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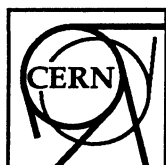


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**Euro-Networking and Industrial Policies:
Lessons from the Past**

François Fluckiger

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Euro-Networking and Industrial Policies: Lessons from the Past (*)

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Abstract:

The past decade has seen the creation of a dozen pan-European initiatives in the field of Academic and Research Networking. One of the reasons for the resulting complex situation is the influence of Industrial Policies from governments or the EC. The paper analyses the rationale and the logic of these policies when taking the A&R community as an intermediary to influence procurements of the global market. The paper tries to explain why these initiatives did not achieve their industrial objectives so far, and how at the same time, complete business sectors, although well adapted to it, have been neglected by the European industry. A few suggestions are proposed, including the opinion that development of partnerships between industry and public research seems more promising than the enforcement of procurement policies.

Keywords:

euro-networking, industry, policies, COSINE, TCP/IP, marketing, bridges, routers, FDDI

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1. Setting the scene.

If the 70's were very quiet on the front of Academic and Research (A&R) networking in Europe, the last decade has been extremely intense with a succession of initiatives and events, as shown in Figure 1. A rapid look at this calendar leads to a simple observation: these events are generally clustered, in the form of active periods of a few months, followed by quieter periods. When

analyzing the nature of these events, the reason for this clustering becomes apparent: most of the initiatives have entailed at some stage counter-initiatives, followed themselves by further reactions. This gives the general tone of the past decade: A&R euro-networking has been constrained by political considerations, and amongst them, industrial concerns played a major role. Discussing these industrial policy aspects is the object of this paper.

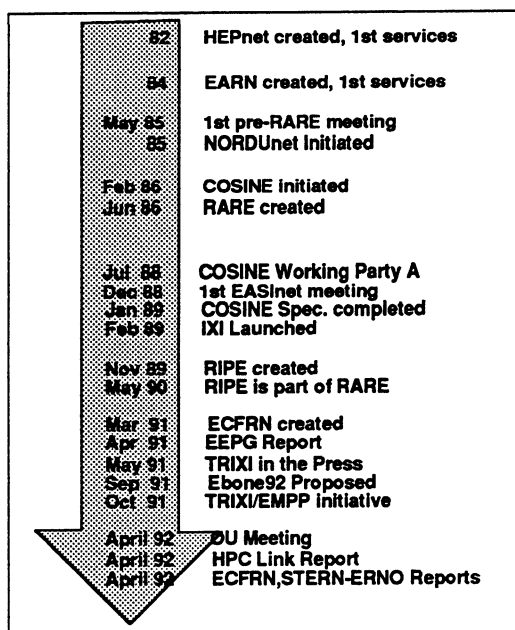


Fig. 1: Some A&R Networking events

A network of initiatives, at least. Listing the various initiatives and their nature is difficult. Presenting their cross-relationships is a challenge.

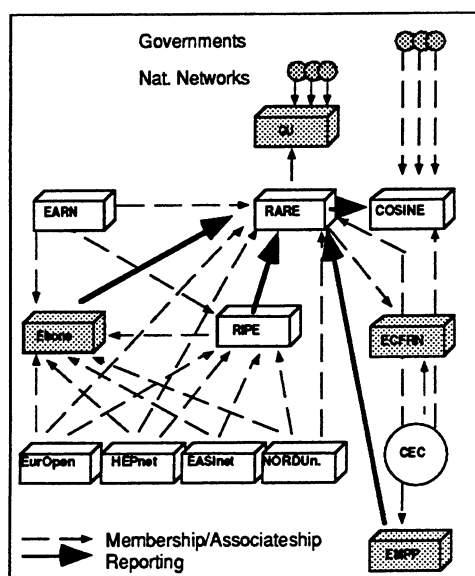


Fig. 2: Perceived relationships 01/05/92

Figure 2 tries to depict the relationships as perceived the 1st of May 1992. Let's say a few words about each of these boxes¹ (more detailed descriptions can be found in [1]):

- EARN** a legal entity, operating file transfer and mail services over a partially private network.
- RARE** a legal entity, driven by national A&R networks.
- COSINE** a Eureka project, supported by the CEC, aiming at building an infrastructure based on OSI.
- RIPE** an ad-hoc group coordinating IP, incorporated in RARE a year after its creation.
- Ebone** a provisional consolidation of European IP leased lines.
- ECFRN** an ad-hoc consultative forum of senior networking officials, now convened by the CEC.
- HPC Links** a sub-group of the High Performance Computing Advisory Committee from the CEC DG XIII.
- RARE OU** a future Operational Unit (Ltd Company) to organize and sell networking services.
- EurOpen** a legal entity, the umbrella for the provision of EUNET network services.
- HEPnet** an informal structure operating services for the HEP community, over a dedicated infrastructure.
- NORDUnet** an informal structure operating services for Nordic countries, over a dedicated infrastructure.
- EASInet** a network sponsored by IBM between EASI centres, together with a transatlantic T1 line to NSFnet.
- EMPP** an initiative from Germany and the UK, with CEC support, to set up a megabit multi-protocol network based on X.25 technology.

No doubt that within 6 months, some of these initiatives will have vanished and others will have solidified as legal entities, as the overall scene keeps changing.

Several of them do have an industrial flavour. Figure 3 indicates the nature of this flavour, according to the following simple criteria:

1. Those sponsored by Industry: EASInet, and initially EARN fall in this category.
2. Those promoting standards, with industrial motivations: COSINE, and to a lesser extent, RARE initially.
3. Those accepting to offer services to Industry: Ebone, EurOpen/EUNET, and probably the future RARE OU.

¹ Initiatives targeting more specifically industrial research will not be discussed in this paper which is focussed on public research.

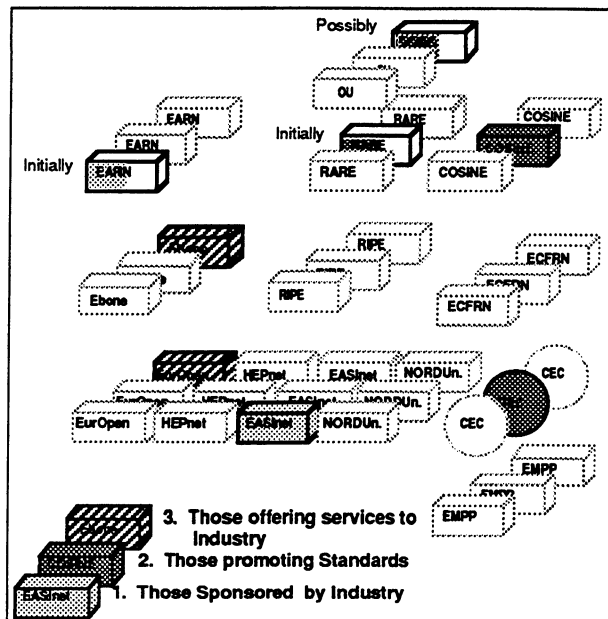


Fig. 3: Industrial flavours of Euro-initiatives

As a matter of fact, industrial concerns have significantly influenced the advances of A&R networking in Europe over the past decade, both on the domestic and the international scene. The following sections try to analyse the rationale and the mechanics of this influence.

The paper will heavily discuss money, and it will be appropriate to put in perspective the sums relevant to market shares and turn-over, with the funding level of some of these initiatives. EARN and RARE have a budget in the range of 1 MECU. COSINE (10 MECU) and the expenditures by A&R on international leased lines (8 MECU) are one order of magnitude higher. New initiatives, such as ECFRN, request another order of magnitude (100 MECU).

2. Industrial policies: the rationale

The national ministries of trade and industry and the Commission of the European Communities are the promoters of governmental industrial policies in Europe. The level of influence that the former exercises on A&R network varies considerably from country to country. The role of the CEC is more complex: to simplify it, one could say that the CEC has a dual mission in Information and Communication Technology:

1. Encourage competition, fight monopolies and dominant positions.
2. Promote and stimulate European IT industry.

This legitimate dual mission is delicate, as the two objectives may turn out to be, in certain areas,

mutually exclusive (competition means also opening protected markets to US industry).

The implementation policies for stimulating the European IT industry rely on the promotion of European norms: for the European IT Industry to acquire freedom and competitiveness in an open market, products must not be dictated by proprietary technical standards, but follow European norms. In other words, the standards must satisfy two conditions: be open, and not be exclusively controlled by non-Europeans. TCP/IP, which is an open suite of standards developed initially by the USA Department of Defense, is felt by several governmental bodies and by the Commission, to satisfy the first condition, but not the second. This is considered as the main obstacle for TCP/IP to be supported by CEC promotional programmes. The practical translation of these principles is that supported norms must come from International Standard bodies where Europe has a voice, such as ISO or CCITT.

**Motherland,
the major
obstacle to
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As for many principles, the implementation of the European norms policy has certain side effects of non-negligible impact. Let's mention three of them:

- The existence of differing European flavours of International standards. This leads from time to time to incompatible versions (e.g. the OSI standards, with incompatible profiles at the network layer on each side of the Atlantic) which in practice generate the opposite effect: segmenting the world user market into non interworking clusters instead of creating an open environment.
- Standards "invented" in Europe (e.g. X.25 and more recently ATM) are particularly appreciated, and benefit generally from support and stimulation programmes.
- Conversely, some ISO standards, satisfying the conditions for support by policy programmes, but "invented" initially in the USA are not always appreciated. The FDDI standard for high speed local area networks, initially invented by ANSI, the American National Standard Institute, falls into this category.

In many cases, such attitudes are more of an emotional nature than dictated by strict industrial considerations. The technological advantage given to a country having launched the first idea of a

**FDDI and
Ethernet:
ISO, but this is
not enough**

standard is often negligible. As demonstrated later, if in certain areas such as HDTV, European industry has a definite advantage (with the D2Mac standard), in many other areas, Europe has already lost the leadership on standards it had invented, by the time they get finalized for production. In this context, it will be interesting to observe the ATM case, and the role actually played by the European industry in its development as a LAN technology.

The above remark on the difficulty of keeping the lead from the specification of standards to products, is similar to the conclusion of a recent study reported by Debora Mckenzie in [4]: *"Europe is not really behind in research, although there seems to be some lag in R&D. Rather, there is a gap in Europe between investment in research, and its results in terms of saleable products"*.

The lack of enthusiasm for fully open ISO/CCITT standards invented outside Europe is somehow selective, which may also indicate its emotional nature. In general it applies mainly to standards from the USA, but those from other continents seem better tolerated. The most recent example is with DQDB, the new standard for Metropolitan Area Networks invented in Australia which seems to meet a significant success in Europe currently, as demonstrated by the license acquired recently by Siemens and Alcatel from the Australian firm QPSX, and the many projects emerging notably in Germany and Italy.

The above discussion illustrates an old truth: standards have always been used as weapons in industrial strategies of all types, not only by industry itself, but by governments too, for protection and conquest of market. Even standard practices that became part of national cultures (left driving, or electricity plugs) objectively serve industrial strategies. It should be no surprise then if the question of standards is central to the fastest growing segment of the IT industry today: telecommunication equipment and services.

3. The actors

Figure 4 provides a model for discussing relationships between the various actors. As any model, this is a simplification of the reality.

- In the centre, the European A&R Community
- At the top, the governmental/CEC initiatives supporting standard promotion as part of industrial policies.
- On the left, Industry, when interacting with European A&R networking via sponsorship,
- and Industry when interacting via partnership.
- On the top right, the network operators, public or private.
- At the bottom, the non-European A&R networking communities, such as the USA one.
- And finally, on the bottom right, all the other networking customers outside the A&R community.

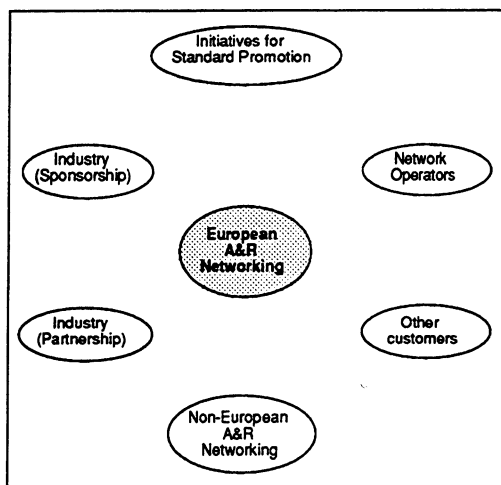


Fig. 4: The actors: a model

4. From a marketing angle

We will take COSINE, the Eureka project, as a typical example to discuss relationships between three of these actors: the governmental/CEC initiatives for promotion of standards, the A&R networking community, and the other customers.

A&R: an intermediate segment

These relationships will be analyzed from a marketing angle, and a few simple concepts will be borrowed from this discipline.

COSINE "... has been created for the promotion of OSI standards based on Europe Wide networks" [2]. More explicitly the COSINE Implementation Phase Project Proposal document [3] defines the objectives as follows:

- To create a common OSI infrastructure [...] to support all European research*
- To establish [...] all the functions and support services necessary to allow the users to take full advantage of the infrastructure.*
- To take steps to ensure that the infrastructure remains available [...] after completion of the project.*
- To thereby contribute to the market pull for OSI*

In marketing terms, this is called influencing target markets via intermediate segments: the Industrial Policy (IP) actions aim at impacting the general telecommunication market. To this end an Intermediate market Segment (IS), the A&R

community, is chosen, and the initiative tries to influence it, with the objective that the intermediate segment will in turn influence the Target global Market (TM).

The overall influence is then achieved by a chain made of two sections as shown on Figure 5. To be successful, it requires the two sections of influence to work effectively. We will analyse each of these two sections for COSINE, taken as a test case.

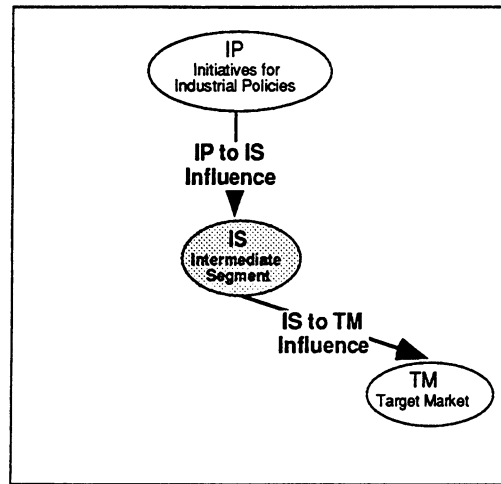


Fig. 5: Influencing Target Market via Intermediate Segment

Document [3], when discussing operational targets, provides a partial answer to the question of the difficult IP to IS influence in COSINE:

"The envisaged market pull for OSI products will only work if the research community's requirements for OSI do not differ unnecessarily from those of others users."

It is therefore a target to align the COSINE specifications for OSI with other major procurements requirements, including the public administration domain."

IP to IS Influence

COSINE [3] specified the objective of the project in terms of penetration of OSI products and services in the A&R community as given on Figure 6.

Total market: 225 K Researchers		
	In 91/92	
	# users	%
X400	150 K	70
FTAM	90 K	40
XXX	125 K	55
X.25+TPO	150 K	70
X500	150 K	70
X25/LLC2	75 K	35
RJE over FTAM	45 K	21
VTP	75 K	35

Fig. 6: COSINE Penetration Targets

These penetration targets have not been reached. For many of the services the actual penetration to the end user is null or close to zero (RJE over FTAM, VTP, X25/LLC2, FTAM, even X.500). Conversely, a technology not supported by the project, and not

used at the time it started (TCP/IP) has penetrated nearly 100% of the user market. It turned out that the first section of the chain of influence has not worked. Let's try to understand why.

Marketing and reverse-marketing

A marketing approach can be defined as follows:

Analyse the market requirements and adapt the offer to the demand. Then stimulate the demand, current or potential, with products matching it.

As the specifications were due to define what the requirements of the A&R community were, the above statement means that these requirements have to be aligned to conform to the Industrial Policy.

In practical terms this is a reverse-marketing approach:

Try to adapt the market requirements to the offer.

In theory, there is nothing wrong with reverse-marketing except that it necessarily requires monopolistic situations. This applies to macro economy of course, but also to sectoral communities. It turned out that monopolistic situations did not prevail sufficiently in the A&R community, to allow the reverse-marketing approach being successfully enforced.

Reverse marketing requires monopolies

It is particularly curious to note, when closing this section, how the notion of "market pull" in the previous statement has been distorted towards the opposite notion: the "technology push". From McKenzie again [4]: "[...] *Technology push is the undertaking of a project because it is possible, and because the specialists in the field say it will be valuable, not because the eventual, putative users say they need it. The opposite approach is market pull, where research is only undertaken if users have expressed a desire for the results.*"

IS to TM Influence

Two factors affect the influence that the Intermediate Segment can actually achieve on the Target Market:

1. The respective size of the intermediate and target market.

It is clear that it will be more difficult to impact a target market via an intermediate segment that represents a tiny fraction of it.

2. The distribution of suppliers in the intermediate and target market: do they match?

If a given sector of supply, dominant in the target market, is a minor fraction of the intermediate segment, impacting this sector will be difficult.

The first ratio (i.e. the respective weight of the A&R community segment in the total telecommunication market), was not evaluated in COSINE to our knowledge. Doing it would be a task beyond the objective of this article. However, it is possible to analyse the structure of the overall market and to compare it to that of A&R.

5. The European Telecommunication Market

In general, industrial policies in networking target not only the telecommunication market, but also, to a lesser extent the computing market. For simplicity, we will not address the latter and will concentrate on the former.

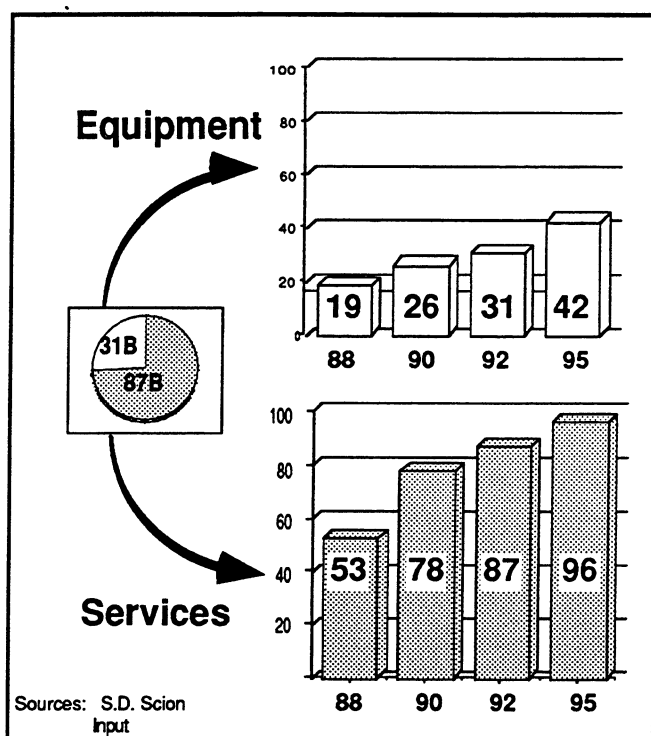


Fig. 7: European Telecommunication Market

The total European Telecommunication market² should reach 118 BECU in 92, broken down into 31 BECU spent on equipment, and 87 in services. As shown on Figure 7, the fraction for equipment should grow from 1/4 in 92 to 1/3 in 95.

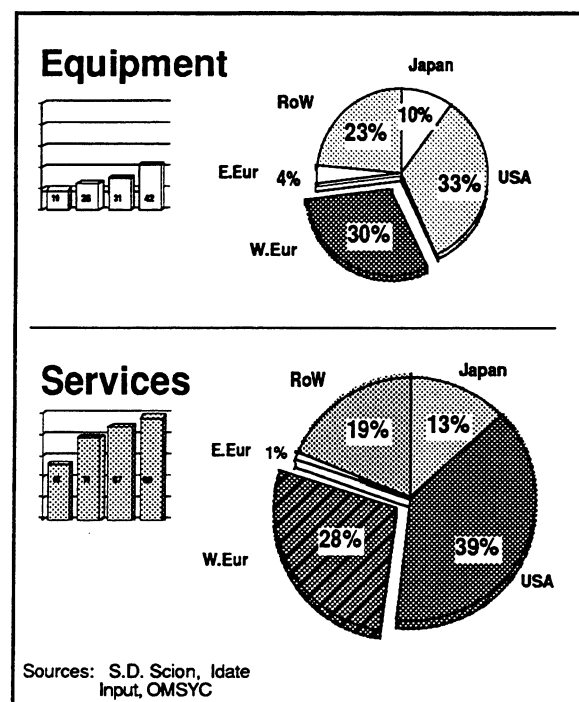


Fig. 8: Telecommunication World Market in 1992

The telecommunication market is therefore dominated by services. A few characteristics of these two sectors: in general, services generate higher profit margins than equipment. However, controlling the equipment is more strategic. But a feedback exists: a high demand in services pulls the equipment market, especially when specific systems are required.

Industrial policy initiatives involving A&R networking do not target of course all sectors of the equipment or service markets. For equipment, the **Data Communication** sector is targeted; it represents 9% of the equipment market, and 2.8 BECU in 92. For services, the **Value Added Network Services (VANS)** sector is targeted; it represents 6% of the service market and 4.8 BECU in 92. To a lesser extent, the sector of **Data Transport Network Services (6%)** is also relevant. Again, when concentrating only on those sectors of equipment and services mainly targeted by industrial policies, services dominate.

² In the following, "market" will designate the yearly turn over generated by a given market

Data Communications:
Services dominate in the global market, Equipment, mainly LANs, dominate in A&R

What about the distribution of the data communication supply in A&R networking? Again, no global data is available on such an analysis. It is however possible to establish how the market generated by a big typical A&R site breaks down. As shown on Figure 10, nearly 84% is spent on LAN and end system equipment, and only 5% on WAN equipment. Only 11% is spent on services, with 1% on VANS.

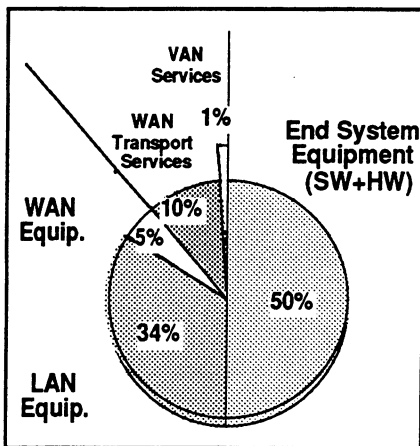


Fig. 10: Distribution of the Data Communication Market for a Typical Big A&R centre

These figures apply for a big site of several thousands of devices connected to the local infrastructure, not necessarily to the entire A&R community. They nevertheless clearly indicate a fundamental fact: in data communications, services dominate the global market, and equipment dominates the A&R market. Thus, the intermediate segment and the target market have structures fundamentally different. There is, for example, little hope to influence significantly the global VANS sector (60% of the global market) via A&R where VANS represent only 1% today³. However, it is probably on LANs and end systems that A&R may have an impact on the global market.

³ Note however that recent initiatives, such as the RARE Operational Unit, tend to increase the level of expenditures of A&R in VAN services, thus making the community closer to the global market

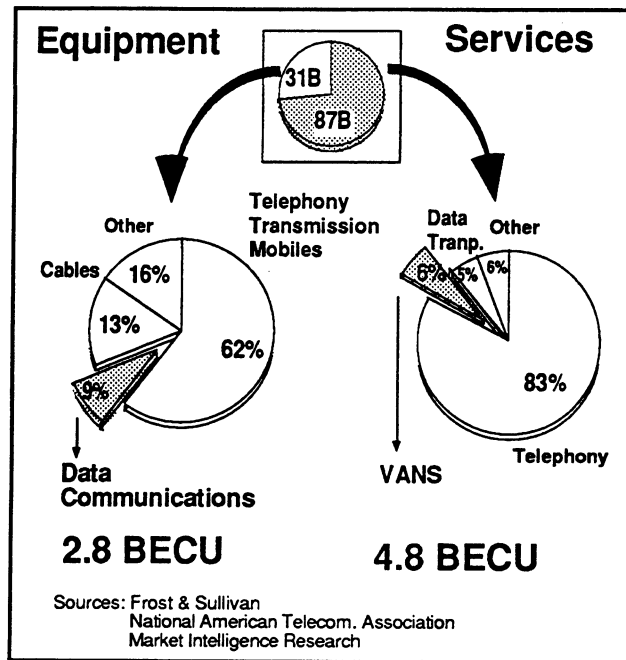


Fig. 9: European Equipment and Service Markets 92

6. Services: who influenced who?

Let's have a quick look at the VANS sector. Figure 11 indicates the weight of e-mail services: 1.4 BECU. This sector is exploding, and the technical basis for this growth is mainly the X.400 standard from the CCITT. At the same time, the use of X.400 in A&R, started about 6 years ago, is rather stagnant, hampered by the lack of commercial products adapted to the specific environment of the community, and SMTP, the e-mail

standard from the TCP/IP suite is growing fast. One can deduce from this observation that the influence of the A&R segment on the development of the global X.400 mail market has been in practice low. Conversely, one may now expect that the development of the global market will allow the appearance of X.400 products better adapted to A&R (i.e. not only designed for office automation environments).

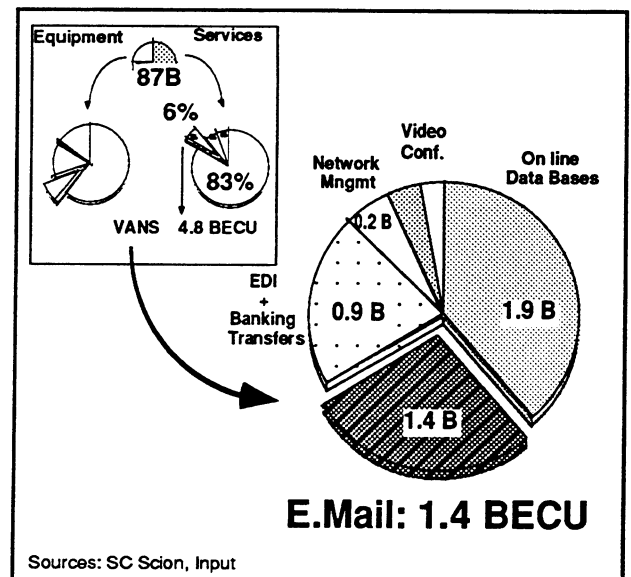


Fig. 11: European VANS market in 1992

As an aside, one may notice the quasi absence of X.500 based VAN services (the CCITT standard for directories), according to market analysts (this concerns the services, not the products). In practice, these services should only account for a few dozens of MECUs in 92, which may be insufficient to

generate a rich and competitive base of software products implementing the standard, unlike for X.400.

7. Equipment: missed opportunities

The Data Communication market in Europe should reach 2.8 BECU in 92. It is estimated that about 50% of it, 1.4 BECU, concerns LAN related equipment. We will discuss here how the European Industry is positioned on this LAN market, and also on the more specific sector of Bridges and Routers.

**Routers,
Bridges, LAN
concentrators:
European
industry absent
from the scene**

Bridges and Routers account for 0.25 BECU in 92 in Europe, 9% of the total data communication market. The sector is growing fast, especially for routers and FDDI Bridge/Routers, as shown on Figure 12.

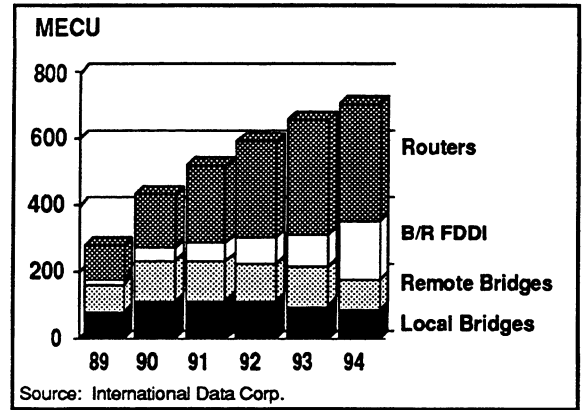


Fig. 12: World Market for Bridges and Routers

Figure 13 shows the shares in volume (1990) of the world market for Bridges, Routers, and also for LAN wiring concentrators. Where is European industry on these markets? Absent. BICC, was one of the only European vendors (9% of LAN concentrators), before being bought a few months ago by the American company 3Com.

Such a situation is difficult to understand, as

these sectors are significant in terms of turn-over, in rapid expansion, and particularly well adapted to the European industry: the packet switching technology does not require large investments, Europe knows how to build X.25 switches, which is not significantly different from building IP switches or Ethernet routers, Ethernet and FDDI are OSI standards, LAN concentrators is not a particularly high technology.

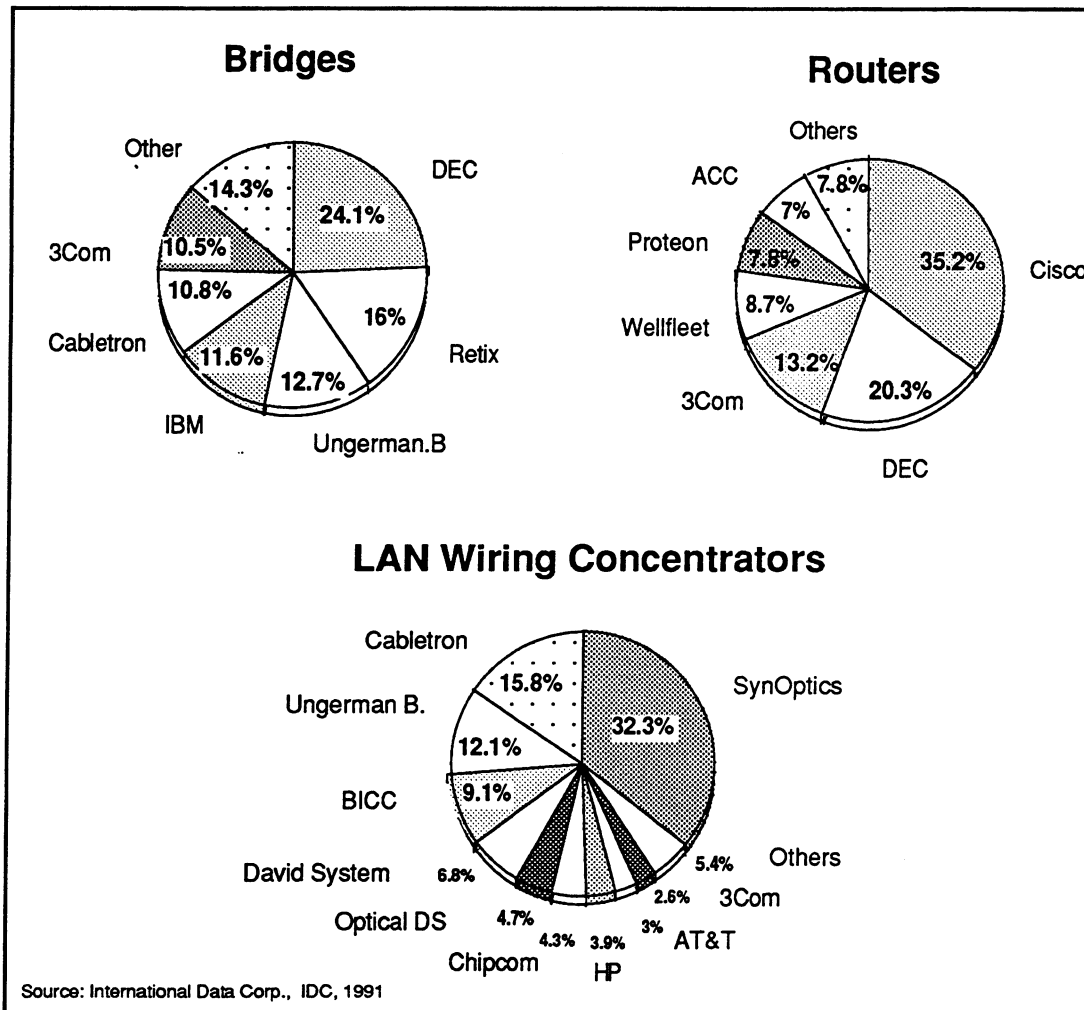


Fig. 13: World market in 1990 for Bridges, Routers and LAN Concentrators: Shares in Volume

**Entire business
sectors well
suited to
European
Industry have
been
abandoned**

The reason lies probably with the fact that industrial policies have not encouraged European industry to tackle these sectors, possibly because the open standards, even OSI, supporting them were coming from the USA (Ethernet and FDDI, or IP).

8. What could be done now?

It is clear that entire business sectors (LANs, routers) well adapted to the European industry, have been neglected and abandoned to US industry.

Other supply sectors, however, those based on OSI standards, were subject to intense promotional actions. Markets do exist for them, although less important than expected. Europe is not absent from them but it does not dominate. Let's have a look at the two major ones. X.25 first: the market is still growing but less fast than that of the other switching technologies, and should reach its peak by 94/95 according to analysts. European countries are not absent from that scene, but are not leading; Canada is. OSI Software: Europe has a minor position here; the leader of portable OSI software (RETIX) is American. This seems to be a by-product of an old industrial behaviour: Europe has a strong software industry, but generally neglects software products, to concentrate on specific or turn-key developments.

What can be done? Two suggestions to Departments of Trade and Industry, and to the CEC:

1. Do not hesitate to support and promote from the beginning official (ISO/CCITT) standards, even if they have been "invented" outside Europe.
2. Negotiate with the USA conditions for European involvement in the future evolution of the de-facto open standards (TCP/IP).

The latter point, if pragmatically implemented, could eliminate the last barrier blocking support of TCP/IP by Industrial Policy initiatives. Together with that of OSI, such a support would be of strategic importance for the European computing industry at large, as a policy of support for TCP/IP is the necessary complement to the existing policy of support for the UNIX operating system.

**Why not
involve
Europe in
TCP/IP
standards?**

A final consideration on money. In marketing, a simplistic criteria to evaluate actions (e.g. publicity campaigns) aiming at impacting a target market is the ratio between the budget of the action and the market itself. Applied to COSINE, this gives the following results. The COSINE budget is

nearly 10 MECU/year. If one assumes that the target market is the European data communication equipment sector only (2.8 BECU), the budget/market ratio is 0.4%. If one assumes more realistically that it includes the data communication equipment sector and the VANS sector (8 BECU), the ratio is 0.1%. Is it enough, or is it by far insufficient? It is impossible to reply without defining the level of impact one was aiming at. But one can certainly observe that the ratio is definitely low. It is with budgets of the order of 100-200 MECU/year, the level one is now talking in new initiatives such as ECFRN, that ratios of a few percent would be reached. Such values would correspond to the threshold to reasonably expect a noticeable impact.

**Were the
10 MECU of
COSINE
enough?**

9. Mutual influences

This paper has detailed the relationships between three of the major actors. In this final section, the relationships between the other actors and the Academic and Research networking community will be briefly presented.

Figure 14 indicates the influence, as perceived by the author, exercised by the various actors on A&R networking, to try to impact the nature or the volume of its data communication procurements. The level of attempts to influence it, and the level of real influence resulting from these attempts are rated as either low, medium or high.

The influence of public industrial policy initiatives on A&R networking have been extensively discussed in this paper: there has been a high level of attempts and low effect on actual procurements. The level of attempts from industry to influence procurements via sponsorships is rated as medium, as is the result. Similar attempts via partnerships were infrequent, but when they took place, the result is rated as fair. Finally, researchers from other continents tried very moderately to influence European A&R (the explosive success of TCP/IP in Europe results from a real user demand, not from an heavy promotion by American academia).

Similarly, the influence that A&R networking exercised on the various actors, is represented in the same way. In this context, influence means any action undertaken by A&R to impact its own procurements, or that of other customers, in terms of volume (negotiate discounts via sponsorships or joint R&D programmes, lobby for public funds) or in

terms of structure (try to get industrial policies changed or adapted, specify requirements to industry to influence the offer).

If it is felt that American A&R networking tried very moderately to influence Europe, the reverse is not totally true. OSI promoters in European A&R networking have made significant

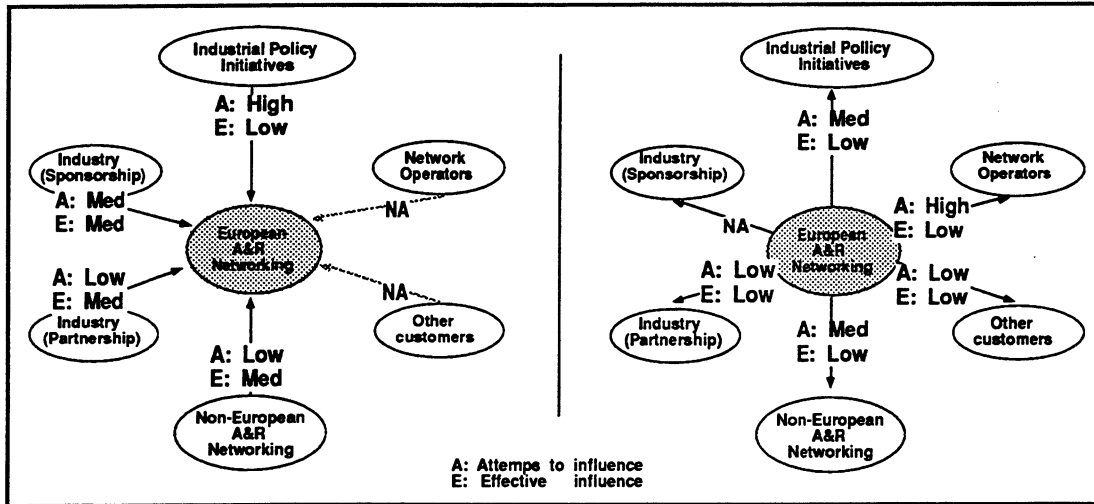


Fig. 14: Mutual influences over last years between actors of A&R networking in Europe

Despite regular attempts to make industrial policies take its specific requirements into account, A&R has had little success so far. Signals indicate however that this might change. A nearly similar situation prevails with respect to network operators: there were many attempts to obtain lower prices, especially for leased lines, which failed regularly.

The paper discussed at length the relationships between A&R networking and the rest of the data communication market. Nearly nothing has been done explicitly by the former to influence the procurement of the other customers. So, the resulting impact of explicit actions on the global market is low.

There is however one form of implicit influence which is not to be neglected: the transfer of technological culture from students to their future firms. This is difficult to quantify, but it is real, and most of the American suppliers realized that in the 80's. One aspect should be kept in mind however: students only transfer the technology they are exposed to, not the underlying layers hidden to them. This means in practice operating systems, languages, network user interfaces and facilities, but not transmission or switching technologies for example. In these early 90's, today's student live in a world of TCP/IP applications, typing daily "FTP" or "TELNET", writing "NSF", "UDP", and "socket" based applications. This is their culture, the one they will bring with them to industry over the coming years.

attempts to export the OSI culture over the Atlantic. So far, the result is felt low, although this should be reassessed within two years.

Finally, A&R is too rarely taking itself the initiative of partnership activities with industry, for example to get its requirements, often at the leading edge

of the technology, taken into account.

10. ... and their efficiency!

With a simple ranking of the level of influence, one may calculate (Figure 15) the ratio between the level of real influence and the level of attempt: this gives the coefficient of efficiency of the actions undertaken for influencing the nature or the volume of data communication procurements. This is an academic exercise, and care should be taken to not draw over-simplistic conclusions.

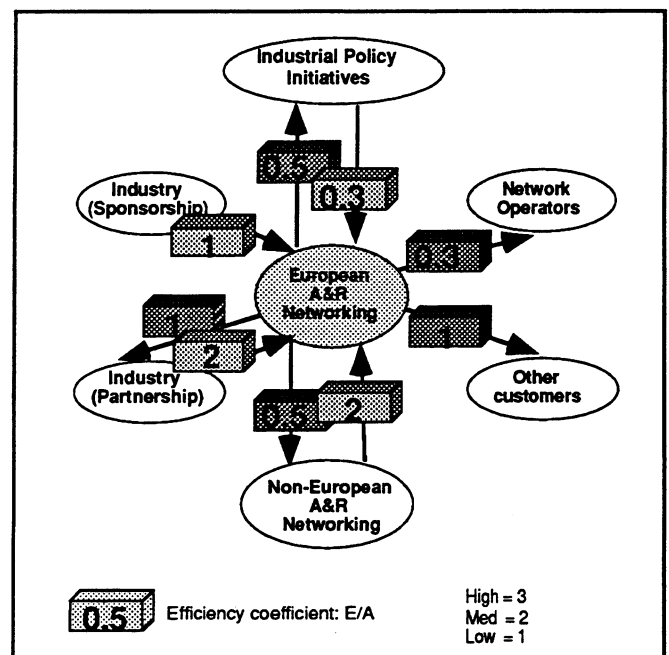


Fig. 15: Efficiency of influential actions

The only lesson that we will draw from these coefficients is that it is via partnerships that maximum mutual influence may be achieved between A&R networking and industry.

Better than via sponsoring, more efficiently than via enforcement of procurement policies from governmental initiatives, partnerships will allow cross fertilisation between A&R and industry, optimize mutual influences and allow, by pulling products to the leading edge of technology, a maximum impact on the overall IT and telecommunication markets.

**Industrial
partnership:
the way for
the future**

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