

## Open innovation via virtual team : how and why do we meet?

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## **Open innovation via virtual R&D project teams: how and why do we meet?**

Author: Raymond Opdenakker MSc

Department of Industrial Engineering & Innovation Sciences

Eindhoven University of Technology

The Netherlands

E-mail: [R.J.G.Opdenakker@tue.nl](mailto:R.J.G.Opdenakker@tue.nl)

### **Abstract**

Open innovation can take place on several levels. In this paper we will look at the virtual R&D project team level, especially at the ‘fuzzy front end’ of open innovation. We conducted qualitative research with six case studies of virtual R&D project teams, consisting of partners all over Europe. We found that most partners were intrinsically motivated for the virtual R&D project team because they were interested in the content of the project. These partners were already involved in research concerning the topic internally in the organisation. By collaboration in a virtual R&D project team they were able to put this research on a higher level. We also found that concerning the forming of the network, i.e. the virtual R&D project team, is that most partners are acquainted to each other, or are ‘acquaintances of acquaintances’

### **Introduction**

In the recent past it was still normal that one or more employees in a firm worked on an innovation, whereas the research process that was conducted was hidden from the outside world. An important reason of course was to become the prime mover on the market with the new product, and therefore get a strategic advantage. This way of working was seen in literature as the closed model (de Jong et al., 2006). The leading paradigm in those times was ‘*if you want something done right, you’ve got to do it yourself*’ (Chesbrough, 2003a, p. xx). But the times they are a changing. Chesbrough (2003a) discriminates several ‘erosion factors’ which make it difficult nowadays for the closed model to function properly. These ‘erosion factors’ are as follows:

- Mobility of knowledge workers: It is more difficult to protect knowledge, because when a knowledge worker moves to another company, he/she takes his/hers knowledge with him/her.
- Higher educated: A greater part of the work force is higher educated, increasing the potential amount of people that can innovate.
- More knowledge intensive partners: Research institutes and universities are nowadays more eager to cooperate with companies.
- Risk capital: Due to risk capital, it is easier to finance innovations.
- Shorter life-cycle of products: More knowledge and more people who create knowledge, leads to an increase of the amount of knowledge. Also, the time to market for new products is shortened. Because it is almost not possible for a company to oversee all new knowledge, cooperation is necessary.
- Information and communication technology: ICT developments have made the world smaller. Internet and other communication possibilities ensure that knowledge can be obtained faster and easier.

All these factors make it more difficult to innovate via a closed model. An open model seems more suited for conducting innovations. This paradigm shift from a closed to an open model takes place during the last decennia. In such an open model, collaboration between several partners can take place, as DeCusatis (2008, p. 155) already concluded 'There is a growing emphasis on collaboration as part of the innovation process'. This collaboration can take place on organisation level, but also on virtual R&D project team level. In this paper, we will take a look at this virtual R&D project team level, especially on the European level. But first we will have a short look at open innovation.

### **Open innovation**

Chesbrough (2003b, p. 36) sees open innovation as 'firms (who) commercialize external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market. Specifically, companies can commercialize internal ideas through channels outside of their current businesses in order to generate value for the organization. Some vehicles for accomplishing this include startup companies (which might be financed and staffed with some of the company's own personnel) and licensing agreements. In addition, ideas can also originate outside the firm's own labs and be brought

inside for commercialization. In other words, the boundary between a firm and its surrounding environment is more porous, enabling innovation to move easily between the two'. Open innovation means that innovation projects are more and more characterised by the input of different sorts of parties, internally as externally of the organisation, and by a greater involvement of users concerning the development of new products and services. In this way, R&D is treated as an open system.

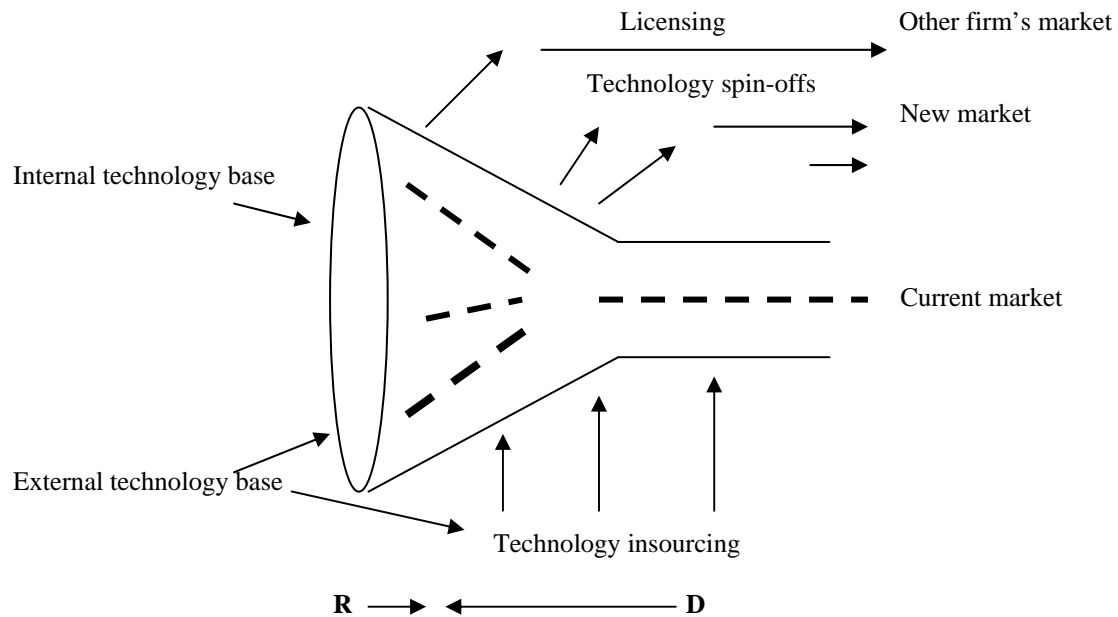


Figure 1 Open innovation model (Chesbrough, 2003a)

As we can see in figure 1, projects can be launched from either internal or external technology sources. Also, new technology can enter into the process at various stages. Projects can also go to market in various ways, by licensing, spin-offs, or the company's own marketing and sales channels.

### **Open innovation via virtual R&D project teams**

Open innovation can be established via virtual R&D project teams (DeCusatis, 2008). The virtual R&D project team can be defined as a cooperation between a collection of individuals, that usually exists for a longer period of time and has a charter to make decisions, and that is oriented to the goal of undertaking creative work on a systematic basis in order to increase the stock of knowledge, including

knowledge of (hu)man, culture and society, and the use of this stock of knowledge to devise new applications, characterised by geographical dispersion of the members, who rely only on a limited extend to face-to-face communication. These team are becoming more popular. There are a lot of specific benefits in using virtual R&D project teams. We can mention a few, without being exhaustive. In the first place, when team members work mostly from their own home (teleworking), using virtual teams can cut office-space costs (Cascio and Shurggailo, 2003). In the second place it can cut time and travel costs (Cascio and Shurggailo, 2003). In the third place the team can get access to and therefore consist of experts, distributed all over the world (Konradt and Hertel, 2002). In the fourth place the potential to produce high-quality, innovative solutions at lower costs by using these teams offers organisations a competitive advantage (Cohen and Gibson, 2003). In the fifth place and more specific to open innovation it can consist of ventures and universities from all over the world, which all can benefit from the innovation process. In the sixth place it can bring the most important parties in a specific field together, from which all can benefit. As a respondent from one of the virtual R&D project teams said *'the fact that the most important European players in this field were brought together in this project and learned from each other can already be seen as a success'*. These benefits makes virtual R&D project teams very suited for collaboration between several partners in the field of open innovation. But, concerning virtual R&D project teams and open innovation still a lot is unknown. Here, we want to focus our attention on the 'fussy front end' of the open innovation model. In the first place, we want to know why partners join a virtual R&D project team. So, our first question is:

*What factors internally at the partners are due for joining these virtual R&D project teams*

In the second place, we want to know how such an innovative virtual project team is formed and who may be part of it. So, our second question is:

*How is such a virtual R&D project team formed and who may be part of it.*

## **Methodology**

In this qualitative study, we have chosen for cases to study, because we want to have a closer look into 'the black box'. We do not use the word 'multiple case-study', but serial single case-study, because

with Dul and Hak (2008, p. 45) we agree that the term multiple case-study must be more nuanced. Dul and Hak (2008, p. 45) distinguish as follows:

- A comparative study is a study in which (a) a small number of cases in their real life context are selected and (b) scores obtained from these cases are analysed in a qualitative manner.
- A parallel single case study is case study research with a replication strategy in which a number of single cases are selected at the same time and the same proposition is tested in each of them without taking into account the outcome of any of the separate tests.
- A serial single case study is case study research with a replication strategy in which each test takes into account the outcome of previous tests (Dul and Hak, 2008, p. 45).

We have conducted a serial single case study because we first conducted three case studies. The outcome of the three mentioned case studies formed the input for the next series of case studies. Beforehand, we formulated factors on the basis of an explorative study (conducted in 2004) and literature study (conducted in 2004 and 2005). Concerning the first research question, we looked at the motivation of the partners. Concerning the second research question the formulated factors were 'trust' and 'partner selection'. These factors were also used to develop an a priori codebook which was used during the analysing process. This is also recommended by Miles and Huberman (1994, p. 58) when they state that 'one method of creating codes - the one we prefer - is that of creating a provisional 'start list' of codes prior to fieldwork'. In the end, the outcome of the next three case studies formed the input for re-analysing the first three case studies. In this way, '(...) the theory is better grounded, more accurate, and more generalizable (all else being equal) (...)' (Eisenhardt & Graebner, 2007, p. 27).

### *Respondents*

For this study, we interviewed a total of twenty members of six virtual R&D project teams between October 2005 and Mai 2008. All six cases (see Table 1) were ex-post studies of virtual R&D project teams (see Table 2). The virtual R&D project teams consisted of partners from different organisations. The virtual R&D project teams were all started to establish high-tech innovation. All virtual R&D project teams ended their project successfully. Three virtual R&D project teams were 'Eureka teams' and funded by their national governments and consisted of several European partners. The other three virtual R&D project teams were funded by the EU and consisted of several European partners. In one

of these projects, the Print project, also a partner from Israel participated. These two different ways of funding will be explained in more detail in the next two sections.

### *Eureka*

In the beginning of the eighties of the last century, the Reagan administration introduced the Strategic Defense Initiative (SDI). The core of this project was to build a protective shield, consisting of all kinds of very high-tech military technology, above the United States. To build such a shield, a lot of research and development still had to be done. Of course, outcomes of this endeavor could also be used in the commercial sector. In this way, the United States intended to increase their innovation capacity, and also strengthen their industry and their influence on the world market. Europe reacted by establishing Eureka in 1985. Eureka is committed to enhancing the competitiveness of European industry through the promotion of cross-border, market-oriented innovation (Eureka, 2007). At the moment, Eureka enables industry and research institutes from 37 member countries and the European Union (EU) to collaborate in a bottom-up and market-oriented approach to developing and exploiting innovative technologies. The collaboration is bottom-up because the project-consortium, and not Eureka, dictates the way the project comes together, its duration and the amount of money invested in it. It is a market-oriented approach, but the outcomes of most projects are pre-competitive. The reason is, that in many projects the project consortium consists of competitors in the same market.

Eureka does not fund the consortium; they only accept or reject the project proposal. When accepted, the consortium receives a label from Eureka. With this label every individual partner can try to get funding from the government in his own country. This is also one of the biggest problems concerning Eureka projects: because every country has its own procedure for awarding the funding, there is a synchronization problem. It is not uncommon that a project already starts with most partners already awarded their funding, except one or two.

### *EU Framework Programs for research and technological development*

These programs, also called Framework Programs (FP), are funding programs funded by the European Union (EU). The EU started with these programs in the eighties of the last century to encourage and support European research. The first six framework programs covered five-year periods. The seventh framework program, started in 2007, will run for seven years.

The European Union encourages pan-European research, because:

- high level research is increasingly complex and interdisciplinary.
- high level research is increasingly costly.
- high level research requests a constantly increasing "critical mass".

It becomes more and more difficult for individual institutes or companies, and even member states, to be able to respond to these challenges. So, the European Union creates the preconditions to make research still possible, which has a lot of benefits for the European economy.

But there is also another side of the coin:

- a shortcoming of the Framework programs is that they involve a lengthy process of agreeing the areas that will be funded and on the extent of the funding.
- The selection process and the process of negotiating contracts can take in excess of a year which means that the drive to innovate is often stifled by the bureaucracy. Not infrequently the EU will be making decisions about funding while technologies will have moved into the market place.

The European Commission decides every four years, and now every seven years, in which fields funding will be awarded. So, this is a top-down process.

**Table 1. Introduction of the cases**

<b>Name project</b>	<b>Kind of project</b>	<b>Duration of project</b>	<b>Project objectives</b>
Dewey	European project, financed by the EU	started January 1 <sup>st</sup> 2001, and lasted for 30 months	to define an infrastructure for modeling all phases in a life cycle of new production facilities.
Goa	European contribution to the Japanese program within the global program	The project started in 2000, and lasted for two years	to develop a system that supported assembly process improvement.
Print	European project, partly financed by a program of the European Commission	project started in January 2001 and lasted for 30 months	<ul style="list-style-type: none"> <li>- Carry out research into the world's best practices and critical success factors for X.</li> <li>- Develop, test and validate an advanced software system for profit and non-profit organisations.</li> <li>- Develop learning and support materials</li> </ul>



Berlin	European project, approved by Eureka, and funded by the national governments of the partners in the project	The project started in August 2003, and lasted till August 2005	To consolidate and extend on the results of the previous project by the investigation of a number of fields of research that are considered extremely important for the application domain but have not been covered by the first project like fault prevention, power management and terminal management including secure downloading aspects.
Lisbon	European project, approved by Eureka, and funded by the national governments of the partners in the project	started in July 2001, and lasted till June 2003	<ul style="list-style-type: none"> <li>- Product family adoption: when and how a system-family approach should be introduced and how best to integrate new with existing processes.</li> <li>- A roadmap for product line adoption (including processes, techniques, and tools).</li> <li>- Support for integrating existing systems into system families to share knowledge and reduce future cost.</li> <li>- Support for development on interoperable heterogeneous platforms.</li> <li>- Support for dealing with varying quality requirements in a product family.</li> <li>- Integrated traceability, version management and variation support.</li> <li>- Support for testing and validation to reduce development time for family members.</li> </ul>
Paris	European project, approved by Eureka, and funded by the national governments of the partners in the project	started in July 2001, and lasted till June 2004	to streamline debugging and testing throughout the product life cycle, and to provide cost-effective methods appropriate to high-volume production.

### *Procedure data capture*

We interviewed three or four members of each team in-depth, using a semi-structured interview method, which gave us the freedom to keep on asking when new questions occurred. It met the requirement of triangulation, also because beside interviewing three or four members, we analysed project documentation. We used four interview techniques to collect the data, i.e. face-to-face interviews (which lasted for about one hour), telephone interviews (which lasted for about one hour), MSN interviews (which lasted for one and a half-hour), and e-mail interviews (spread over several days). These interview techniques were used because in the first place we had not enough budget to visit the members who were spread all over Europe, and in the second place because we wanted to use communication media with which virtual R&D project team members are already common with. The four interview techniques are essentially equivalent for conducting interviews in research. An

important distinctive criterion is however the nature of the information one wishes to obtain, especially the importance of social cues. If the interviewer is seen as a subject, and as an irreplaceable person, from whom the interviewer wants to have his personal opinion on a certain topic, for example on the labour union, then social cues are very important. Interviewing by FtF, or by telephone is then preferable. When the interviewer, as was the case in this research, interviews an expert about topics that do not pertain to his status as an expert, then social cues become less important. In that case, all four interview techniques can be used (Also see Opdenakker, 2006).

**Table 2. Time interval of data capture and techniques used for data capture in the five cases**

Name project	Time interval data capture	Ex post or longitudinal research	Amount of interviewed	FtF interview	Telephone interview	MSN messenger interview	E-mail interview
Dewey	November 2005 till February 2006	Ex post	Four members	3	--	1 (together with e-mail interview)	1 (together with MSN messenger interview)
Goa	October 2005 till December 2005	Ex post	Three members	3	--	--	--
Print	October 2005 till December 2005	Ex post	Three members	1	1	1	--
Berlin	October 2006 till February 2007	Ex post	Three members	2	1	--	--
Lisbon	October 2006 till February 2007	Ex post	Three members	1	2	--	--
Paris	October 2006 till February 2007	Ex post	Four members	1	3	--	--

The members were invited for the interview by telephone or by e-mail. Confirmation of the appointment for the interview followed by e-mail, and some information concerning the aim of the interview was sent to the informant. We also asked the first respondent of a case for additional information (f.e. documents) concerning the project, and names and addresses from other members of the project.

The face-to-face and telephone interviews were tape recorded with the permission of the respondents beforehand. Within three days after the interview, the tapes were transcribed. MSN messenger and e-mail interviews have the advantage that the whole text is available immediately after the interview.

#### *Procedure data analyses*

The analysis phase is an iterative process. The factors of the codebook (or template) were taken as items on which the cases could be compared. For analysing the interviews by coding, a software program for qualitative research, ATLAS Ti, was used.

After analysing the different cases with the help of the coding template, a case history was written, as a within-case analysis. The within-case analysis were sent to the informants to get feedback (member-check). After the within-case analyses a cross-case analyses was conducted.

#### **Results**

To give an answer to the question ‘what factors internally at the partners are due for joining these innovative virtual project teams?’, we studied the motivation from the partners, which can be divided in extrinsic and intrinsic motivation. The following results were found.

In the Berlin project, partners had different motivations to participate in the project, although they can be divided in extrinsic and intrinsic motivations. By participating in the project, one partner (Dutch; university) could acquire funding for research (extrinsic motivation). Other partners participated in the project to see and hear what happened. They did not have a clear contribution to the project (extrinsic motivation). Most partners were intrinsically motivated for participating in the project. Firstly because they were interested in the content of the project. Secondly, as one informant added, because they could work together with industry and in this way could validate their research (a university).

Concerning the Lisbon case, most partners were intrinsically motivated for participating in the project. Firstly because they were interested in the content of the project. Secondly some partners already wanted to do the specific research, but thanks to the Eureka projects they could do this in collaboration with other partners. Some of the partners were also extrinsically motivated, because it was their policy to be involved in funding projects.

In the Paris project, most members were intrinsically motivated. One informant was curious about what other organisations did in the field. Another informant was very interested in the test topic. For another

informant it was a 'dream' to organise such kind of collaboration. The fourth informant said the motivation was the 'benefits to belong to such kind of consortium and the project is of course to be able to first want some collaboration with partners'.

Also the partners were mostly intrinsically motivated, because they were already busy in the field of test and debugging in their organisation. Now they could exchange information in this field with other partners. There was also an external motivator for the partners for taking part in the project: they got funding for their participation. To receive this funding, they had to prove that they had indeed executed the things for which they received their funding.

In the Dewey project, two informants said that the product fitted very well into the research topic of their organisation. The motivation of another informant was that it would be of benefit for the company; to show that they were able of doing it.

Concerning the Goa project, one informant said that in the first place participation in projects was a high priority of his organisation, in the second place the project was used to give a new impuls to research that was already conducted in the organisation, and in the third place purely for the networking aspect. Another informant also had three reasons for participating. The first reason was to conduct interesting research. The second reason was the international collaboration, and the third reason is the collaboration between industry and universities on themes for the long term. A third informant said that in the first place the networking aspect was important, in the second place the 'idea-output' which can be used in other projects, and in the third place for the money.

Concerning the Print project, one informant said that the outcome of the project was used as a product for the company. For another informant the networking aspect was important.

Concerning the question 'how is such a network formed and whom may be part of it?' we made a distinction between the two different ways of funding on a European level.

#### *EU Framework Teams*

The partners in the Dewey project were selected along three ways to the consortium. In the first place the familiarity with the initiators of the project. In the second place because these partners were familiar with other partners, whom could take part in the project. The familiarity with these partners led to faith (trust). In the third place one partner who was added by the EU to the consortium. In addition,

the selection criterion for the partners was expertise, which can be seen as an attribute of partner selection.

Concerning the Goa project, the partners who wrote the first draft of the project proposal looked for other partners (up to a total of twelve). These partners were selected on two main criteria. In the first place, most of the partners who were involved in the project were acquaintances of one or more of the original four partners. Some partners were added by the EU to the project. The criteria which were put to these partners had its origin from the EU, which financed the GOA project. These criteria were: a. It must be a good mix from the different member states of the EU. b. also Mediterranean sea countries had to be involved, because these have a separate status in the EU. In the second place every partner must have an added value for the project with regard to its expertise. So, an attribute of partner selection is expertise.

In the Print project, eight other participants for the project were added to the project. The participants came or from the initiators' network, or were acquaintances of other participants in the project. This led to trust, which led to the development of collective commitment. The partners were selected for their expertise, and organisation talent.

#### *Eureka teams*

There are two big project clusters under the flag of Eureka: Alpha and Beta. The Alpha cluster started some eight years ago. The members of the virtual R&D project team knew each other beforehand. Projects last for about four years. Projects are started every four years, or also halftime another project. The partners in these projects are mainly industrial partners – it is industry driven – and some institutional and/or university partners. Also, some SME's participate in these projects.

Every year there is a call for proposals in the Beta cluster, and a 'brokerage event'. Small and big companies can go to this 'brokerage event' and join a specific proposal. The ones who 'find each other' concerning a proposal start discussing about further collaboration in a project. It is also possible within this cluster that partners who already know each other beforehand start a project together.

All three projects mentioned below were follow-up projects. At the beginning of these follow-up projects, some or even a lot partners stayed the same, while new one's could join.

Concerning the Berlin project (Betha cluster), as the members knew each other beforehand, and knew what they could and could not expect from each other, there was also trust in the team. According to one informant 'the level of trust was quite good. Of course you are going to trust more in some persons than others. Average I think it was quite well'.

After the partners agreed concerning the objectives of the Lisbon project (Betha cluster), other partners were asked to participate in the project. This was to a great extent done by a smaller group of six partners, one from every country that participated in the previous project. Most of these partners were acquaintances, and most of them were already participating in the previous project. This led to trust, because the partners knew what they could expect from each other. Some of the partners were chosen by the national authority of a country who was responsible for the funding. Their collective commitment for the project was mostly small. So, partners were not always acquaintances. For the Lisbon project, 16 out of 22 partners from the previous project decided to join the new project. Four new partners, under which partners from two new countries (Italy and Austria), were added to the team. In the Paris project team (Alpha cluster) most of the partners from the previous project participated. These were industrial partners. They descended new partners, at least academic partners, from a network of potential partners. So, most partners knew each other directly or indirectly beforehand, and this 'partner selection' can have a positive influence on collective commitment.

## **Conclusions**

Virtual R&D project teams consisting, as described in this article, of different partners form a platform where ideas and knowledge is generated and transferred between these partners, who can commercialise these ideas. In this way, open innovation is established. What becomes clear concerning 'what factors internally at the partners are due for joining these virtual R&D project teams?' is that most partners were intrinsically motivated for the project because they were interested in the content of the project (five projects). These partners were already involved in research concerning the topic internally in the organisation. By collaboration in a virtual R&D project team they were able to put this research on a higher level.

Also, some of the partners were extrinsically motivated, because it was their policy to be involved in funding projects. To receive this funding, they had to prove that they had indeed executed the things for which they received their funding (four projects). A factor for other partners to participate was for the

networking aspect (two projects). Different partners mentioned seven other factors for participating in innovative virtual project teams. These are as follows:

- To see and hear what happened. These partners did not have a clear contribution to the project (extrinsic motivation). They used the information for other projects.
- Because the partner (university) could work together with industry and in this way could validate their research. In this way, the partner was able to put the research on a higher level.
- Some partners already wanted to do the specific research, but thanks to the Eureka projects they could do this in collaboration with other partners.
- For some partners the motivation was the 'benefits to belong to such kind of consortium and the project is of course to be able to first want some collaboration with partners'.
- The motivation of another partner was that it would be of benefit for the company; to show that they were able of doing it.
- One partner used the outcome of the project as a product for their company. Because they did not have the expertise all by themselves to build the product, they started a virtual R&D project team to fill up the gaps by collaboration.

What becomes clear concerning the forming of the network, i.e. the virtual R&D project team, is that most partners are acquainted to each other, or are 'acquaintances of acquaintances'. As became clear from the Eureka projects, they are mostly part of a broader network of partners. A main reason for choosing acquaintances is that it leads to trust between the partners in the project. In this way, it comes up to the path-dependence theory. According to the path-dependency theory, used by Sydow et al. (2005) for explaining (inter)organisational behaviour, previous ties between partners – also from different organisations – increase the probability of collaboration between them in the future. In phase 1 (figure 2), out of many possibilities who may be chosen to collaborate with by the initiators of a project, one possibility – i.e. the partners who may join the team – is made. This 'choosing-process' is not at random, but also 'steered' by the experiences with the partners in the past. According to Sydow et al (2005, p. 8) 'once these decisions have been made, dynamic self-reinforcing processes may be set into motion, which eventually lead to deterministic patterns'. At the moment that this path dependency is set into motion, a 'critical junction' is represented. In phase 2, the options are increasingly narrowed and it will be difficult to change the decisions made in phase 1, i.e. change the composition of the team

partners. At the end of phase 2, a lock-in effect is established. Entering phase 3, it is no longer possible to change the composition of the team partners.

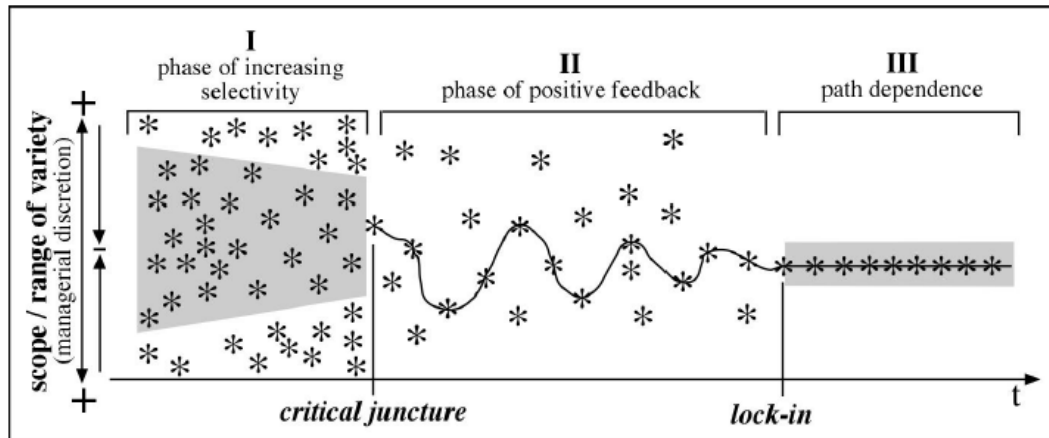


Figure 2. Constitution of an organizational path (Sydow et al., 2005, p. 9)

But the national funding organisation can oblige a consortium to let a partner join their team, based on the industrial politicks of that country. Also the EU can oblige a consortium to have their partners spread all over Europe. As became clear from the Goa project, the criteria which are put to these partners have their origin from the EU. These criteria are as follows:

- It must be a good mix from the different member states of the EU.
- also Mediterranean sea countries must be involved, because these have a separate status in the EU.

When partners are not acquainted beforehand to one or more partners in the existing consortium, as is the case when partners are put to the team by the funding organisation, trust is not taken for granted. There is also a chance, as became obvious in the Lisbon case, that the collective commitment of this/these partner(s) is small, because their contribution is very small.

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