation: general information and models	
Traffic flow theory: models	
Traffic safety: general information and models	
Transit network planning	

Barriers to the transfer of research into education

Barriers which emerge from the investigations can be categorised into the following:

- information availability, lack of awareness and information retrieval,
- unsuitability of formats and styles of products from research projects, and
- quality of the research.

Not all research projects carry out dissemination activities. When confidentiality of results is not an issue and dissemination is done, a project website is an effective tool because it can offer, in electronic formats, all the project documentation. However, project websites are often discontinued after the project end and documentation from projects is not made available permanently. Research results are still of interest for a long time after they are released as research often offers solutions for problems several years ahead.

Dissemination is generally considered as a priority by EU-funded projects. The EU has recognised the importance of dissemination of research since the founding Treaties. EU-funded projects use different dissemination tools. In addition to the project website, newsletters and printed leaflets and brochures are used. Only to a minor extent results of EU-funded projects are disseminated by the publication of books and papers in scientific journals. Dissemination of EU-funded research does not suffer from the language barrier which, in contrast, severely restricts the potential for transferability of research funded at national and local level.

Having the information available is not sufficient for transfer as teachers must be aware of it and be capable of retrieving it easily. Lack of awareness is still a barrier although the surveys have shown an increasing use of EU-funded research in university courses. Awareness of results from EU-funded research is mostly the consequence of personal involvement in the project, to a lower extent of literature search or conference attendance. In addition, it is noted that those in universities who are most heavily involved in EU-funded research and have a more detailed experience of it are members of the research staff who are not necessarily expected to make an input to teaching. Without personal involvement in research, for awareness teachers need to search themselves for information or, alternatively, receive notification of availability.

The search for projects in a particular area is facilitated when the project is included in a database publicly available on the internet with a dedicated search engine allowing search by theme, such as the TRKC portal covering European projects. However, there is a multiplicity of sources in the internet which gives rise to information overload. Generally, tools to retrieve information from them exhaustively and systematically are lacking. There is a need for helping teachers know “what is available where”.

Another related barrier is the lack of time of teachers to search for appropriate material. The difficulty of the search task and the lack of time become even more serious when it is considered that the search should be repeated over time to achieve continuous updating. Automatic alerting systems have been put in place by publishing companies and work

already effectively for papers in scientific journals and for books (e.g. Elsevier through its "ScienceDirect" service), while electronic newsletters sent out by individual projects for alerting on project products work less effectively.

The formats and styles of the products provided by research projects do not meet teachers' preferences. Products are found indigestible and unwieldy. Teachers that have been involved in EU-funded projects are likely to be more familiar with the grey literature of unpublished project reports but this is not necessarily an advantage.

Teachers need high-quality and succinct review material, ideally in the style of papers in scientific journals, that research projects often do not yield. It is unlikely that material produced by research projects can be directly transferred to students as course notes because each teacher has his own style and preferences. Also, researchers might not be the best persons to produce education material, those who teach are in a better position to do that. There is little acceptance of material prepared by anyone than a professor.

A final category of barriers relate to the quality of the research. Quality may often be not sufficiently determined. There is a mental barrier of academics to trust results which have not been achieved by themselves. An argument holding for research in general is that research results need a period of assimilation before they can be transferred into education programmes. New results may take time before the academic community accepts them. From this the preference for publications in journals, as peer review provides validation for new results. For technological research in particular, new technological solutions must undergo a period of testing. This clearly applies to EU-funded projects which relate to pre-competitive research. Teachers may judge that the technology is not mature enough for a transfer into education programmes. A related barrier is scepticism for positive results of projects: everything from research tends to be "sugar-coated", while failures tend to be hidden.

Recommendations

Dissemination by individual research projects

Research-funding bodies should take action, using both contractual requirements and incentives, to ensure that dissemination carried out by individual research projects is done effectively and is able to meet teachers' needs. In the absence of explicit contractual requirements and of incentives from the funding bodies, research organisations will not adapt dissemination to the needs of the education market.

The funding body should require research projects to report shortly on the relevance to education of the project results. Preferably such report should be written by a teacher rather than by a researcher. As the activity of pooling and comparing research results from different sources and projects is important for the transfer into education, thematic networks and coordination actions are the first candidate for the implementation of such requirement.

To overcome the language barrier, national and local research-funding bodies should require projects to provide translation into English of at least the project final report. This could be made available to the public via posting on the TRKC portal.

As papers in scientific journals meet the preference of the teachers, incentives should be put in place to increase the production of such publications. Incentives might take the form of bonuses in the evaluation of research proposals: the higher the number of papers originating from EU-funded projects published in scientific journals by the participants in the proposal, the better the evaluation. In addition, the European Commission might sponsor the publication of a journal specifically devoted to results from EU-funded research projects, possibly web-based, open access and indexed by ISI.

Cross-project dissemination initiatives

As a major research-funding body the European Commission has recognised the importance of initiatives specifically devoted to disseminate research results and able to deal with a multiplicity of research programmes and projects. This is the case of the TRKC portal of European transport research.

Archiving documentation from research projects and making it publicly available permanently in the internet is a priority. The loss of such documentation is a threat. Documentation should not restrict to the project final report, but extends to all deliverables issued in the course of the project, other products of the project such as databases, and slide presentations such as those prepared for the project final conference. In addition, the projects might provide the files of charts and photos because they are highly useful to prepare teaching material.

An internet facility should allow searching and retrieving project items according to research age (e.g. items released after a certain year). This is already done by TRKC for EU-funded projects and should be further supported by the European Commission because with the current arrangements there is no certainty that all the items produced by a project are made available to the managers of the TRKC site.

There is a problem of overload of information coming from research and therefore a need to help teachers search in the internet and, in particular, know “what is available where”. An internet facility linking different links together would help the user navigate and find desired information in various databases and websites. This might include databases providing documentation from research projects as well as databases providing access to papers in scientific journals and proceedings. Production of synthesis documents offering information on research by different projects on a certain theme, such as the thematic research summaries produced by TRKC, are also of value in this respect.

Monitoring of products released by research projects and monitoring of publications on scientific journals that originate from EU-funded projects are recommended activities. An alerting system targeting specifically teachers could be put in place imitating the well-functioning and appreciated alerting systems of scientific publishers. The alerting system

could be organised with a thematic structure with keyword specified by the user. The system could inform when a product has been released by a project (e.g. a handbook, the results of a survey, the results of a demonstration, a set of recommendations) or when a paper about an EU project has been published in a scientific journal. The alerting system could take the form of an electronic newsletter providing blurbs in the same vein as the one issued by TRB in the United States.

Other initiatives

The transfer of research results into education is greatly facilitated when there is personal involvement in research but teachers do not do research in all areas where they teach. In addition to support proper dissemination of research results, the research-funding bodies might take other useful initiatives to facilitate the transfer.

Support should be given to direct participation of teachers in research projects. In order to facilitate the exchange of research results, attendance of teachers in conferences and programmes where teachers are exchanged among universities should be supported. Guest lecturing should be promoted as an important element of dissemination.

CONCLUSION

The investigations of the PORTAL and TRKC projects have shed light on the practice of transfer of research, particularly EU-funded research, into university education. A number of hurdles could be highlighted. Desirable actions have been suggested. A potential exist for research-funding bodies sponsoring useful initiatives.

The process of take-up of research results in education is the result of the interaction between researchers, teachers and students. A key element of the process is the transfer of knowledge from researchers to teachers. The analysis here has made it clear that, as teachers cannot restrict to research where they have personal experience, attention is to be devoted to proper dissemination of research results, both at the level of individual projects and at the cross-project level. Inputs from research projects are usually further processed by teachers who adapt them to their needs and preferences when producing education material for students.

Internet facilities, such as the TRKC portal, providing permanent archiving of documentation from research projects, are considerably useful. Linking research databases which are available in the internet is a promising development and, as a follow-up of the results reported on here, steps in this direction have already been taken within TRKC with the planning of enhanced functionalities of the portal and the establishment of contacts with the holders of other databases in the EU and in the United States.

REFERENCES

Delle Site, P. and Leiss, U. (2004) Transport Research Knowledge Centre for the European Research Area. Proceedings 9th WCTR, July 2004, Istanbul.

PORTAL Consortium (2001) Deliverable 2 – Analysis on Demand and Supply. PORTAL (Promotion of Results in Transport Research and Learning) Project, European Commission's Fifth RTD Framework Programme, http://www.eu-portal.net/project/start_offrep.phtml?sprache=en (accessed April 2010).

PORTAL Consortium (2003) Final Report. PORTAL (Promotion of Results in Transport Research and Learning) Project, European Commission's Fifth RTD Framework Programme, http://www.eu-portal.net/project/start_offrep.phtml?sprache=en (accessed April 2010).

Stantchev D., May A., Delle Site P., Leiss U., Jauernig G. (2010) Facilitating use of European transport research: the Transport Research Knowledge Centre. 89th TRB Annual Meeting, January 2010, Washington.

TRKC Consortium (2007) Transferring transport research results into university education. Report on the results of a user survey, a workshop in Rome, and a roadmap for future improvements. TRKC (Transport Research Knowledge Centre) Project, European Commission's Sixth RTD Framework Programme, http://www.transport-research.info/web/index.cfm (accessed April 2010).