R&D Collaboration: The Process, Risks and Checkpoints

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Introduction
As research and development (R&D) collaboration becomes increasingly used in large international enterprises, it is of growing importance to have the related business processes, procedures, supportive materials, information security, controls, information systems and risk management in order. This article shows positive and negative aspects of R&D collaboration, discusses the various categories of R&D collaboration, gives general checkpoints for the R&D collaboration process management and examines some of the risks and information security issues involved in R&D collaboration.

R&D Collaboration or Not?
In R&D there are cases when it may be favorable for a large enterprise to collaborate with a company, university or some other organization or consortia. In the case of an IT enterprise in today’s business world, while the importance of R&D cannot be emphasized enough, it is not economically justified to carry out R&D alone on the hundreds of R&D fields in IT.

To successfully achieve R&D collaboration, the organization must manage the many business processes, risks, controls and all the other issues involved. If an enterprise does not manage these issues, the collaboration may bring many drawbacks including significant economic losses to the enterprise, inefficient R&D collaboration, missed deadlines, wrongly used resources, damages to the brand, missed business opportunities and information security breaches. R&D collaboration usually starts with small projects and then, when mutual trust increases, the collaboration may deepen. This possible development process may take several years.

Positive aspects of R&D collaboration include:
• It is useful when it is not possible or reasonable, for resource, economic or competence reasons, to complete all the R&D work internally.
• There is an increased flexibility in resourcing, competence development and technology focus.
• Knowledge can be purchased with ease and quickness.
• It provides freedom for internal resources to concentrate on more strategic tasks in product development.
• It provides ease and reliability by having a central figure responsible for R&D collaboration.
• In some cases, it provides a more accurate prediction of project costs.

Negative aspects of R&D collaboration include:
• Generally speaking and mainly for security reasons, areas that are of significant strategic importance should not be subcontracted.
• There are risks involved in relying too heavily on one collaborator, especially in strategic R&D.
• Many concerns arise when using subcontracting, such as what will be subcontracted and to whom, why subcontractors will be used, what the expected results are, and how the results will be linked to and integrated into the whole work.
• There is a risk that the collaborator’s level of information security, risk awareness and risk management is not adequate.
• There is a possibility of communications issues/problems due to differences in corporate and national cultures.
• The organization may lose the opportunity to gain important strategic knowledge that may be necessary in the future.
• A project might be more difficult to manage with the addition of collaborators.

Categories of R&D Collaboration
In large enterprises in the business area of IT, there are a number of categories and subcategories of R&D collaboration. The various categories demand that strategy selections be undertaken for finding the most suitable form of collaboration for a project. The decision-making process may be long, troublesome and time-demanding. Actually, there are as many strategy selections as there are collaborators. The R&D collaboration categories include, but are not limited to:
• University sponsoring/cooperation:
  – Thesis works—Thesis works of a single person, such as a master’s, diploma or doctorate thesis, are typical examples of this category. An example of this would be engineering students who, at the end of their studies, may write their diploma work for a research laboratory in a large enterprise.
  – Sponsored research—A sponsored research model can be used when a university is doing high-quality research on research fields that are of interest to the enterprise, but where the applications of the research are not yet clear enough for other approaches. One can, for example, support the university’s activities by donating resources to buy important research equipment.
  – University with a research consortium—This category typically is funded when there is clear added value in conducting the research as a consortium. The added value may come from the cooperation inside the consortium and/or from aggregating critical R&D resources. There are many
types of consortia, e.g., a collaboration project where there are a university, the enterprise, two companies functioning as subcontractors and a national research institution. The management of large consortia may be especially complicated.

- University professor—University professors can be financed if they are the clear key researchers of the area in question. In this category, professors can get resources through their university for doing research on an area of their expertise.
- Specific institution, faculty or university institute—For example, a research institution receives financial resources from a large enterprise for doing research on a specific topic/module. In the majority of such cases, a university has done excellent research on the topic over a long period of time. In these cases, universities typically are active in marketing their work to an enterprise to get additional funding and top-class guidance in helping them find the industrial relevance for their research. Sometimes an enterprise recruits researchers from such projects and tries to give a positive impact to the level of education as a result of country or specific strategic business reasons.

• A company as R&D collaborator:
- Large collaboration project—An example of this is an enterprise having a multimillion-dollar R&D project with a collaborator. Using companies in R&D may be challenging because they may lack some competencies. Therefore, companies in R&D mostly are used for specific research where more straightforward tasks already have been identified. However, this is case-specific to a high degree.
- Resource hiring or subcontracting from a company—Resource hiring is a rather straightforward extension of an enterprise’s own resources. It is used in cases where tasks are defined and can be given to an external person having the necessary skills. The skills hired typically are based on old working cooperations/relationships. The business relations can be domestic/international, onsite or offshore.
- Module, design or unit—A part (module/design/unit) of the working total is ordered from an R&D collaborator. These mostly are fixed-price subcontracting projects. The part is delivered, tested and then integrated into the whole product.
- International resource hiring—Generally speaking, this category has become increasingly used in many large organizations during the last few years. A specific challenge to international resource hiring cases is that it may be difficult to verify that ethical principles required and demanded by the enterprise are followed. For example, a resource hiring company placed in country A, renting personnel from country B to an enterprise in country C, may provide a cost/benefit to the enterprise hiring the resource. However, a possible drawback is that it might be difficult to ensure that this arrangement fulfills the employment/employee regulations in all the involved countries, that appropriate ethical principles are followed in respect to the employees and that the enterprise’s values are fully understood and followed.

• Special variants of R&D collaboration:
This third category of R&D collaboration deals with categories that are “especially special,” such as the external (i.e., nonenterprise) person who has made an invention and contacts the enterprise, hoping to sell the invention or subcontract it. In this category, there also is the R&D collaborator working for a unit in an enterprise, but in another department’s project and facilities.
- Collaborator’s subcontractor—This also includes any subcontractors of the R&D collaborators (who also may have their own subcontractors). The key business rule is to check and assess topics such as confidentiality, security, contractual requirements, third-party intellectual property rights (IPR) principles, product liability, assessments of the collaborator/subcontractor and warranties. One also has to be careful that collaborators and their subcontractors do not get the opportunity to participate in internal discussions where they might get patentable ideas. This aspect has to be considered in all subcontracting categories, but this is a case-specific issue. Information security is naturally of special importance in this category. However, this is case-specific, as there may exist tight collaboration, more of partnership. In partnership, a deep and long-term collaboration is in question, where the driving forces behind the partnership are the carefully mapped-out benefits for both parties and mutual trust. Further, in this category it is of especially great importance to achieve a win-win situation.
- Ad hoc R&D subcontracting—R&D subcontracting ad hoc would be necessary in a case where, for example, the project is at risk of being late, the researchers are sick and, with the existing resources, the project will not remain on schedule. This kind of ad hoc R&D subcontracting is mostly done on an hourly basis. In such cases, the use of existing collaborators (i.e., those already in use by another unit/department within the organization) is recommended to keep up existing timetables until a new suitable and reliable collaborator can be found if necessary.
- Alliance or cooperation forum—Although this is a tight form of collaboration, it is looser than a joint venture. This type of alliance may create a natural potential collaborator and subcontractor base for all the interested and participating companies and may speed up technology take-up and ramp-up of global developer communities, as well as facilitate global standardization of (future) core technologies.
- International R&D projects—Examples are projects financed by the European Union (EU). EU-financed projects in R&D and in the area of IT are large, usually have several participants and run in several European countries. The participants mostly are universities, enterprises, research institutions, collaborators and interest organizations. EU projects usually have specific contractual obligations that must be considered and included in the collaboration legal agreements.

General Checkpoints for R&D Collaboration
For an R&D collaboration project, it is necessary to have a large number of checkpoints (a list of items to complete) for before, during and after the project’s completion. The following are some possible checkpoints:
- Identifying the project entity where R&D collaboration is needed
- Defining the parts that can be subcontracted
• Defining the parts that must not be subcontracted
• Identifying all the partnership alternatives and combinations of products or services that might meet the project’s needs
• Completing a thorough audit and assessment of the collaborator, including finances, IS, security, personnel, product(s), strategy, processes and ownership of the company
• Taking into account the collaborator’s overall technology strategy
• Maintaining financial controls in the project and the collaboration project
• Checking the various types of billing, such as hour-based and module-based
• Ensuring that the external person signs the nondisclosure agreement (NDA), which is completed by the project manager
• Surveying for, assessing and finding the most suitable collaborator
• Completing time scales, which should be detailed in the project plan
• Setting and following realistic and achievable quality standards
• Completing the selection based on technical and business reasons
• Checking the giving out and management of accesses to information and information systems
• Completing the contract drafting process, including proposal request, NDA and the contents of the contract. When a contract draft has been made and the collaborator’s comments received, the enterprise has to, with regard to the comments from the other party, decide which proposed changes are acceptable or unacceptable. For large collaborators with which an enterprise has a long-term cooperative agreement, it may be advantageous to make a memorandum of understanding (MoU). An MoU is a mutual understanding by the parties to do something together in the future.
• Making the final decision whether to use the collaborator in question
• Completing negotiations and contract signings, including practical arrangements, such as the location to sign the contract, who will sign the contract and the rights to sign it
• Setting project checkpoints, including the financial situation of a project
• Setting up a project and collaboration project library, which includes minutes, materials, change requests, reports, plans, etc.
• Setting reporting procedures internally and externally
• Remembering that mutual respect and commitment are crucial for successful R&D collaboration
• Taking into account that a large enterprise may have to advise and support the collaborator and help it to develop and grow
• Continuing to manage the collaboration project
• Testing the deliverables
• Carrying out the R&D collaboration in a legal and ethical way with full respect to all involved parties, countries, companies, employees, organizations, legislations, ethical principles and cultures
• Following up, which includes questioning if the project’s good and bad points have been recognized, documented and communicated in a constructive manner, both internally and with the collaborator
• Storing the project and R&D collaboration project’s materials in a secure and systematic way for security, audit trail and legal reasons

Managing the Risks in R&D Collaboration

In risk management (RM) there are a number of alternative methods to deal with the risks, such as risk avoidance, risk control, risk transfer, risk monitoring and risk acceptance. The most important thing is to recognize the risks and choose a way to deal with them. In R&D collaboration, there likely are a few thousand risks because of the magnitude and interdisciplinary nature of the area in question. R&D collaboration involves areas such as finance, sourcing, legal, intellectual property rights, contract management, project management, planning, security, information systems, controls, risk management, engineering, human resources, quality and reporting. Further, the risks in R&D collaboration are not only a question of risks in the collaboration itself but also, among others, the general risks in the business environment. There should be replacement strategies, procedures and plans if something should go wrong with the collaborator and the cooperation. There is no such thing as a typical, standard R&D collaboration case, but every single project has its specific risks and checkpoints. In a large enterprise there may be simultaneously running, globally, thousands of collaboration projects. Further, the collaboration itself also is a process, as it usually starts from a small project with the collaborator. Then, as the mutual respect, confidence, resources and processes become stronger, the amount of collaboration can increase to a large scale where the collaborator is a trusted partner and strongly involved in the enterprise’s activities.

Below are, from a general (non-case-specific) point of view, some of the risks and information security issues in R&D collaboration:
• There is a risk if there is inadequate communication between the enterprise and collaborator. One reason for this may be differences in corporate cultures.
• Inadequate reporting procedures can constitute risks, as a subcontractor may not use the same tools (for project management, reporting, etc.) as an enterprise.
• Multiple changes to what was agreed to with the collaborator originally may bring problems. This is especially problematic if changes are left undocumented or documentation is done carelessly.
• A problematic issue can be inadequate communication and identification of risks in the project before its commencement.
• A lack of awareness among the steering group and project group of the importance of risk management is indeed a risk. Additionally, a steering group should have meetings regularly for, among other reasons, checking that budgets, timetables and quality requirements are kept.
• Especially in global multisite and transdivisional projects, there may arise additional specific issues and risks to be considered, such as in reporting, management, resourcing, contract management, IS security, personnel security, cultural issues, traveling security and insurance.
• If information systems security has been constructed so that it slows down the work progress, a project can be delayed. Security is there for supporting business.
• Selecting the wrong R&D collaborator and/or not following up with an existing one can bring significant problems to the project. This is especially urgent if quality, budgets and time scales are not kept.
• Too much dependence on one R&D collaborator can, in some very specific cases, constitute risks.
• Risk may exist if there is inadequate personal communication between the organization and the collaborator.
• In today’s world there is a risk that an enterprise is the target of industrial espionage. For example, there is a risk that collaborators may be used to get access to the enterprise’s information, such as breakthrough R&D results.
• A collaborator who wants to get rid off all responsibilities (cash in and run away) when a project is over may constitute a severe risk, as this may show that the collaborator has weak or no confidence in what has been delivered.
• The risk exists that R&D collaborators will, against a legal agreement, start their own business based on the research results. If so, legal measures have to be taken.
• Making amendments to the contract without contacting legal authorities can, for example, lead to disputes between an enterprise and a collaborator in a worst-case scenario regarding intellectual property rights.
• For legal and contract reasons, among others, there always should be an audit trail.
• If there are no or inadequate quality requirements, there is a risk that the product will be of low quality. Because of this, a systematic quality control process is important.
• If the wrong module is subcontracted, i.e., the one the enterprise should do by itself, there is a risk with inadequate in-house knowledge.
• Too much or inadequate monitoring of an R&D collaborator’s work may slow down the performance of work.
• Before acceptance, a delivered product always should be thoroughly tested, and possible reclamations should be completed in a written form.
• Having unknowingly received “rookies” (e.g., recent university graduates) from a collaborator may, in the worst case, delay a project.
• Not completing a follow-up of the collaboration project may lead to similar problems and risks in the next comparable collaboration project.

• Ignorance of risks, information security, processes, subprocesses, policies and supporting materials always is a risk.
• And finally, the largest risk of all is not knowing what the enterprise (as the client) wants from the R&D collaboration project.

Conclusion

The number of business processes, risks and information security issues is indeed large in R&D collaboration. To manage those issues, an enterprise must have a systematic, modeled, up-to-date and flexible approach to the R&D collaboration. The management of these issues may be resource-demanding, but very necessary for managing the many risks and maintaining the efficiency in collaboration. In today’s business environment, it is of growing importance to have well-working, efficient, reliable and secure R&D collaboration. There is no large global enterprise using IT that can isolate itself from the world and complete all R&D work by itself.

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