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An analysis of participation and network relations (*)

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Follow-up study by Manning, Stephan (2004): **How Project Networks Develop (Through) Collaborative Paths: The Case of European Education Research**. Paper Presented at the [20th EGOS Colloquium](#), Ljubljana. [Download PDF](#).

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European research networks in vocational education and training

An analysis of participation and network relations

Introduction

The following analysis of project related networks in vocational education is a joint undertaking which has arisen out of two research contexts:

- data collection and accompanying studies on European project work in vocational education, which have been undertaken by the Research Forum WIFO in collaboration with CEDEFOP and its Research Arena ([CEDRA](#)) for the last five years (see [ERO Gateway](#));
- a study, carried out at the Institute for Business Studies, Free University Berlin, investigating the relationship between actors and networks in the media industry; this study provides both the research framework and the empirical tools for the network analysis (see [project outline](#)).

The first of the accompanying studies on project work in vocational education (see [presentation 2002](#)) was concerned with European communities of researchers, guided by the following research questions: What are the major forms of collaboration (types of 'community')? How is the membership of these communities structured in terms of country of origin and gender? To what extent are individual researchers involved in various collaborative activities (communities)?

The present study is related to a similar context of communities and researchers, but it focuses on the relationship between these researchers in selected networks. Networks are essential for facilitating collaboration, exchange of knowledge and mutual learning. How have research networks in vocational education developed across Europe? What are the patterns of participation and involvement of researchers in project partnerships, thematic networks and publishing teams? The analysis in this presentation centres on European research project partnerships and three networks which have had particular impact on promoting collaboration between researchers: FORUM, CEDRA and VETNET (see [annex](#) for details).

The analysis has been supported by applying UCINET, a Windows programme for matrix and social network analysis ([Info](#)). A brief guide to the network analysis is enclosed as PDF document ([Analysing project-based research networks](#)).

The major outcome of this analysis is expected to support efforts of efficient and productive collaboration among European researchers in vocational education and training. What matters in this context is to produce both sound analytical results (also as a contribution to more general research on networks etc) and concrete outcomes, to be taken up by network coordinators and other actors in European VET research.

European research networks in vocational education and training

Section: **Overview of networks**

Networks are essential for facilitating collaboration, exchange of knowledge and mutual learning. The analysis in this presentation focuses on European research project partnerships and three networks which have had particular impact on promoting collaboration between researchers: FORUM, CEDRA and VETNET. Altogether, the term 'network' in this analysis stands for a broad variety of communities of researchers characterised by a certain (even if minimal) organisational structure.

Project partnerships have been supported by the European Commission via the Leonardo programme, the research framework programmes (FP4 and FP5) and similar programmes. Included in this analysis are 29 projects (from the period 1995 to 2003) carrying out research in European vocational education. The project coordinators and partners under contract are institutions only; however, in reality the formation of partnerships rests on individuals; this analysis is therefore concerned with partner and coordinator persons.

The **FORUM** (Forum for European Research in Vocational Education and Training) emerged as an informal group of researchers in the mid-1990s, received temporary support by the European Commission (1998-2001), and resumed its informal activities for a brief period after the support had ended.

CEDRA, the CEDEFOP Research Arena, was initiated in the late 1990s with the aim of promoting opportunities for researchers to collaborate in sharing and developing knowledge about vocational education and training; CEDRA is neither a network of the FORUM type nor a project partnership; it is perceived as an environment for voluntary collaboration among researchers.

VETNET, the Vocational Education and Training Network, was set up in 1994, in the context of the European Educational Research Association (EERA). The network has become associated with a Board and an open membership related to participants in the VETNET programme provided for the annual European Conference of Educational Research (ECER).

More details about these networks will be provided in the individual sections of the analysis. A list of networks including home pages is available in the [annex](#).

The following figures compare the networks described above in terms of composition and participation by country.

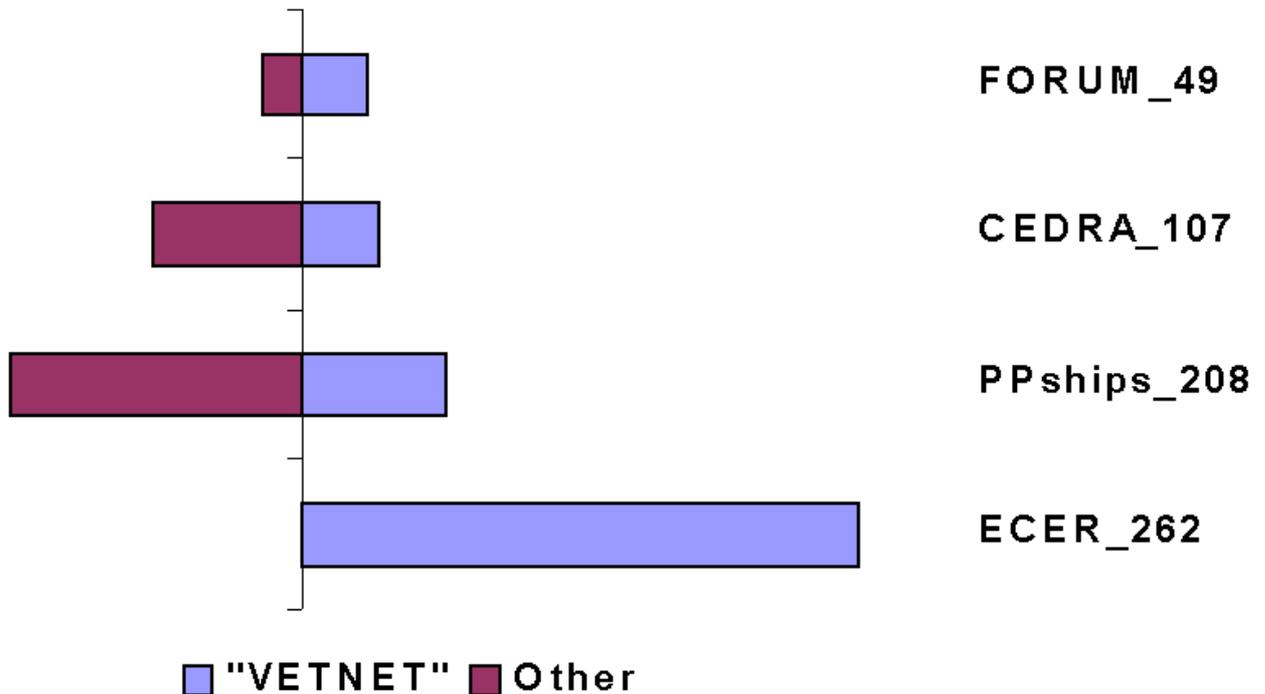
Figure 1: Networks: Composition ([medium+text/ large](#))

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Networks: Composition (participants: n= 478)

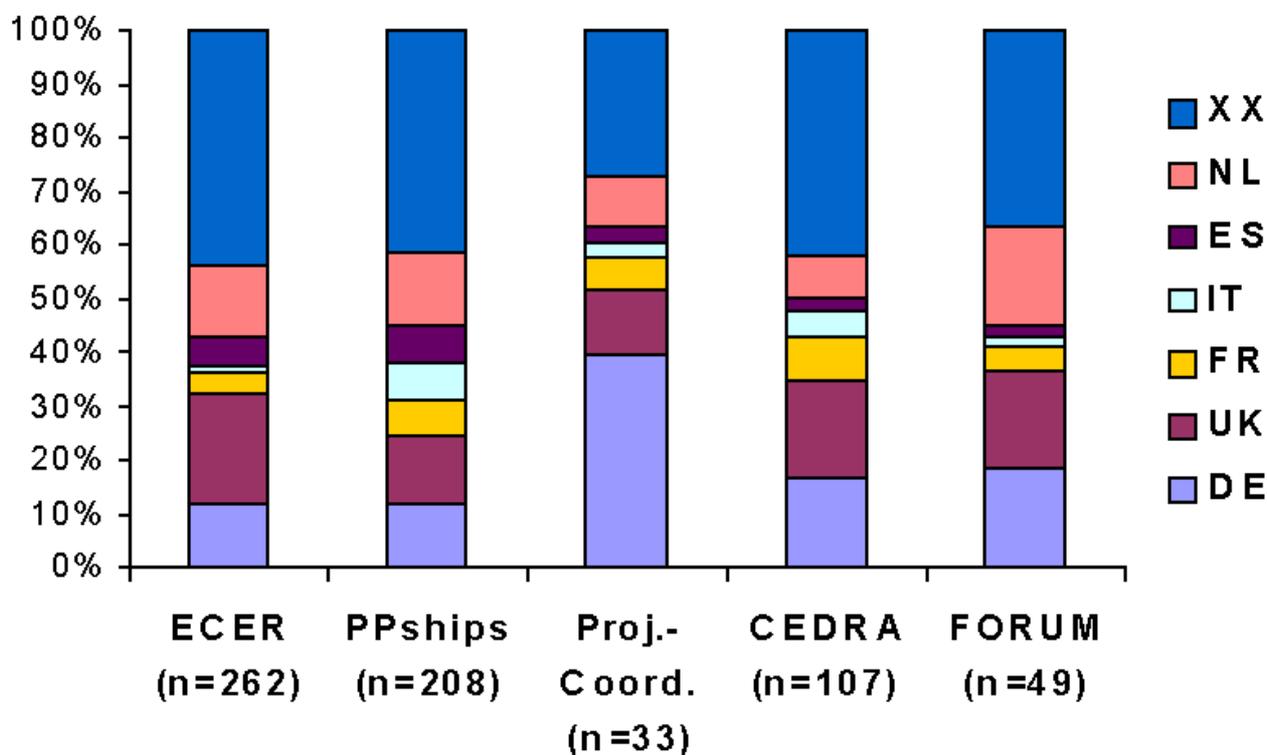


The following networks are relevant for the community of European researchers in vocational education and training (VET):

- the FORUM (FORUM for European Research in Vocational Education and Training), which emerged as an informal group in the mid-1990s, received temporary support by the European Commission (1998-2001), and resumed its informal activities after this period;
- CEDRA (CEDEFOP Research Arena), initiated in the late 1990s with the aim of promoting opportunities for researchers to collaborate in sharing and developing knowledge about vocational education and training;
- Project partnerships, supported by the European Commission via the Leonardo programme, the research framework programmes (FP4 and FP5) and similar programmes; included are 29 projects (from the period 1995 to 2003) which are related to vocational education;
- ECER: this refers to the participants in the annual European Conference on Educational Research who have contributed to its programme on vocational education, run by VETNET (The Vocational Education and Training NETWORK); since VETNET has no formal membership, these ECER participants (aggregated number of persons since 1998) are taken to represent VETNET.

The participants identified for the individual networks are of course overlapping. The largest community is formed by the ECER/VETNET participants (blue bar), who are also represented in the individual networks (blue part of each bar). However, a considerable part of researchers, particularly in the project partnerships, have never been involved in this community. In the next section (starting with [figure 3](#)) we shall look at the network relationships of project partners.

Networks: Participants by country



This figure provides an initial breakdown of participants by national origin, focusing on major European countries arranged according to the size of population:

- The proportion from Germany (the bottom part of each column) is on average close to that from the Netherlands or the UK, while France, Italy and Spain form a much smaller proportion. This major difference is obviously connected with the role that English has assumed as lingua franca of research.
- An exception from the general pattern of German representation is the column in the middle, which shows those researchers that have coordinated at least one of the European project partnerships: 40% of the coordinators come from Germany (most of them originating from ITB Bremen).
- The fairly large representation of researchers from the Netherlands in all the networks is worth mentioning, in view of the country's relatively small population (about one fifth of the German population). This representation may partly be explained by the high degree of mobility of researchers and the command of foreign languages in this country.

European research networks in vocational education and training

Section: **Project partnerships**

European project partnerships in the field of vocational education emerged in the 1990s, promoted by special programmes of the European Commission. In this analysis, 29 projects carried out in the period from 1995 to 2003 are included. The criterion of selection has been their public performance in the European research community: the projects concerned were presented, in various ways, at one or more of the annual European Conferences of Educational Research (ECER) in the period 1998 to 2003.

The selected projects and their partnerships were supported by the European Commission via the Leonardo programme and the research framework programmes (FP4:TSER and FP5). The 'waves' in which project partnerships developed in this framework are presented in the figure below:

Figure 3: Projects by programme and duration ([medium+text/ large](#))

The analysis in the following figures focuses on project partnerships. Although the constituting contracts refer to institutions, the actual development of partnerships rests on individuals. Therefore, partnerships are described in terms of relations between persons. This presentation is based on network analysis, which identifies actors and their relationships, and shows how communities develop. A brief introduction into the aims and methods of this network analysis can be found in the guide below:

[Guide to analysing project-based research networks \(PDF\)](#)

The project partnerships selected for this section have been grouped according to the major periods of programme support. In the following figures the project partnerships are described as individual and related networks:

Figure 4: Project participation networks: 1995-1997 ([medium+text/ large](#))

Figure 5: Project participation networks: 1997-2000 ([medium+text/ large](#))

Figure 6: Project participation networks: 2000-2003 ([medium+text/ large](#))

One of the earliest partnerships, EUROPROF (concerned with new forms of education of professionals in vocational education and training), has played a particular role in generating collaboration within and across projects. The researchers involved in this partnership and also the participants in the thematic network FORUM are specially emphasised in the network analysis.

The overview below includes all project partnerships in this section, providing both the acronyms (used in the figures) and the titles.

1995 to 1997

EUROPROF - New forms of education of professionals in vocational education and training
INTEQUAL - The acquisition of integrated qualifications for professional work and study
POST-16 - STRATEGIES Finding new strategies for post-16 education
DELOS - Developing learning organisation models in SME clusters

1997 to 2000

CATEWE - A comparative analysis of transitions from education to work in Europe
DEVELOP - Development, enskilling, learning organisation package
DUOQUA -L Qualifications with a dual orientation towards employment and higher education
HRD & LLL - The role of HRD within organisations in creating opportunities for life-long learning
LATIO - In-company training and learning organisations
SPES-NET - Sharpening the post-16 educational strategies by horizontal and vertical networking
TQC2000 - Toolkit Quality Craftmanship 2000
WORKTOW - Changing working life and training of older workers
FLEX-VET - Educating a flexible workforce for Europe
RE-ENTER - Improving the transition of low-achieving school leavers from school to vocational education and training
SMES-TRAINING - Small business training and competitiveness
TACITKEY - Tacit forms of key competences for changing employment
WEX21C - Work experience as an education and training strategy: New approaches for the 21st century
WHOLE - Work process knowledge in technological and organisational development (Thematic Network)

2000 to 2003

CoCKEAS - Co-ordinating competencies and knowledge in the European automobile industry
E&T Cluster - Towards the learning economy?
EarlyBird - Early recognition of a need for qualification
FAME - Occupational identity, flexibility and mobility in the European labour market
GENDERQUAL - Gender and qualification
ORGLEARN - Ways of organisational learning in the chemical industry
RE-INTEGRATION - Transnational evaluation of social and professional re-integration programmes for young people
CERN - Capitalisation and Evaluation Research Network
EHRD Base - Resource base of a research project cluster related to human resource development in Europe
SELF-EVALUATION - Transnational methods and models for self-evaluation of non-formal personal competencies
SERVEMPLOI - Innovations in information society sectors

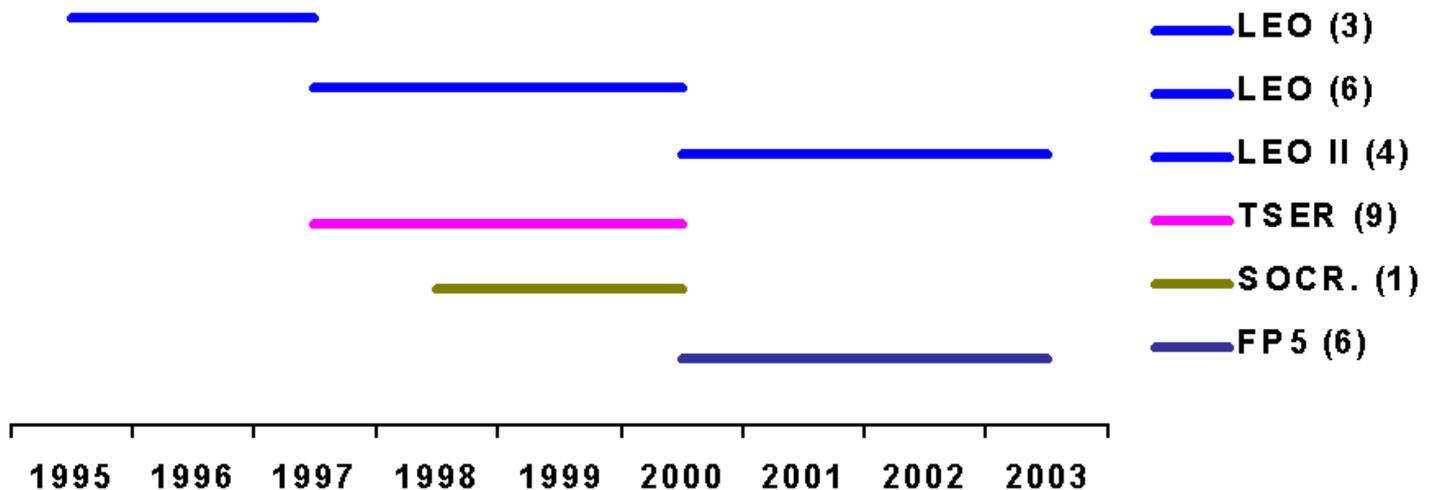
More information about these projects and their partnerships can be obtained from the home pages available in the [annex](#).

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Projects by programme and duration (n=29)

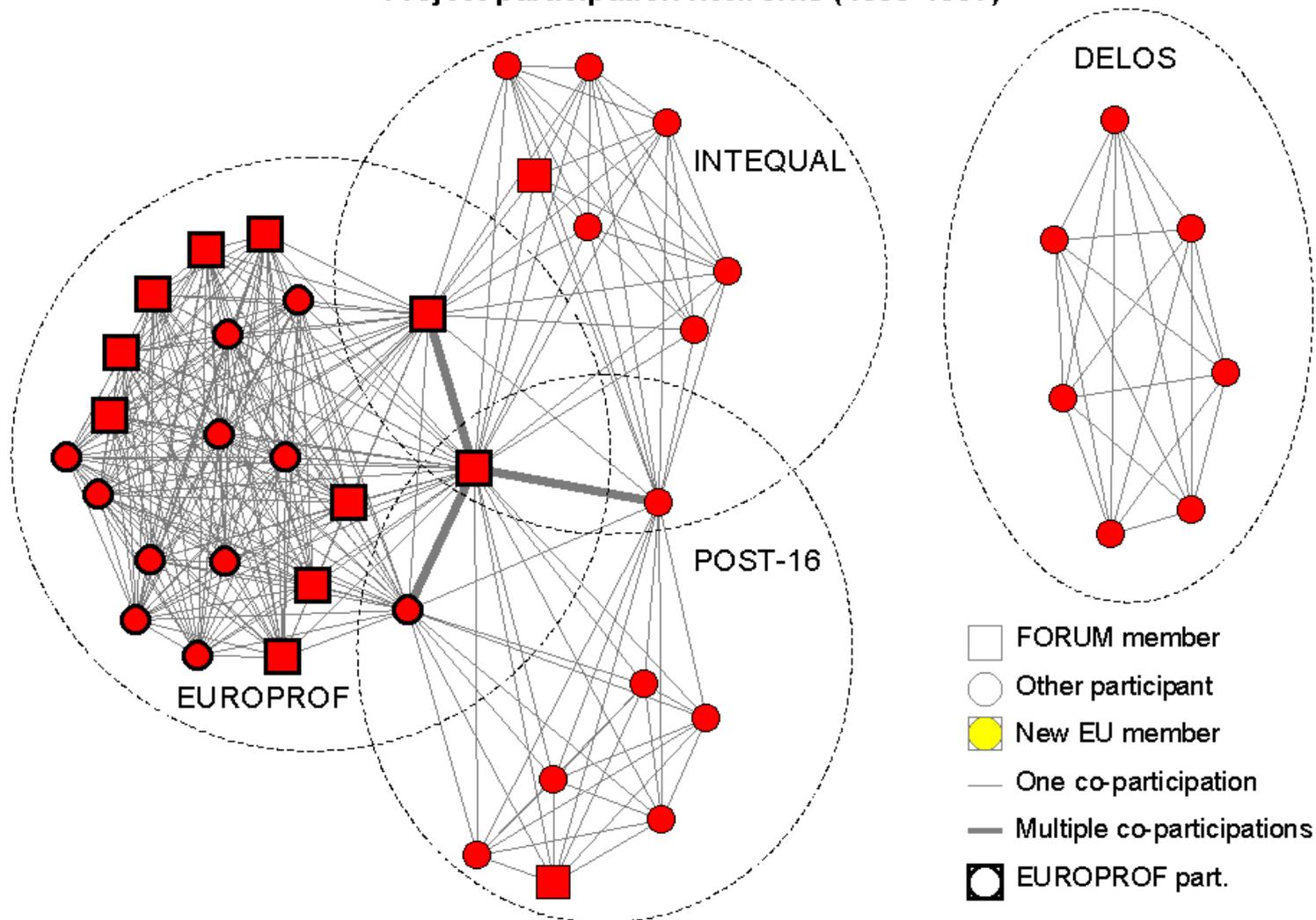


In this section we shall look at the development of project related networks. The starting point is a set of research projects in the field of vocational education and training which have been implemented under major EU programmes. These include LEONARDO, the Targeted Socio-Economic Research Programme (TSER), SOCRATES and the Fifth Framework Programme for Research and Technological Development (FP5). The projects selected for this analysis have been presented, in various ways, at one or more of the annual European Conferences of Educational Research (ECER) in the period 1998 to 2003.

The intervals of support provided by the EU programmes result in roughly three phases covering the total period from 1995 (when the first European projects started) to 2003. As indicated in this figure, the average duration of projects is two or three years. These time frames determine the initiation and termination of rather short-lived project partnerships.

Two more aspects of EU project work should be noted. The programmes expect multi-national participation (with participants originating, in general, from at least three different European countries); they have also stimulated the involvement of new EU candidates. The project partners under contract are institutions only; however, in reality the formation of partnerships rests on individuals. For this reason, the following analysis of project related networks is concerned with persons rather than institutions.

Project participation networks (1995-1997)



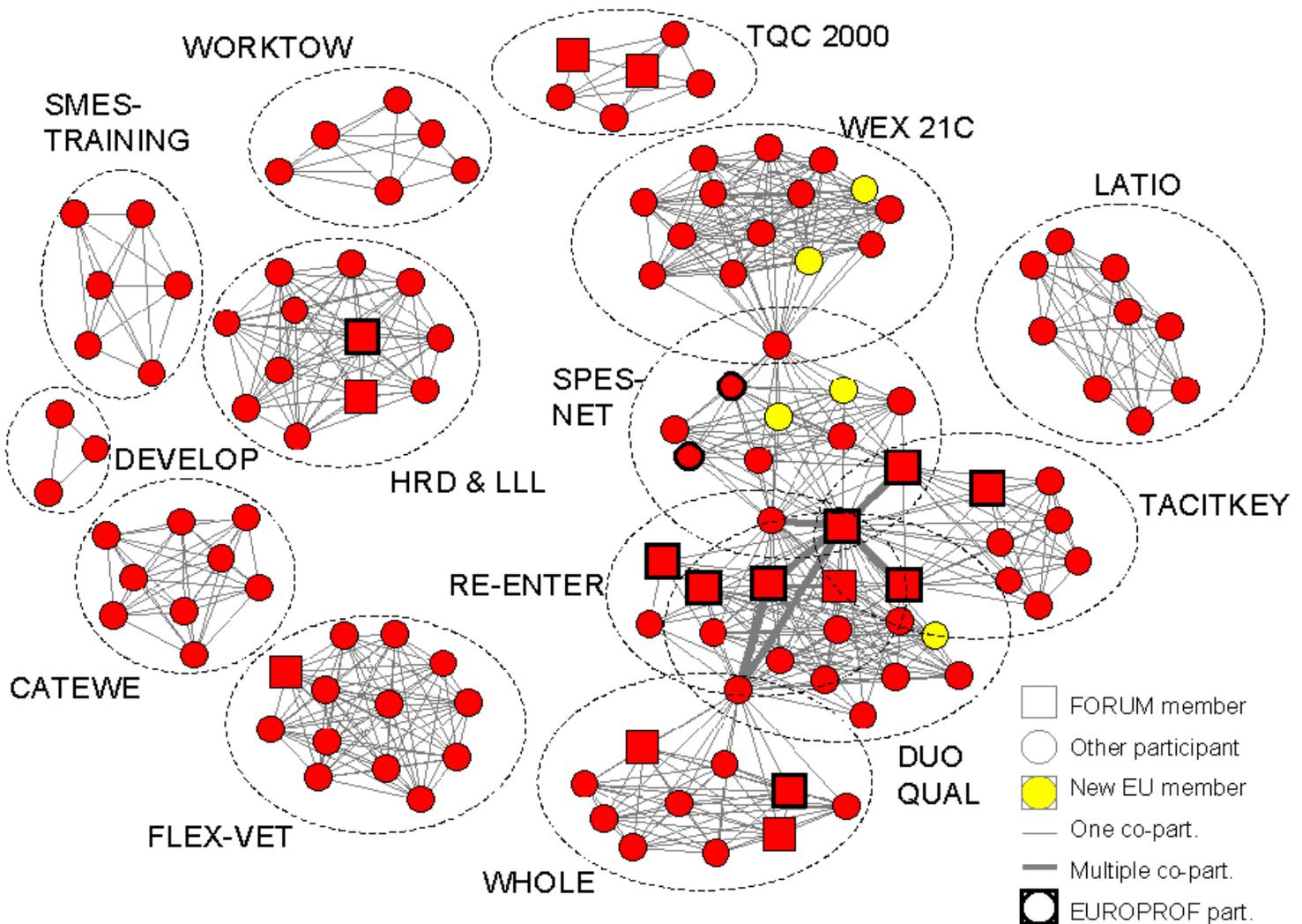
In this set of figures (4 to 6), project partnerships are described as individual and related networks. This presentation is based on network analysis, which identifies actors and their relationships, and shows how communities develop (see PDF [guide](#)). The analysis has been done with software called UCINET, which serves as a tool for analysing network, mainly in sociological research. Information on individual projects can be looked up in the [annex](#).

In this figure you can see project partnerships in the first phase: 1995 to 1997. The red nodes represent the individual partners, the line between every two partners marks the relation between them and indicates the potential of collaboration.

What is worth noting?

- Three projects form a cluster, because several individual researchers participate in two or three of them. This interrelation in fact supports the efforts made by CEDEFOP and others to develop collaboration and synergies between projects.
- The four partners involved in multiple co-participation form stronger ties between themselves. They represent a central group, functioning as boundary spanners; these may be important as potential interfaces for knowledge transfer.
- A lot of partners in this cluster, particularly within EUROPROF, are FORUM members, identified by squares. FORUM, at that time operating informally, played a major constituting role in developing project networks. We shall follow up their role in the next two periods.

Project participation networks (1997-2000)

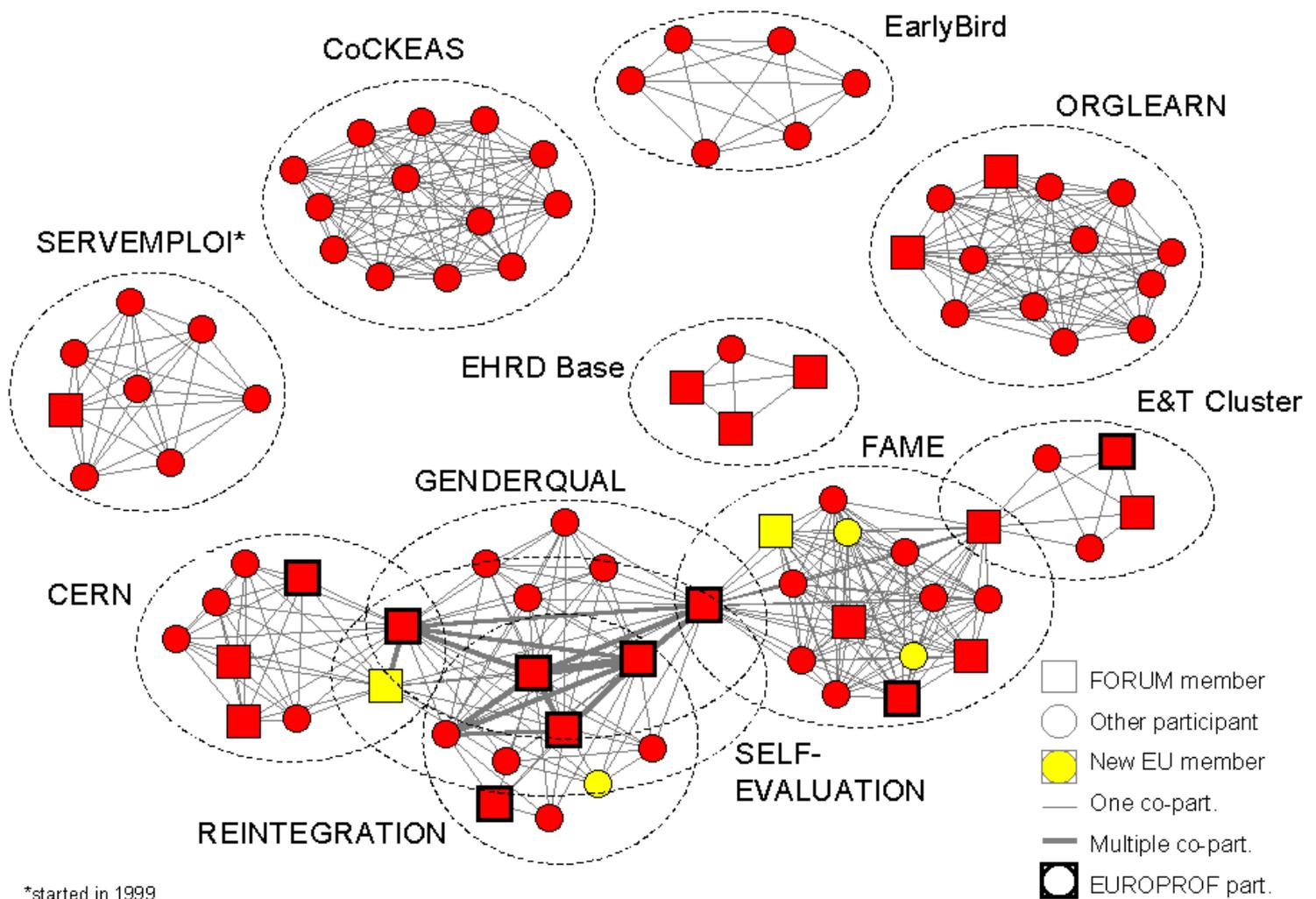


In this period - 1997 to 2000 - the number of projects increases. Several of them are isolated from each other, but there is also a fairly large cluster of interrelated projects (a project network). This has developed out of the initial three-project cluster (see [figure 4](#)). Their joint thematic area is about learning, competence development and qualifications.

Three aspects are interesting:

- The FORUM members, particularly those who also participated in EUROPROF (marked by black-edged squares), are represented in the majority of projects, especially in the enlarged cluster.
- The cluster has got a strongly interrelated central group of projects, but also two projects - top and bottom - which are connected with the rest by just one partner each. A partner in such a position serves as a cut-point; this is, potentially, an essential link for exchanging information and ideas between the project at the edge and the rest of the cluster.
- Also noteworthy, in this period, are the first yellow marks: partners from newly associated countries in Central and Eastern Europe. They are only involved in the cluster of projects - showing the cluster's potential for integration.

Project participation networks (2000-2003)



The third period - 2000 to 2003 - shows a similar pattern: new isolated projects and a cluster with a strong central group of projects, again focusing on themes of learning and competence development in work environments.

Two points should be emphasised:

- The FORUM members, who are still frequently represented, now form even stronger links between themselves within the central project group. The thick lines between each of them indicate a multiple relationship which produces a particularly dense subgroup or clique. While such a clique may function as a strong power centre of a project network, generating knowledge in intense collaboration, it may also become self-sufficient, by regenerating its own relationships, ideas and interests.
- The second point is the very modest progress with partners from Central and Eastern Europe: neither their number nor their position within projects has changed, only the inclusion of two of them in the FORUM network has increased their potential role.

European research networks in vocational education and training

Section: **CEDRA (CEDEFOP Research Arena)**

The CEDEFOP Research Arena (CEDRA) aims at promoting opportunities for researchers to collaborate in sharing and developing knowledge about vocational education and training. CEDRA serves as an environment for voluntary collaboration among researchers, in close liaison with project partnerships and networks in this field. More information about the conceptual background and the activities of CEDRA can be found on its [home page](#).

In this network analysis, we take a closer look at the involvement of researchers in CEDRA. Two major activities are considered: participating in thematic events and producing joint studies. The resulting composition of involved researchers is shown in the figure below:

Figure 7: CEDRA participants: Composition ([medium+text/ large](#))

A particular aspect in this analysis is the European context of networking: the national origin of researchers participating in the CEDRA activities. This mapping (see figures below) also includes data about those FORUM members who have been involved in CEDRA.

Figure 8: CEDRA participants across Europe ([medium+text/ large](#))

Figure 10: CEDRA authors across Europe ([medium+text/ large](#))

The relation between participants in events and also between authors in joint publishing is presented by means of network analysis. This presentation (see figures below) again identifies the role of FORUM members who have been involved in CEDRA.

Figure 9: CEDRA participation network ([medium+text/ large](#))

Figure 11: CEDRA co-authorship network ([medium+text/ large](#))

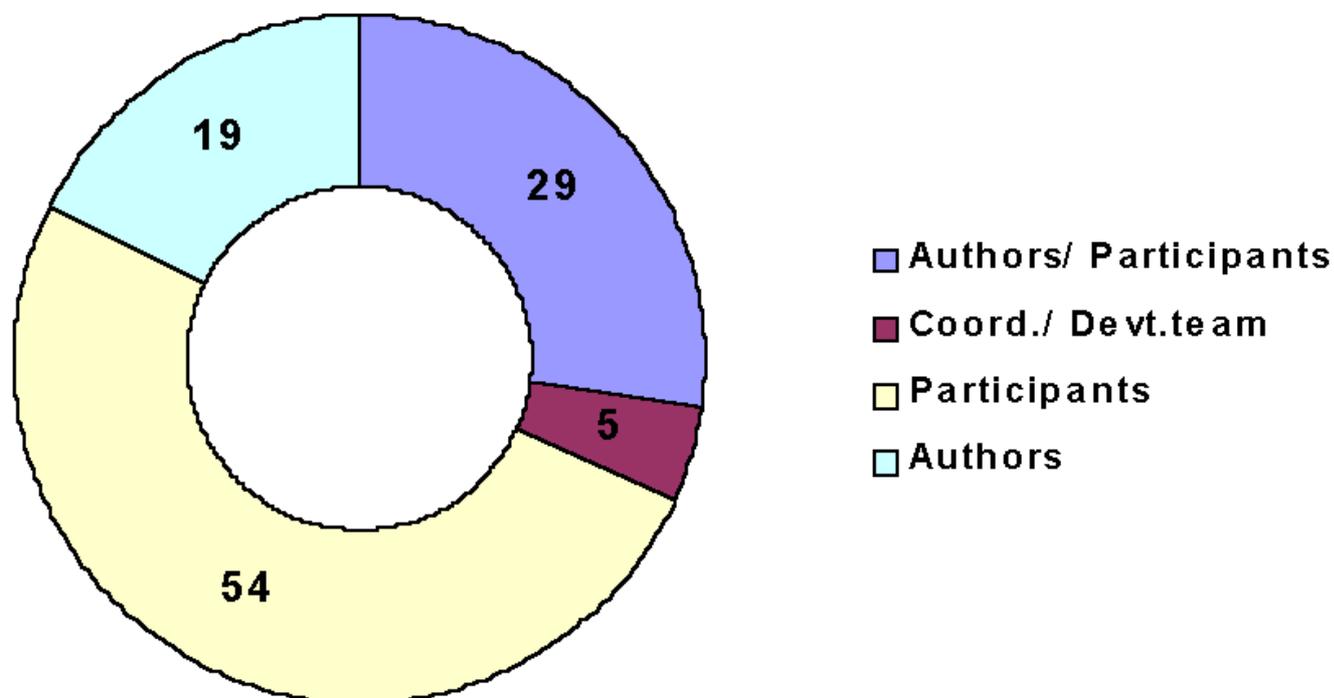
A brief introduction to the network analysis applied in this section can be found in the guide below:

[Guide to analysing project-based research networks \(PDF\)](#)

The final figure illustrates the role of CEDRA in drawing on project work and promoting collaboration between partnerships:

Figure 12: Project representation in CEDRA ([medium+text/ large](#))

CEDRA: Composition (n=107)



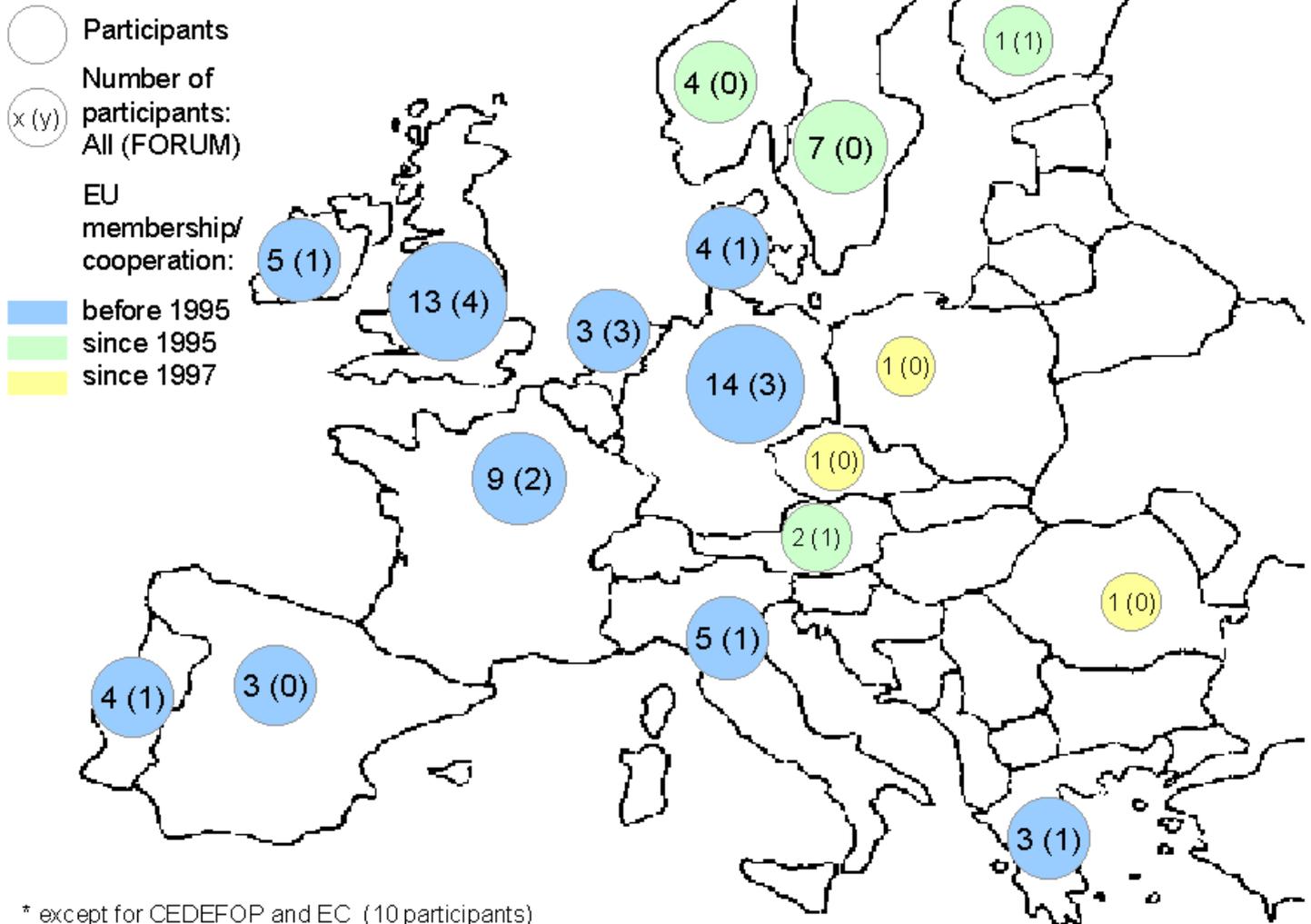
Now we want to look more closely at CEDRA (the CEDEFOP Research Arena): this is neither a network of the FORUM type nor a project partnership, it is called 'arena', perceived as an environment for sharing information and knowledge among European VET researchers, also by drawing on the outcomes of the European projects we looked at. This sharing is facilitated by two major activities: participating in thematic events and producing joint studies.

Starting out from these two related activities, the number and composition of researchers involved in CEDRA can be identified:

- there is a small development team (dark red);
- the next group (blue) are those who have been involved both as authors of studies and participants in events;
- there are also several persons who have been authors only (light green);
- and the largest group are participants only (light yellow).

In this section on CEDRA we shall consider both the regional distribution of participants and the relationship between them, first related to events (figures [8](#) and [9](#)) and second, to publications (figures [10](#) and [11](#)). Finally, the involvement of CEDRA participants in the projects analysed earlier will be presented.

CEDRA participants*



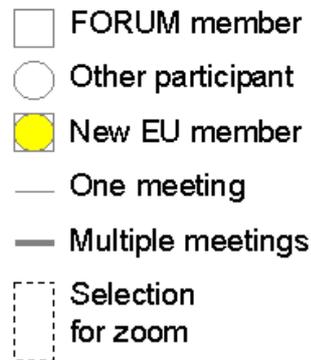
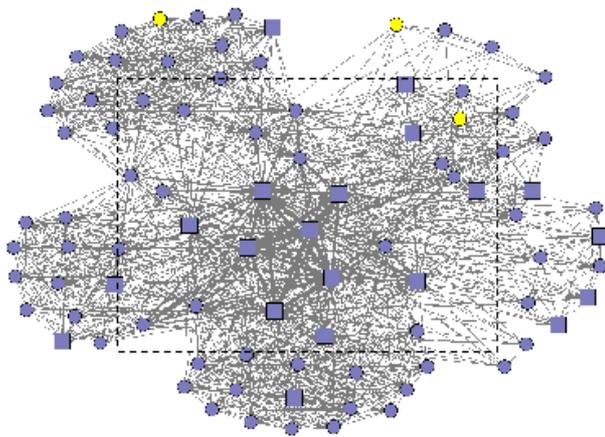
* except for CEDEFOP and EC (10 participants)

This is the geographical presentation of participants in CEDRA events (altogether seven colloquia or conferences between 2000 and 2003). The individual participants, who took part in one or more of these events, extend across 17 European countries. This range may have been partly achieved by choosing five different countries for locating the events (BE, DE, GR, PT and UK). Also participants from various countries which joined EU activities more recently (1995, 1997) have become involved in CEDRA.

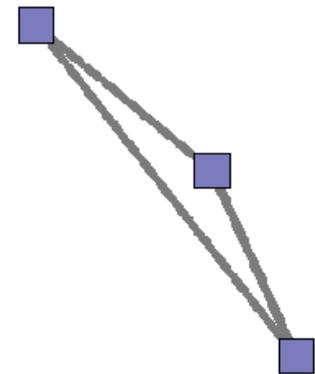
FORUM members from 11 countries are included (numbers in brackets). In view of their small total number this is also a considerable range, although they are mostly represented among the earlier EU member countries. As a feedback process, the extended national participation at CEDRA events may have contributed to broaden the scale of FORUM relations.

CEDRA participation network

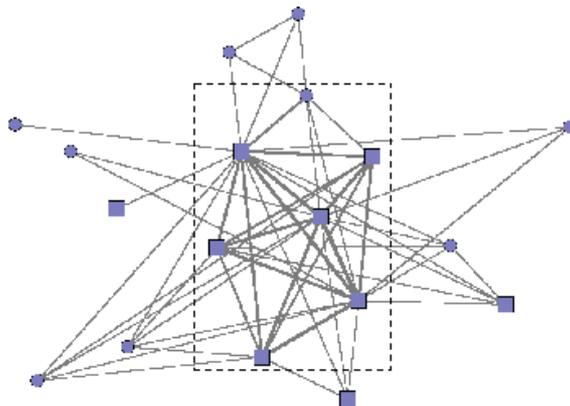
(A) Total network (n=88)



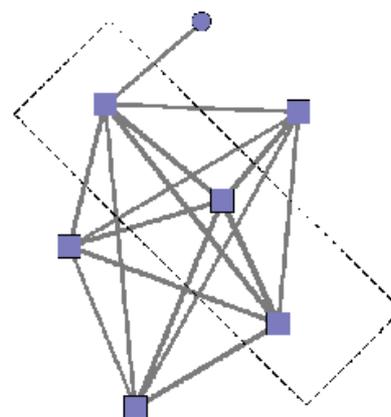
(D) >4 co-participations (n=3)



(B) >1 co-participation (n=18)



(C) >2 co-participations (n=7)



This set of figures presents relations between participants in CEDRA events (seven colloquia or conferences between 2000 and 2003). The main outcomes of the investigation, which has been carried out by applying tools of network analysis (see PDF [guide](#)), are described below.

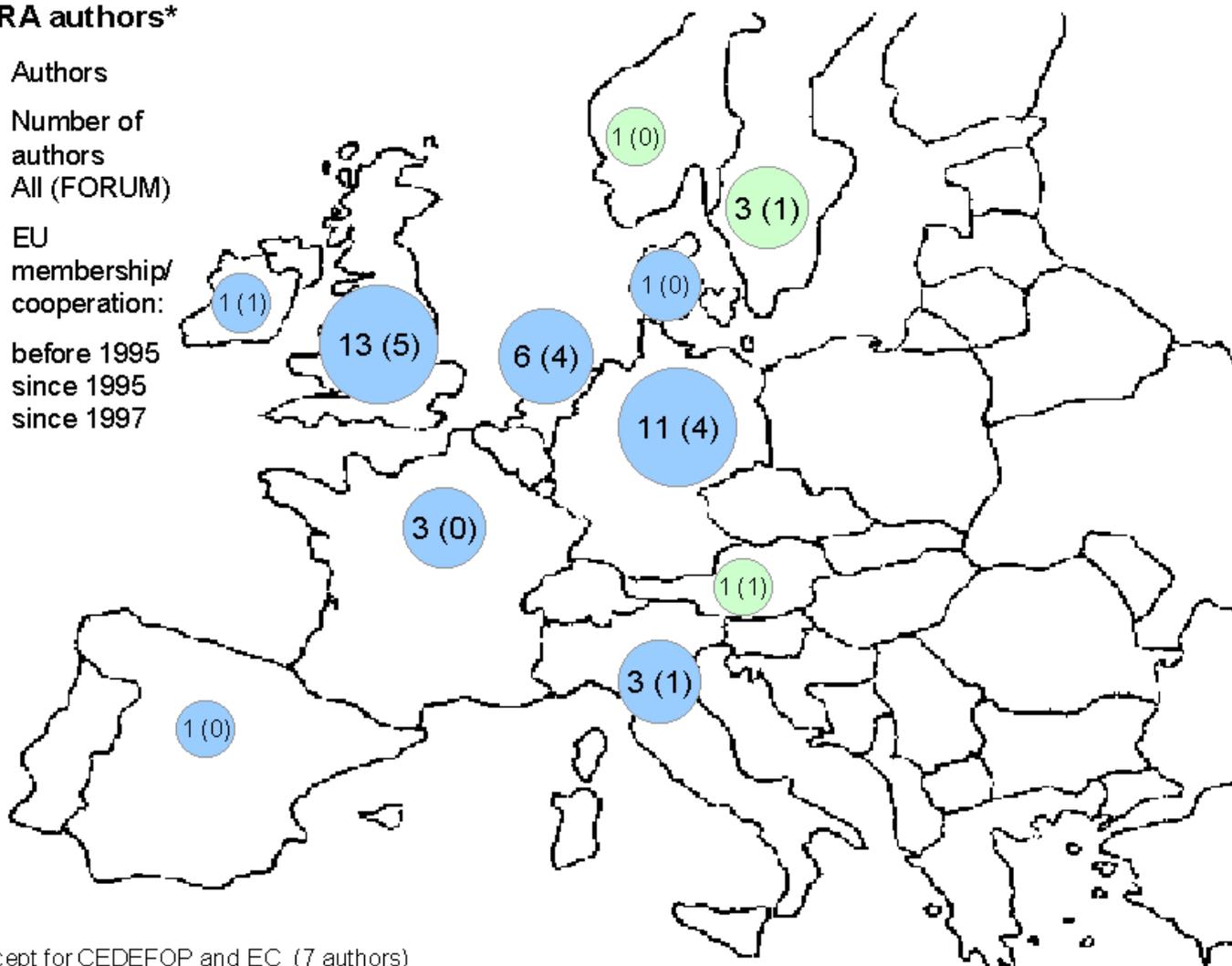
The total network of participants in CEDRA events is presented at the top left: figure A; the following figures (B to D) are selections of those participants who took part in more than one, more than two and finally more than four events.

The difference between the figures A and B is most striking: the majority of participants have potential contacts only once; they appear as extensions at the fringe of the network. While these participants have only weak links among themselves and with the rest, they in fact demonstrate a strong point of the 'arena': the ability to draw in new researchers and other experts, also from local contexts, in a series of events.

Turning to the most strongly interlinked group or central clique, shown in figures C and D, we recognise a pattern from within the project clusters (figures 4 to 6): the prominent representation of FORUM members. CEDRA may be regarded as a reinforcing environment for these highly active researchers in the community.

CEDRA authors*

- Authors
- Number of authors All (FORUM)
- x (y) EU membership/cooperation:
- before 1995
- since 1995
- since 1997

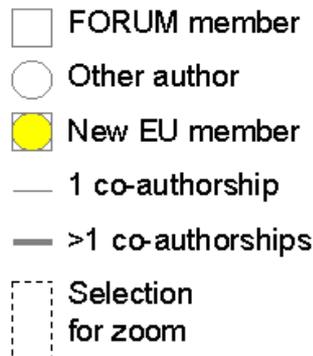
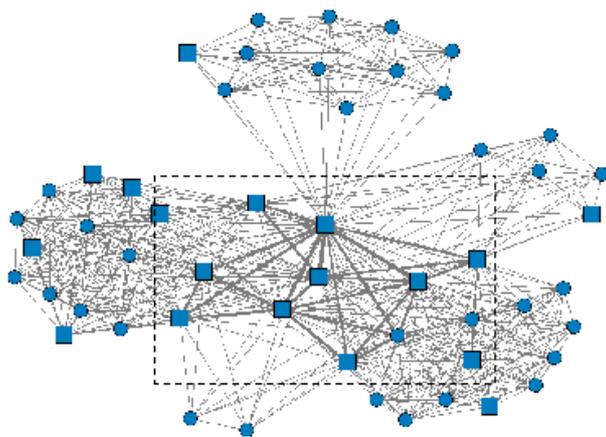


* except for CEDEFOP and EC (7 authors)

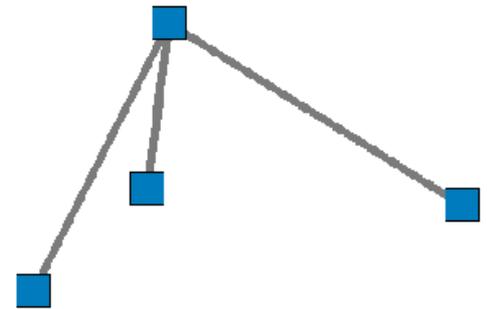
We now turn to the geographical presentation of authors in CEDRA publications (eight major editions produced by groups of co-authors have been selected for this analysis). Authors from 11 European countries have been involved. The pattern of distribution is similar to the previous one of participants in CEDRA events ([figure 8](#)), although more concentrated on a central group of countries. This reduced range is partly due to the smaller number of actors involved, but also to the higher demands (research background, command of English and experience in collaboration) attributed to producing joint publications. As may be expected in this context, FORUM members are strongly represented among the authors.

CEDRA co-authorship network

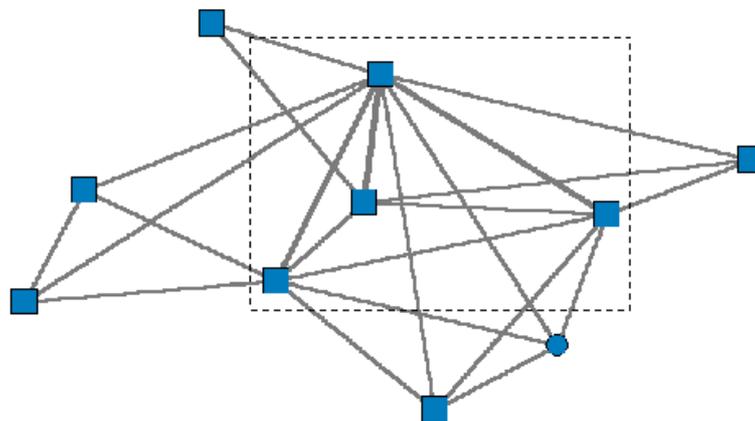
(A) Total network (n=53)



(C) >2 co-authorships (n=4)



(B) >1 co-authorship (n=10)

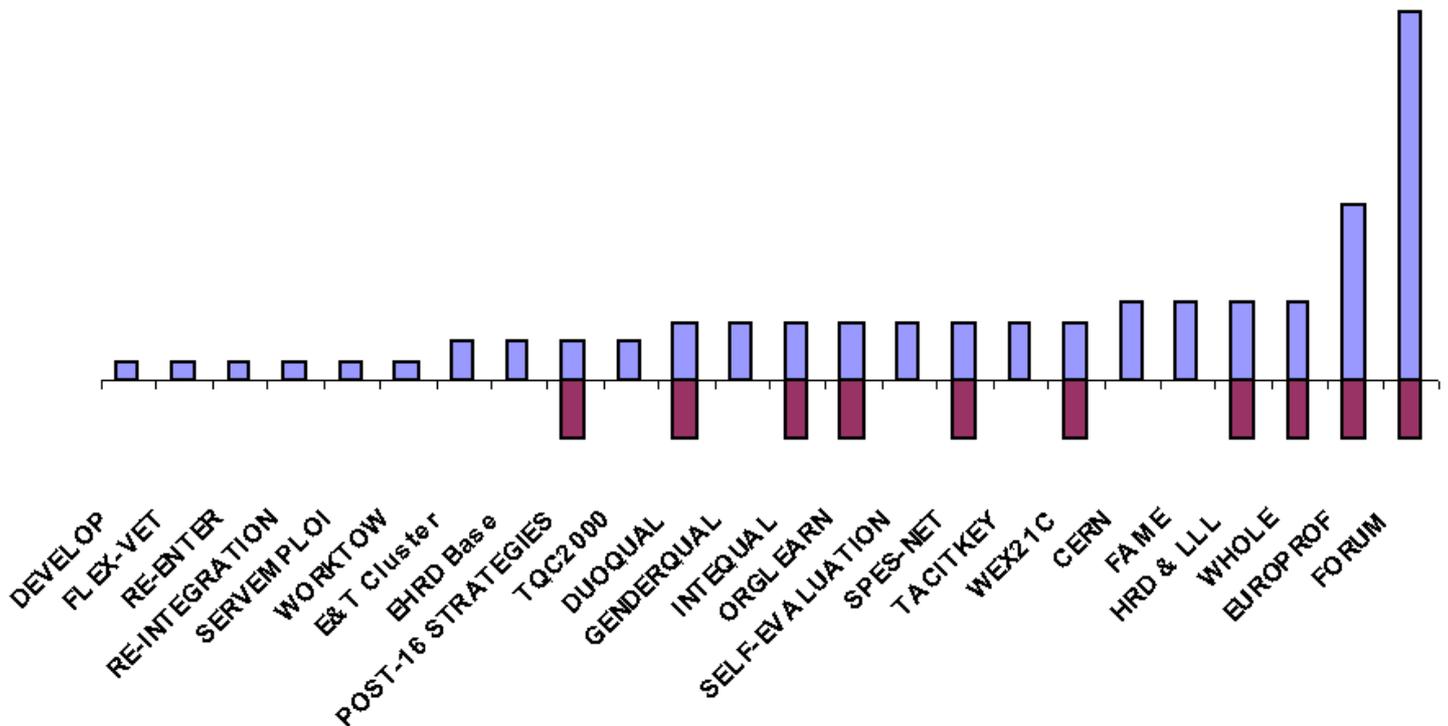


This figure shows the relations between co-authors involved in CEDRA publications (eight major editions produced by groups of co-authors). The investigation has been carried out by applying tools of network analysis (see PDF [guide](#)).

The picture presented by the network of co-authors in CEDRA studies looks similar to the previous one of co-participants in events ([figure 9](#)): again the hard core (co-authors involved in at least two studies) consisting nearly entirely of FORUM members. The potential of this densely connected group (figure B) for generating knowledge, in exchange with the wider group of authors, is very high. In contrast, the four co-authors most frequently involved (figure C) are connected with each other by just one person. This comparison (figures B:C) suggests that the collaboration in CEDRA publishing activities is underpinned by a relatively large group of closely related researchers rather than a small team.

Project representation in CEDRA (n=24)

■ Pj-Partners involved in CEDRA (1 to 19) ■ Pj-References in CEDRA publications (min. 1)



In this concluding overview we want to relate the European projects analysed before (figures 4 to 6) to the CEDRA activities. It is one of the objectives of CEDRA to promote collaboration and synergies between projects in order to generate further knowledge. The extent to which this objective has been achieved can be illustrated, in quantitative terms, by the following evidence:

(a) the involvement of project partners in CEDRA activities, both as participants in events and authors in publications. Partners from 24 projects (out of the total number of 30 investigated projects incl. FORUM) have been involved. The number of representatives per project ranges between one and four in most cases, while only EUROP PROF and FORUM exceed this average (confirming the special role which these two related networks have played in the overall community of European VET researchers and in CEDRA).

(b) the reference to project outcomes in CEDRA publications, by drawing on interim or final results and quoting the reports concerned.

Within the eight major publications considered in this analysis, ten projects are represented by at least one contribution. Special attention has been paid to a group of projects related to the CEDRA themes of learning in organisations, work related learning and work process knowledge (FORUM: work package 'Learning Organisation', ORGLEARN and WEX21C).

Altogether, the above evidence indicates that CEDRA has been active as 'arena' for promoting project related research and collaboration.

European research networks in vocational education and training

Section: **VETNET (Vocational Education and Training Network)**

VETNET, the Vocational Education and Training Network, was set up as part of the European Educational Research Association ([EERA](#)). Its main function has been to organise the VETNET programme for the annual European Conference of Educational Research (ECER). To start with, the network had a formal structure including registered members. Later on, it became associated with an active Board and an open membership related to participants in the annual VETNET programmes at ECER.

In this section, the network is identified as a community of ECER/ VETNET participants. The main indicator applied for characterising the degree of network involvement is the frequency of participation in the annual ECER events (see figure below):

Figure 13: Frequency of ECER/ VETNET participation ([medium+text/ large](#))

In order to find out more about the composition of ECER/ VETNET participants, their parallel involvement in other networks is considered: CEDRA, FORUM and project partnerships (see next figure):

Figure 14: Composition of ECER/ VETNET participants ([medium+text/ large](#))

In the final two figures, the regional composition of ECER/ VETNET participants is displayed, both against the map of Europe and as a flow chart showing the development during the last six years:

Figure 15: ECER/ VETNET participants across Europe ([medium+text/ large](#))

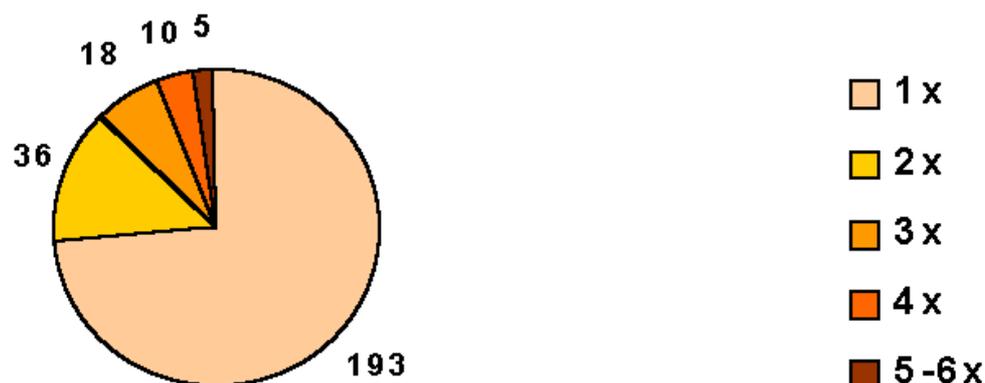
Figure 16: ECER/ VETNET participants by country group ([medium+text/ large](#))

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Frequency of ECER/ VETNET participation (persons n=262)

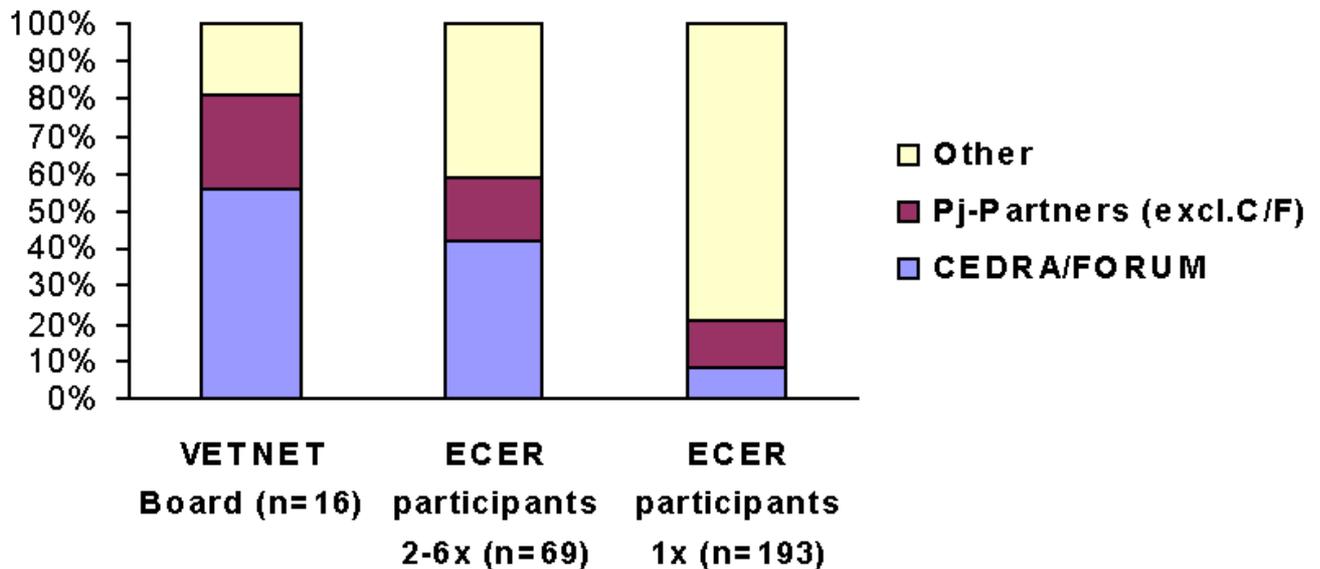


The following section on the Vocational Education and Training Network (VETNET) starts out from an analysis of participation in the annual European Conference on Educational Research (ECER). As already indicated ([figure 1](#)), VETNET has no formal membership. The network is associated with those persons who have contributed to the VETNET programme arranged by its Board for ECER each year.

In this analysis, the participants in all the ECER/ VETNET events between 1998 and 2003 are considered (the data for 1998 to 2001 refer to the authors in the proceedings, while the data for 2002 and 2003 include all contributors to the programme). This calculation results in an aggregated number of 262 persons who have participated in one or more ECER/ VETNET events for the last six years.

Since the annual ECER/ VETNET programme provides a framework of contact, two effects may be relevant: on the one hand, the involvement of new researchers (as a process of revitalising) every year; on the other hand, the reappearance of researchers (leading to intensified relations within the network). The evidence given in the above figure points in both of these directions: a large proportion of participants have turned up only once, while about a quarter of researchers have participated at least twice. The latter group of frequent participants may be regarded as the core group of the network, at least for the purpose of this analysis.

Composition of ECER/ VETNET participants



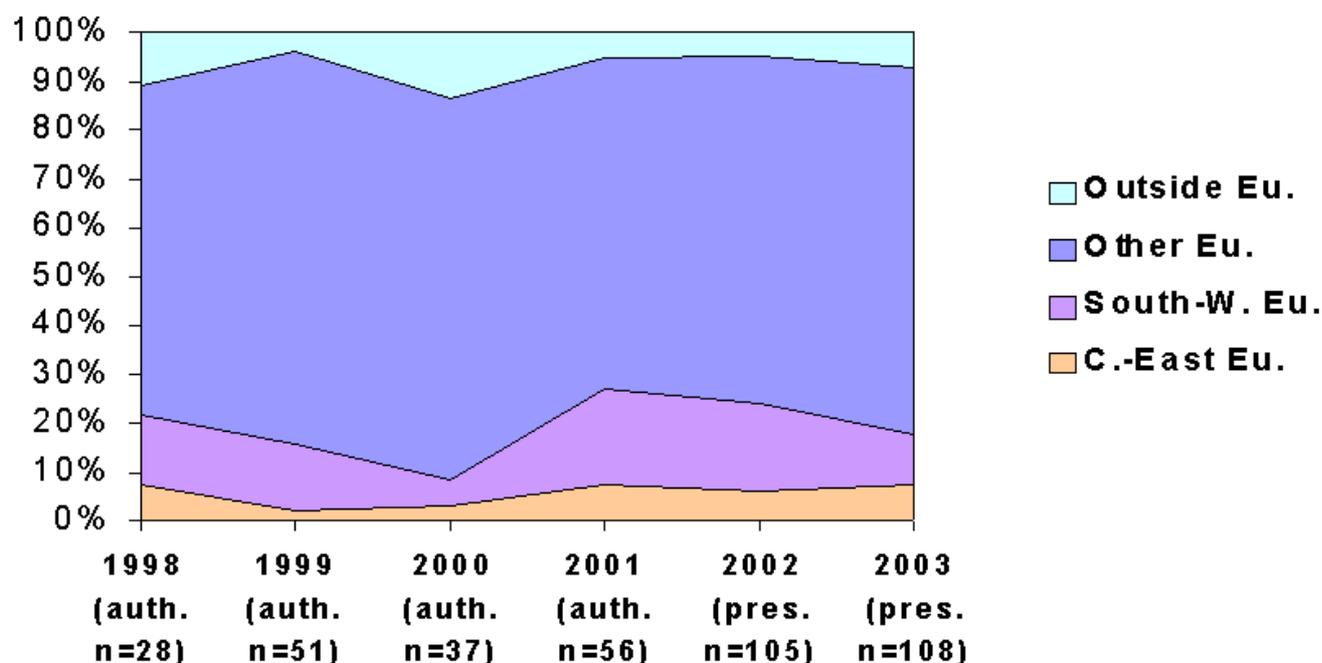
In order to find out more about the composition of ECER/ VETNET participants, we relate the data concerned to evidence on other networks: CEDRA, FORUM and project partnerships (see [figure 1](#)). In particular, we want to identify the proportion of ECER/ VETNET participants who have also been involved in CEDRA or FORUM and/or project partnerships.

The figure above shows this involvement by contrasting three ECER/ VETNET groups: the Board members (aggregated over the 6 year period), the frequent participants (2 to 6 times, also including the Board members) and the once-only participants. It is obvious that a large majority of Board members and also a majority of frequent participants are involved in several networks, while a small minority of the once-only participants share this characteristic. This comparison suggests that the frequency of ECER/ VETNET participation is underpinned by a high degree of parallel network contacts.

However, the different size of these three groups should also be taken into account. If those ECER/ VETNET participants who have been involved in other networks are counted in each group, the absolute numbers are fairly close, in fact equal between the groups of frequent participants and once-only participants. On the other hand, the absolute numbers of ECER/ VETNET participants without other network affiliations vary considerably between the three groups, being five times as high among the once-only participants as against the frequent participants.

This latter comparison of absolute numbers confirms the high correlation, already observed for group three, between once-only participation in ECER/ VETNET and lack of other network affiliations. The opposite case is less pronounced: ECER/ VETNET participants involved in other networks are represented in equal numbers among the once-only and the frequent visitors. However, even at once-only visits these participants are likely to reinforce relations with other participants of joint network contexts. Therefore the participants involved in other networks are all potentially related to the core group of frequent ECER/ VETNET participants.

ECER/ VETNET participants by country group (n=262)



In this figure, the participants from selected country groups are shown for each of the six ECER/ VETNET conferences. Comparison is facilitated by indicating the proportions for each year, based on numbers of proceedings authors (1998 to 2001) and presenters (2002 and 2003).

The overall distribution of participants between the country groups confirms the pattern already made visible in the previous map ([figure 15](#)). What this new figure adds is the impression of continuity throughout the period, only interrupted by certain variations especially within the South-West European group. These variations may be partly attributed to the location of ECER conferences: 2000 in the UK, as against 2001 in France and 2002 in Portugal.

The small proportion of the Central and Eastern European group appears virtually unchanged. This situation contrasts with the noticeable, even if modest, rise of participation from these countries in the project partnerships (figures [4](#) to [6](#)). The difference just noted may confirm the observation about policies made with regard to the previous mapping ([figure 15](#)).

European research networks in vocational education and training

Section: **Co-authorships**

A central aim of the European networks in vocational education and training, investigated in this analysis, is to produce and publish research results. In this section we want to find out to what extent the researchers involved in these networks produce joint articles or papers, or edit joint studies and proceedings. The co-authorships related to joint publication activities indicate intense working relations, which might result from or contribute to wider collaboration.

Attention is paid to two groups of co-authors: those associated with CEDRA publications and those emerging from producing papers for the ECER/ VETNET proceedings. The section starts out from an overview of authorships, and then narrows the focus down to transnational co-authorships.

Figure 17: Authorship of articles ([medium+text/ large](#))

Figure 18: Co-authorship of articles by country ([medium+text/ large](#))

The transnational co-authorships are of particular interest, since they may be regarded as a reflection of the general progress of transnational networking. In the following figures, they are analysed by theme and country:

Figure 19: Transnational co-authorships by theme ([medium+text/ large](#))

Figure 20: Transnational co-authorships by country ([medium+text/ large](#))

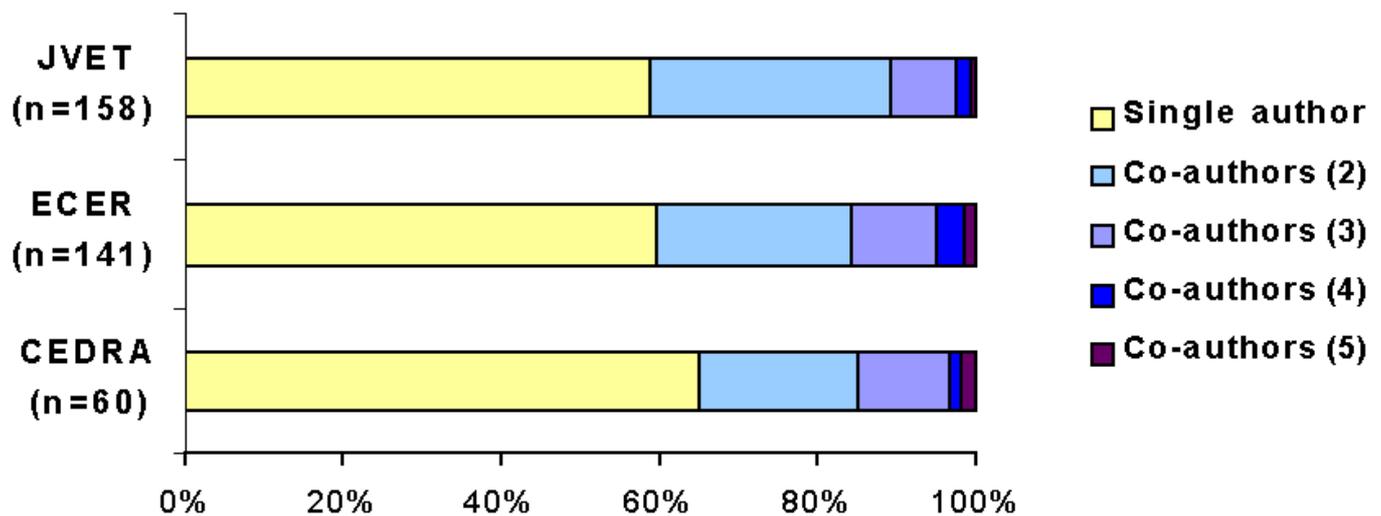
Finally, the teams of transnational co-authors emerging from these publication activities are presented, by contrasting patterns of team formation in CEDRA publications and ECER VETNET proceedings:

Figure 21: Transnational co-author teams ([medium+text/ large](#))

A brief introduction to the network analysis applied in this figure can be found in the guide below:

[Guide to analysing project-based research networks \(PDF\)](#)

Authorship of articles

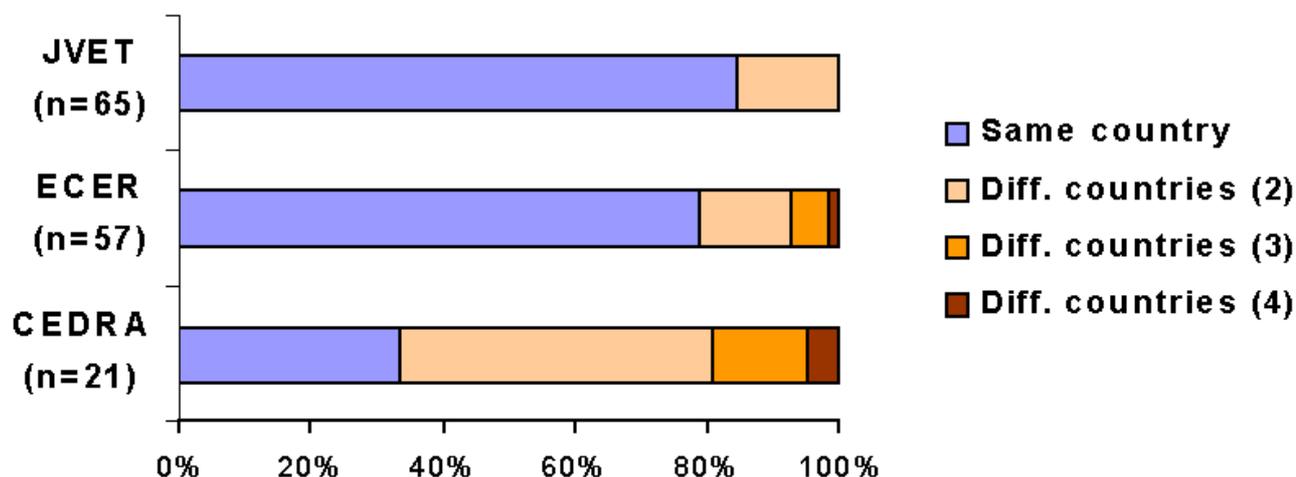


In this section we want to find out to what extent the researchers involved in the networks analysed before produce joint articles or papers, or edit joint studies and proceedings. The co-authorships generated in joint publication activities are assumed to represent particularly intense relations.

The figure above gives an overview of the authorships considered in this section. The publications which have been analysed include the joint CEDRA studies (2000-2003), the ECER/ VETNET proceedings (1998-2003) and, for comparison, the recent editions of the international Journal of Vocational Education and Training (1999-2003). The number of authors involved in each of the publications is indicated in brackets.

The pattern of authorships is largely similar across the three publication contexts: the majority are single authors; the teams of co-authors mostly include two persons and only rarely a maximum of five authors. These co-authorships are the focus of analysis in the following figures (18 to 21).

Co-authorship of articles by country

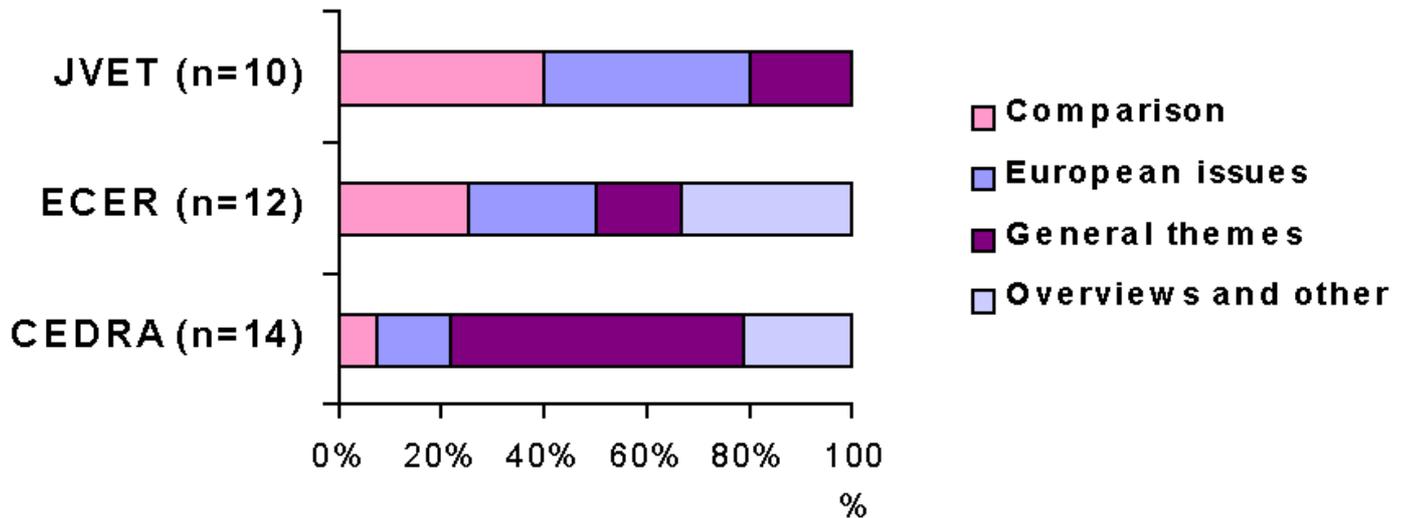


Co-authorships are now analysed against the background of European networking. It might be assumed that the context of transnational project partnerships, networks and conferences also promotes transnational teamwork in publishing. The figure above takes up the analysis of authorships introduced in the previous figure (17), by breaking down the groups of co-authors according to country composition.

Altogether, the teams of co-authors from different countries are small in number, and also small in comparison to the total sample of authors (see data given in figure 17). We may conclude, in general, that the overall progress of transnational networking (project partnerships, networks, conferences), in which these authors are involved, does not seem to be matched by a high level of transnational co-authorships. Nevertheless, some differences between the three publishing media are noticeable:

While only a small proportion of co-authorships in JVET and the ECER/ VETNET proceedings are transnational, the corresponding proportion of CEDRA co-authorships is much bigger. CEDRA also exceeds the two other groups in the proportion of teams involving persons from more than two different countries. This is certainly an outcome of the deliberate transnational approach followed in CEDRA activities and, more specifically, in producing the joint studies. These studies not only include teams of editors and of authors for individual articles (represented in the figure above), but also form larger groups of contributors (teams or individuals), already presented as CEDRA co-authorship network (figure 11).

Transnational co-authorships by theme



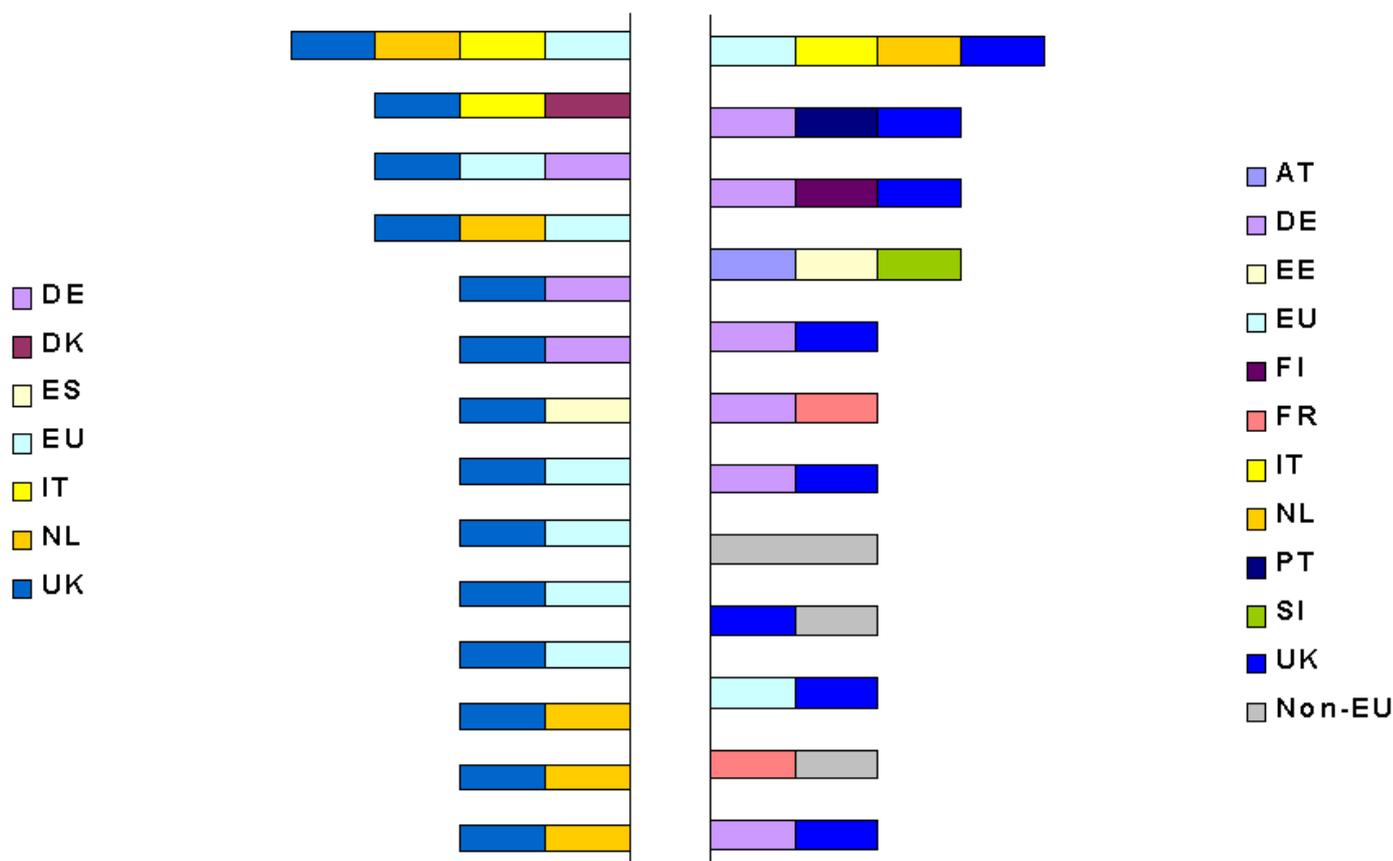
Transnational co-authorships are likely to arise in collaboration (project-based or other) around common themes. This figure offers a tentative specification of the transnational themes identified in the three sets of publications (for a description of these publications see [figure 17](#)):

- comparisons are concerned with contrasting characteristics found in systems or processes;
- European issues are identified across various phenomena or around common concerns;
- general themes are developed by focusing on common concerns or selected issues;
- overviews compile and structure various items (also referring to proceedings of papers and volumes of contributions).

The main outcome of this figure is that the given range of co-authorship themes is shared by all sets of publications. Only the overviews are missing in JVET, thereby making the journal's other three themes appear somewhat larger in proportion. What is worth noting, referring to all sets of publications, is the relation between comparisons on the one hand and European issues or general themes on the other: comparisons, as a more traditional approach, are less represented than the other two, which may be considered as more highly integrated approaches. This balance is particularly striking among the CEDRA co-authorships.

Transnational co-authorships by country

CEDRA publications < > ECER proceedings

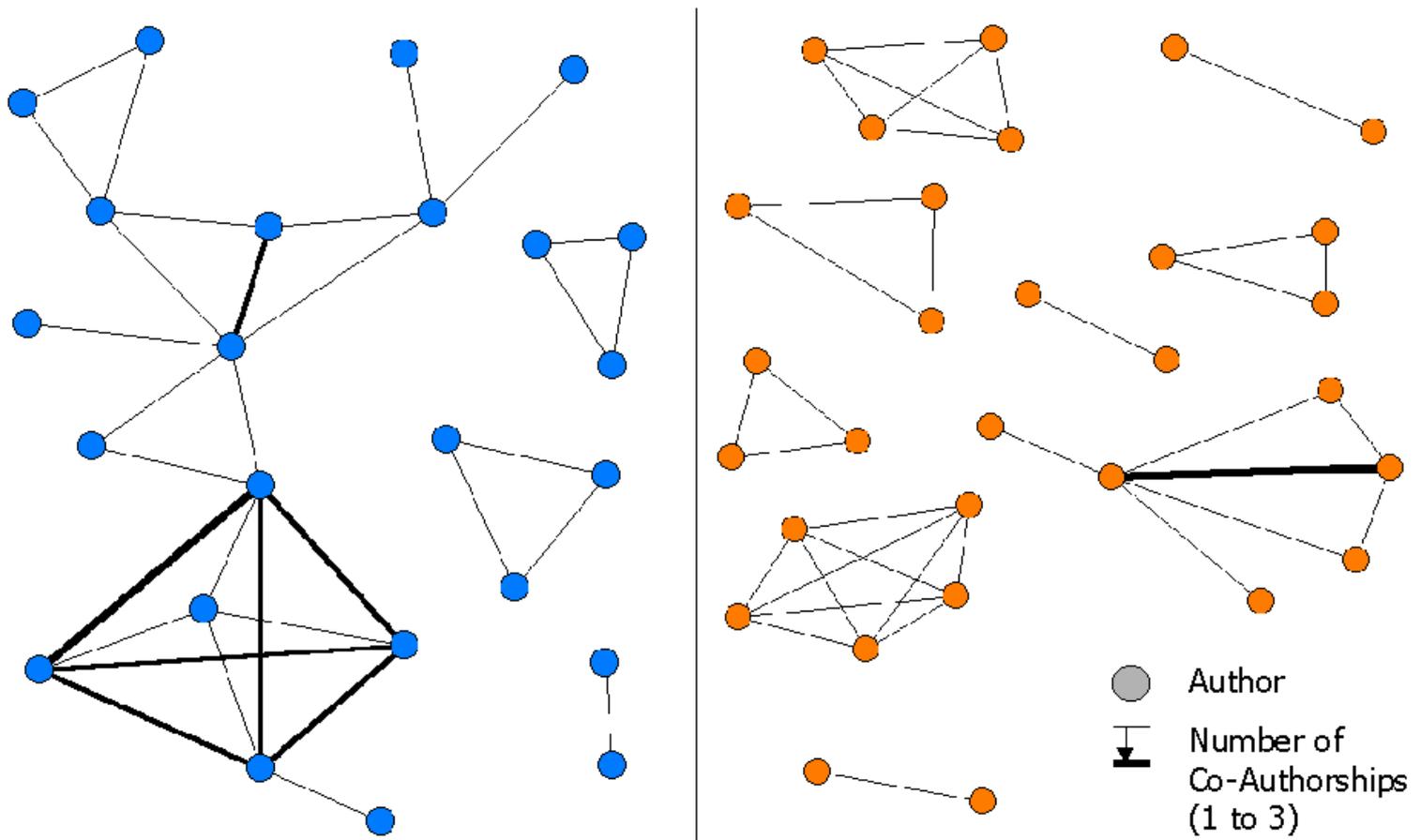


Which countries are represented in transnational co-authorships? This question is related to the national origin of co-authors within a given team (co-authors coming from the same country, alongside one or more authors from different countries, are counted only once). The figure above shows the national composition of co-authorships in both CEDRA publications (14 teams) and ECER proceedings (12 teams). While the amount and size of co-authorships are similar in both sets, the transnational composition varies between the two:

- CEDRA co-authorships share a smaller range of countries than ECER co-authorships do;
- the combination of countries in ECER co-authorships is more varied than the one in CEDRA publications, the latter being particularly marked by including a UK co-author in each team and, more predictably, a EU (CEDEFOP) co-author in every second team.

These differences are partly connected with the contexts in which the co-authorships develop: while CEDRA publications are determined by major themes and corresponding expertise required from co-authors, ECER proceedings are open for any papers which meet general criteria of quality. So these two cases convey alternative characteristics or values of co-authorships: the professionalism gained by selected transnationality (CEDRA) versus the rich variety achieved by spontaneous transnationality (ECER).

Transnational co-author teams CEDRA publications < > ECER proceedings



The transnational co-authorships are now viewed as teams of authors, both in CEDRA publications and in ECER/VETNET proceedings. This picture has been produced by applying tools of network analysis (see PDF [guide](#)).

As already pointed out in the previous breakdown according to country ([figure 20](#)), the two groups share basic characteristics:

- both the teams involved in CEDRA publications and those represented in the ECER proceedings are similar in number (14; 12);
- they are also similar in size, although the range of members (between 2 and 5 CEDRA; 2 and 4 ECER) somewhat exceeds the range of different countries (between 2 and 4 in each case); this is because some of these transnational teams also include co-authors of the same country (which were counted only as one team component in [figure 20](#));
- the total number of individual persons involved in these transnational teams is also similar in each case: 39 in CEDRA publications and 34 in ECER proceedings.

The figure above demonstrates how individual persons are related with each other as co-authors in transnational teams. As should be expected, a majority of small teams (mostly involving just two or three persons) produces a more scattered picture than, for instance, a set of large project partnerships (figures [4](#) to [6](#)). Nevertheless, there are two features which resemble special relations in networks:

- there are several repeated relationships (thicker lines) in both groups, particularly in cases of collaborating editors of CEDRA publications and ECER proceedings;
- a lot of CEDRA co-authors are related to more than own team, thus forming a large cluster of teams and, as part of this, a clique of intensely related co-authors.

The higher degree of interrelation found among the CEDRA co-authors is due to the collaborative approach applied in

these publishing activities. This has already been evident from analysing the total network of co-authors in CEDRA studies ([figure 10](#)).

Both CEDRA and ECER co-author teams should also be considered against the background of project partnerships (from which many articles or papers arise) and thematic networks (which underpin the collaboration of many co-authors). This background of European collaboration provides lots of invisible links between the transnational co-authors and may show the teams, instead of looking scattered, as foci or highlights of multiple networking.

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European research networks in vocational education and training

Section: **Conclusion**

This concluding section aims to produce the total picture of network relations, summing up the involvement of researchers in project partnerships, co-authorship teams and networks (CEDRA, ECER/ VETNET and FORUM). It was evident from the beginning ([figure 1](#)) that a large number of researchers are multiple participants. In more detailed break-downs of the larger networks (CEDRA, ECER/ VETNET), a typical pattern appeared: a core group of researchers sharing intensive relations (or repeated participation) surrounded by loosely connected groups at the fringe (see figures [9](#), [11](#) and [13](#)).

The individual participants belonging to these core groups of European networks are identified in the first concluding figure. These 'core participants' may be regarded as the key actors or multipliers in the European VET research community.

Figure 22: Core participants in networks ([medium+text/ large](#))

The second figure is concerned with the means of communication between European networks. The total network participants are contrasted with the membership of the largest mailing list (ERO-Call):

Figure 23: Communication across networks ([medium+text/ large](#))

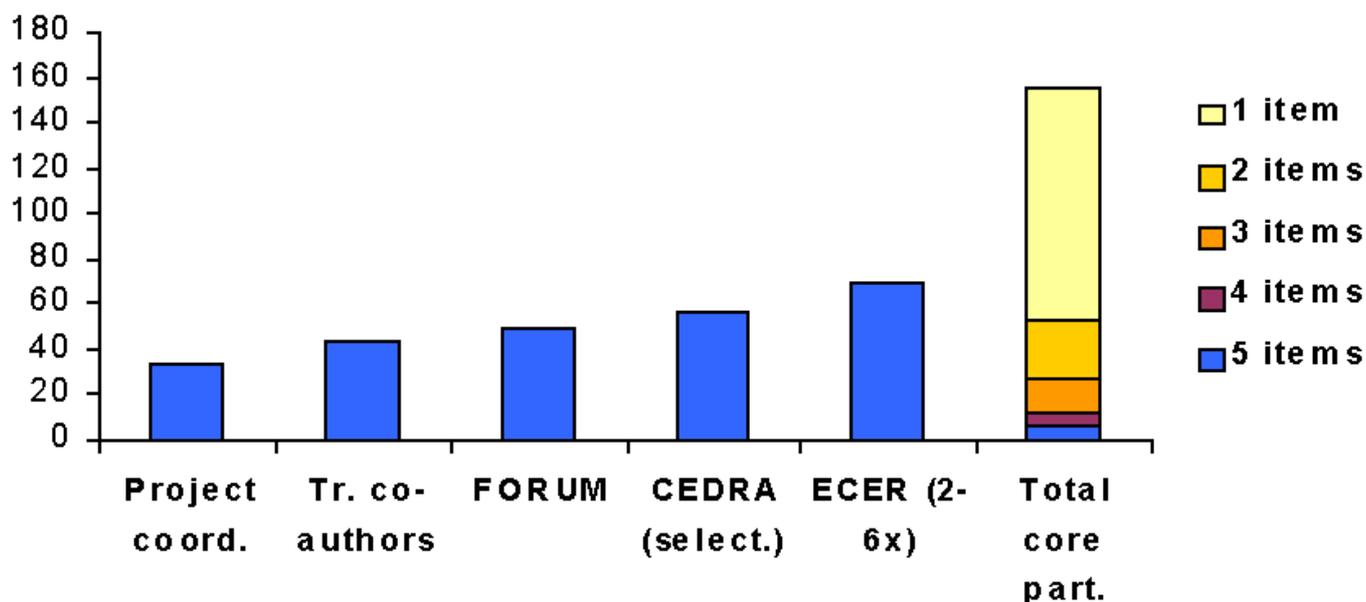
This evidence leads to the final conclusion that a relatively small interactive list involving lots of core network participants could play a multiplier role, with information being drawn from and passed on to individual networks.

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Core participants in networks (n=155 =32% of all participants)



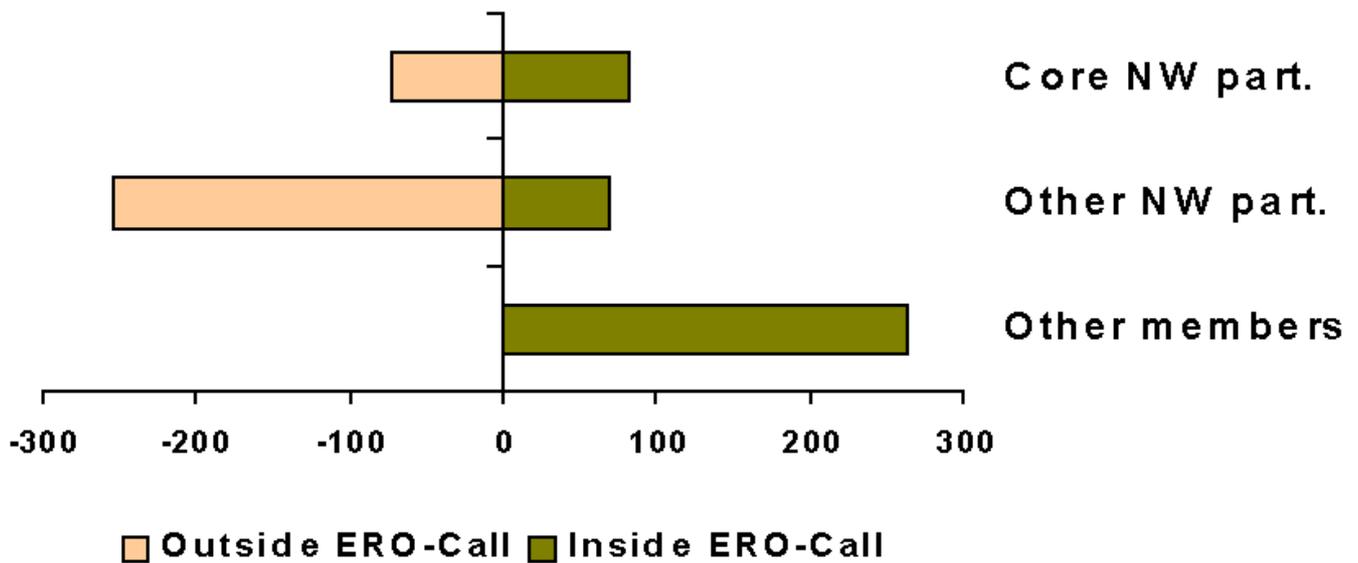
In this concluding section we want to return to the total picture of network relations, after having analysed the involvement of researchers in project partnerships, co-authorship teams and individual networks.

In the figure above, only the core participants of European networks are presented: the coordinators of project partnerships, the co-authors in transnational teams (CEDRA, ECER), the FORUM members, CEDRA and ECER participants/ authors (excluding once-only participants in both cases). Altogether, 155 persons are included in this selection of core participants. This is a third of the total number of persons (478) involved in any of these networks.

A glance at the individual blue columns shows that the core groups do not vary greatly in size despite significant variations in the total memberships (see [figure 1](#)). This outcome may be partly accidental, not least in view of the different criteria of selection. In any case, the low variation between the five core groups entails a suitable balance for the following synthesis.

The final column (right) presents the frequency with which participants are involved in these core groups. The proportions between single and multiple involvement are two thirds against one third (a similar pattern as in the overall division between general and core participants). We may conclude that those researchers who have been involved in two or more core groups (about 50 persons) are the key actors or multipliers in the European VET research community (as defined by the sample of this analysis).

Communication across networks: Use of ERO-Call



In the previous analysis of relations within and across European networks only one medium of communication was mentioned: conferences or similar events facilitating face-to-face meetings. These play a part in all the networks included in this sample. However, in view of the transnational nature of European networks, virtual communication via email or other electronic means is just as important. A common tool for this form of communication are mailing lists.

As part of the CEDRA activities, a mailing list (ERO-Call) was set up three year ago, intended to facilitate communication between European VET researchers. The list is based on self-subscription, which means that the enrolment can only be partly influenced. ERO-Call, now comprising about 400 members, has proved to be a successful means of communication (about 50 messages per year). The point of interest, in the light of the network analysis, is to what extent this list may support communication across various networks.

The above figure can make the following points clear:

- there is only a partial overlap between the ERO-Call members and the network participants, the majority of both groups being separate from each other;
- while half of the core participants (definition see [figure 22](#)) belong to the list, only a fifth of the other network participants are included.

This breakdown suggests that ERO-Call can only play a limited role in cross-network communication. In particular, it cannot compensate for the lack of individual network lists (for instance ECER/ VETNET). The solution, though, would not be to establish a comprehensive list covering all networks (which, in any case, exceed the sample of this analysis). Rather, a relatively small interactive list involving lots of core network participants could play a multiplier role, with information being drawn from and passed on to individual networks.

European research networks in vocational education and training
An analysis of participation and network relations

Annex:
**Information on European networks and project partnerships
included in this analysis**

(alphabetic list, by acronym)

CATEWE - A comparative analysis of transitions from education to work in Europe

1997 - 2000

<http://www.mzes.uni-mannheim.de/projekte/catewe/>

CEDRA - CEDEFOP Research Arena

http://www.trainingvillage.gr/etv/Projects_Networks/Cedra/

CERN - Capitalisation and Evaluation Research Network

2001 -

<http://www.theknownet.com/eval-cern/>

CoCKEAS - Co-ordinating competencies and knowledge in the European automobile industry

2000 - 2003

<http://cockeas.montesquieu.u-bordeaux.fr/>

DELOS - Developing learning organisation models in SME clusters

1996 - 1997

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----0000000000005E0&_app.page=show-TSR.html

DEVELOP - Development, enskilling, learning organisation package

1997 - 2000

<http://www.napier.ac.uk/depts/eri/research/develop.htm>

DUOQUAL - Qualifications with a dual orientation towards employment and higher education

1997 - 2000

<http://www.b.shuttle.de/wifo/duoqual.htm>

E&T Cluster - Towards the learning economy - conclusions from FP4 and FP5 projects to shape European policies in education and training (Accompanying Measure)

2000 - 2003

<http://www.learningcitizen.uni-bremen.de>

EarlyBird - Early Recognition of a Need for Qualification and Measures of a Shaping Oriented Vocational Education in Plant Engineering

2000 - 2003

<http://www.earlybird.eu.tc/>

ECER - European Conference on Educational Research (organised by > EERA)

<http://www.eera.ac.uk/events.html>

EERA - European Educational Research Association (organiser of > ECER)

<http://www.eera.ac.uk/>

EHRD Base - Resource base of a research project cluster related to human resource development in Europe (Accompanying Measure)

2001 - 2002

<http://www.ehrd-portal.org/>

EUROPROF - New forms of education of professionals in vocational education and training

1995 - 1997

<http://www.itb.uni-bremen.de/projekte/europrof/default.htm>

FAME - Occupational identity, flexibility and mobility in the European labour market

2000 - 2003

<http://www.itb.uni-bremen.de/projekte/fame/fame.htm>

FLEX-VET - Educating a flexible workforce for Europe: Consequences for designing responsive vocational education and training

1998 - 2000

<http://projects.edte.utwente.nl/crc/flex-vet/>

FORUM - FORUM for European Research in Vocational Education and Training (EC support: 1998-2001)

http://www.itb.uni-bremen.de/projekte/forum/Forum_framesets.htm

GENDERQUAL - Gender and qualification: Transcending gendered features of key qualifications for improving options for career choice and enhancing human resource potential

2000 - 2002

<http://www.biat.uni->

[flensburg.de/biat.www/Projekte/genderqual/genderqual_eng.HTM](http://www.biat.uni-flensburg.de/biat.www/Projekte/genderqual/genderqual_eng.HTM)

HRD & LLL - The role of HRD within organisations in creating opportunities for life-long learning: Concepts and practices in seven European countries

1997 - 1999

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----

000000000000AD6&_app.page=show-TSR.html

INTEQUAL - The acquisition of integrated qualifications for professional work and study: An assessment of innovative approaches in seven European countries
1995 - 1997

<http://www.b.shuttle.de/wifo/intequal.htm>

LATIO - In-company training and learning organisations
1997 - 2000

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----000000000000660&_app.page=show-TSR.html

ORGLEARN - Ways of organisational learning in the chemical industry and their impact on vocational education and training
2000 - 2003

<http://www.itb.uni-bremen.de/projekte/orglearn/orglearn.htm>

POST-16 STRATEGIES - Finding new strategies for post-16 education by networking vocational and academic/general education and working life to improve the parity of esteem for initial vocational training
1995 - 1997

<http://www.jyu.fi/ktl/leonardo.htm>

RE-ENTER - Improving the transition of low-achieving school leavers from school to vocational education and training
1998 - 2000

http://www.biat.uni-flensburg.de/biat.www/Projekte/Eingliederung/reEnter_eng.HTM

RE-INTEGRATION - Transnational evaluation of social and professional re-integration programmes for young people
2000 - 2003

http://www.biat.uni-flensburg.de/biat.www/Projekte/Re-Integration/RE-Integration_eng.HTM

SELF-EVALUATION - Transnational methods and models for self-evaluation of non-formal personal competencies
2001 - 2004

http://www.biat.uni-flensburg.de/biat.www/index_projekte.htm

SERVEMPLOI - Innovations in information society sectors: Implications for women's work, expertise and opportunities in European workplaces
1999 - 2002

<http://www.tcd.ie/erc/Servemploi/index.htm>

SMES-TRAINING - Small business training and competitiveness: Building case studies in different European cultural contexts
1998 - 2000

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----000000000000387&_app.page=show-TSR.html

SPES-NET - Sharpening the post-16 educational strategies by horizontal and vertical networking

1997 - 2000

<http://www.jyu.fi/~stenstro/spesnet/>

TACITKEY - Tacit forms of key competences for changing employment

1998 - 2000

http://www.biat.uni-flensburg.de/biat.www/Projekte/TACITKEY/TACIT_eng.HTM

TQC2000 - Toolkit Quality Craftmanship 2000

1997 - 1999

<http://www.mtcltd.com/LeonardoTQC2000/>

VETNET - The Vocational Education and Training NETwork (> EERA network)

<http://www.b.shuttle.de/wifo//vet/vetnet.htm>

WEX21C - Work experience as an education and training strategy: New approaches for the 21st century

1998 - 2000

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----000000000000ABF&_app.page=show-TSR.html

WHOLE - Work process knowledge in technological and organisational development (Thematic Network)

1998 - 1999

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----0000000000000968&_app.page=show-TSR.html

WORKTOW - Changing working life and training of older workers

1997 - 2000

http://improving-ser.sti.jrc.it/default/show.gx?Object.object_id=TSER----00000000000009CA&_app.page=show-TSR.html

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Stephan Manning, Free University Berlin
Analysing Project-Based Research Networks
A brief guide (2004)

The notion that *networks* play a significant role for researchers, in particular in the European context, is widely shared. Networks are regarded as sources of innovation and cooperation, both for individual researchers and a research community as a whole. The question is how these networks emerge and what they look like; what role individual researchers play in setting up these networks and how individuals as well as collectivities of researchers can benefit from, or are constrained by these networks. To look at research communities from a network perspective, social network analysis can be employed as a method.

In general, *social network analysis* looks at social actors and their relationships. A social network is often defined as “[...] a specific set of linkages among a defined set of persons with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved.” (Mitchell 1969). That is, by looking at social actors and their relationships, the way these actors interact, enabled and constrained by the networks they are embedded in, can be analysed.

In more concrete terms, the types of actors and relationships to be analysed must be defined. *Actors* can be individuals, organizations or other collectivities. *Relationships* can be looked at in terms of personal relationships, such as friendship or personal contacts; or business relationships, such as financial exchanges or partnerships. In the context of research networks, individual researchers or research institutes are analysed as actors. Project partnerships or coauthorships are analysed as relationships. Of course, relationships, even in research, include more than just project partnerships or coauthorships. Still, these two dimensions are very important in order to assess what kind of relationship there is between particular researchers or research institutions.

To analyse these relationships, so-called *socio-matrixes* are set up. They contain all actors to be included in the analysis as heads of rows and columns, and their relationships with each other as contents of the cells in the matrix. To give an example, the following matrix (Table 1) contains five researchers (R1 to R5, presented both vertical and horizontal) and the number of joint partnerships in research projects (indicated in the white cells) over a couple of years. The matrix says, for example, that Researcher 1 (R1) joined two projects with Researcher 3 (R3), whereas Researcher 2 (R1) joined no project with Researcher 4 (R4).

	R1	R2	R3	R4	R5
R1	0	2	2	1	0
R2	2	0	2	0	0
R3	2	2	0	0	0
R4	1	0	0	0	3
R5	0	0	0	3	0

Table 1: Simple Research Network

These matrixes can be displayed as graphs, that is graphical networks, which are composed of nodes (researchers) and ties (project partnerships). These graphs as well as the matrixes can be produced with special network analysis tools, such as UCINET and NetDraw (Borgatti et al. 2002) Figure 1 shows all actors and their relationships as a graph. The thickness of the lines indicates the number of projects which the connected actors have collaborated in.

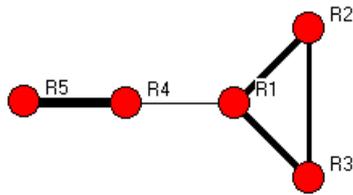


Figure 1: Simple Research Network

This graph (as well as the underlying matrix) can be analysed in several ways. For example, the centrality of actors in the network can be compared. R1 is very central because he/she collaborated with three other researchers. In practice this means that R1 more than the other researchers had the opportunity of learning from other researchers, of transferring contacts and information. Also the graph shows that without the cooperation of R4 and R1 the network would break apart. So, R4 and R1 form a bridge that makes the transfer of knowledge possible amongst all researchers. Of course, as the lines represent an aggregate of partnerships over a couple of years, the transfer of knowledge does not happen at once but, possibly, over a certain period of time.

Finally, the graph shows that R1, R2 and R3 form a clique which is a group of actors who are all connected with each other. Cliques are considered as cohesive groups that share norms and expectations (strong ties). In this case, this clique has formed over two joint projects. Similarly strong is the relationship between R5 and R4, which has developed over three joint projects. By comparison, between these two groups there is only a one-off project relation, which might, depending on the project, indicate a swift transfer of knowledge between these two groups, and a source of mutual innovation (weak tie).

Of course, the ties presented in the graph are only *one* dimension of relationship. They simply indicate if (and how often) researchers have joined projects. In practice, these researchers would also communicate by email, over the phone or in meetings. They would develop friendships, or just professional relationships, or even competition despite joint project relationships. Also, the quality of project relationships is not shown in this graph. It is not clear what these actors contributed to the respective projects. Therefore, formal network analysis, as used here, can only give hints as to what research networks look like.

In sociological and economic research, network analysis is used to show structures of relationships that *might* facilitate innovation, concentrate power, increase competition or elicit cooperation. Some attempts have been made to theorize network analysis, for example Burt (1992), Cook (1987), Lin (1991) and others. Many researchers, however, still see network analysis (just) as a research tool which facilitates, but not compensates for the analysis of relationships between social actors. Therefore, this particular analysis can be only one step towards understanding how research networks might come about and how they influence individual researchers and the research community as a whole.

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