Risk Management for Life Cycle of Academic Entrepreneurs' Incubation Project**

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1. Introduction

Recently, there are various systems and policies for supporting the incubation in campus laboratory. It reveals some viewpoints of politic authorities that try to facilitate venture business to lead in a series of new economic take-offs, because they orient to 'high risk and profit.' In other words, many governmental policies and other supportive measures have been executed to encourage academic entrepreneurs to establish venture business such as laboratory incubation company, so as to facilitate more academic incubation, provide financing sources, lead technical development, supply physical facilities, provide tax benefits, and so on.

Laboratory incubation features a series of projects ranging from new product development by R&D to market advancement. In consideration of project-related risks, it focuses on the risk related to substantial characteristics of project. Nevertheless, many project risks have been associated with the course of project management as itself(Ward-Chapman, 1995). Thus, in terms of project risk management, this study analyzes the activity process of academic entrepreneurs in incubation or technical transfer, who lead study or research programs which consist of a system linked with industry, academy and government.

In particular, this study defines the life cycle of incubation project led by academic entrepreneurs and analyzes the risk management process for incubation project based on such definition. In addition, the study analyzes the types of project risk for each life cycle as academic entrepreneurs experienced through case studies.

2. Theoretical study on the life cycle of incubation project

As one of technical transfer phenomena, the incubation of academic entrepreneurs features a project that attracts a series of attentions or interests from politic authorities, academic or general entrepreneurs and venture capitalists. Because the laboratory incubation project has various project features including clear performances (such as new product, factory and system), specified schedule and budgets, interdependence, uniqueness and life cycle process(Nicholas, 2001; Archibald, 1992; Meredith-Mantel, 2000).

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In general, the incubation project of academic entrepreneurs is completed via a series of phases similar to theoretical project life cycle. Accordingly, in case of subdividing the project life cycle, it is very available for identifying any risk source occurring during project performance. That is, the project life cycle allows us to identify where a specific risk occurs in the cycle and how much influence such risk has. Therefore, the project life cycle provides us with some clues available for project risk management for each phase.

(Table-1) Types of the project life cycle

Adams-Barndt(1988)	Thamhain -Wileman(1975)	Chapman-Ward(2001)	Archibald(1992)
Conceptualization	Formation	Conceive	Concept
			Define
Planning	Build-up	Design	Design
		Plan	
		Allocation	
Execution	Main programme	Execute	Manufacture
Termination	Phaseout	Deliver	Installation
		Review	
		Support	

Typically, there are different arguments for subdividing the project life cycle as shown in Table 1. But the basic principle covers all arguments equally. However, it is required that the project life cycle should consider various dimensions in project, such as substantial field, functionality, technology, location, timing, economics, financing and environment. In addition, if necessary, each phase may be regarded as multiple dimensions that consider each dimension as parallel or repetitive sequence.

However, this study analyzes the life cycle of laboratory incubation project led by academic entrepreneurs who commercialize laboratory research results according to each phase such as idea conception, R&D contract conclusion, R&D performance/evaluation, establishment/operation of production facilities, market advancement and final arrangement.

(1) Idea conception

Idea conception refers to the process that embodies the concepts and purposes of a research project. In general, the idea conception phase starts when we derive ideas from innovative process(Lemaitre-Stenier, 1988) or each member of incubational organization recognizes some opportunities or desires(Lyles, 1981). Nevertheless, academic entrepreneurs can afford to find new research items, though ambiguous idea dimension, during their research activities. This phase also means the process that academic entrepreneurs embody the concepts and purposes of their research project by evaluating types of research result, success possibility, expected profits, etc. via the examination of new research ideas.

In this way, the idea conception phase is the phase to decide whether to make preliminary evaluation for opportunities(Ward-Chapman, 1988). This phase always

involves a series of processes for evaluating opportunities and establishing the budget for R&D project. In particular, academic entrepreneurs have to do preliminary business feasibility study by evaluating how much we can commercialize products available from research project and how much we can expect the profit from the project as well.

(2) R&D contract conclusion

This phase refers to the process for supporting R&D budget, searching business partners under future partnership and adjusting individual interests. In this phase, the most critical party concerned includes R&D financing supplier(institution) and commercialization partner. However, this phase may be skipped when academic entrepreneurs appropriate the financial budget required for their R&D activities.

In this phase, there is the adjustment of different viewpoints and understandings among parties concerned for concepts and purposes suitable for research project. That is, this phase corrects or adds the original concepts and purposes of R&D project, and furthermore, establishes the right, duty and liability or responsibility of participants as well as R&D schedule and the required expenses. In this case, we have to examine interests among other individuals, organizations or potential parties concerned that are related to R&D project. The contracts available in this case are typical means to adjust different interests among many parties concerned.

(3) R&D performance/evaluation

According to what is concluded in R&D contract, there are some accompanying performances of participants' right and duty. In this phase, research budgets in cash should be available for related researchers. For the incubation projects which are promoted as long-term assignment, the follow-up performance of research schedule depends upon the results of intermediate evaluation for the research process.

In addition, there might be ineffective research results other than what we expects, otherwise completely new variables. In this case, we may correct some of the contract or agreement for right and duty, or conclude a new contract or interrupt the contractual performance. If a research is completed, we have to go to the evaluation for research results on the basis of interests among parties. Of course, it is also critical in this phase that we should establish financial budgets required for marketing new products and make detailed discussions on how to finance the budgets.

(4) Establishment/operation of production facilities

This phase is the significant phase where research results from R&D activities are transformed to entrepreneurial activities via technical transfer process, i.e. it is the phase where researches end and actions start, where there are detailed activities for making new products created by R&D project.

For the new product that requires new manufacturing methods, there are newly emergent parties concerned for manufacturing production facilities and installations. In this case, academic entrepreneurs have to search manufacturers specializing in those facilities. In this process, it is notable that we should change given designs or repeat trial and error. Moreover, those manufacturers often learn or acquire the know-how for developing new manufacturing facilities during manufacturing process. That is why

we have to clearly specify or arrange the corresponding right and duty relationship.

(5) Market advancement

It is required to embody the strategy for each management function, which is required for marketing new products almost simultaneously with ordering production facilities. In other words, this phase should be accompanied with location, technical personnel employment and training, marketing plan, etc., i.e. a series of management activities should be systematically and synthetically deployed along with academic incubation.

Out of factors as described above, marketing plan is critical, because it controls the business success while it is beyond technical fields of academic entrepreneurs. Accordingly, it is required to form executive organization and select marketing strategies. Furthermore, we have to take more care of productivity enhancement and follow-up product development as well as promotion and marketing of new but non-commercialized product in terms of its function and quality.

(6) Final arrangement

This phase depends upon how we define the content of R&D contract concluded and the role of academic entrepreneur. First, it refers to the decision how to allocate the profitable results from a research for participant partners who have already supported R&D budget in accordance with R&D contract as concluded.

Next, the role of academic entrepreneur can be categorized into two role such as technical developer and specialized entrepreneur respectively. If an academic entrepreneur is satisfied with some of management results in the form of royalty as his pay for contributing to developing a new product, he is supposed to be responsible for post-complement of a series of activities related to technical fields as shown in production and marketing process after a R&D project is completed.

On the contrary, if he is changed to a specialized entrepeneur, he has to lead in supervising continuous development of new related products or production methods, while other management functions other than his own technical fields may be responsible by new partner scouted or employed.

3. Risk management for incubation project

Project risk means the critical uncertainty of a project, which may have disadvantageous effects on the performance level achievable in the project. Saad, Cicmil and Greenwood(2002) argued that it is necessary to establish an evaluation framework for capturing a variety of project elements and their interaction as well as the complexity of technical transfer process. They also presented 'Project Management Multiple Perspective Framework(PMMPF)'. According to their argument, it can be found that a variety of project elements affecting project advancement, performance and results can be categorized into 5 correlated and interconnected viewpoints such as project context; project content; organizational behaviors; communication process; and project results and congruence.

Project risk management intends to identify which element affects given project and to quantify the effects of each element, so as to relieve the disadvantageous effects

which controllable elements may have on the purpose of project(Wideman, 1992). Likewise, the project risk management intends to remove any potential risk from such uncertainty and rather to convert the risk to a good opportunity. In other words, the risk management refers to enhancing project results through systematically identifying, evaluating and managing project-related risks so that it requires more extensive viewpoints that try to use an opportunity or profitable possibility, i.e. 'upside' risk as well as try to any threat or unprofitable results.

A series of project risk management processes(RMP), if official, should be applied to each phase of project life cycle by customer(project owner) and contractor(other parties concerned with project). Most of RMPs can be classified as shown in Table 2 in terms of assignments(activity) related to projects(results/products). However, in terms of RMP throughout general project, this study divided RMPs into 5 processes such as project definition, risk recognition, risk evaluation, selection of risk management strategy and risk management planning.

(Table-2) Types of the project risk management processes

Wideman	UK MoD	Chapman	APM
	Initiation	Scope	Define
			Focus
Identification	Identification		Identify
	Analysis	Structure	Structure
			Ownership
		Parameter	Estimate
		Manipulation and Interpretation	Evaluate
Response	Planning		Plan
Documentation	Management		Manage

(1) Project definition

Project definition refers to the process for identifying the nature of given project, where we have to arrange existing information or data required for project management such as project purpose, current progress, expected results and evaluation measures. In this way, project definition process refers to the phase that covers whole RMP fields so that it allows us to analyze risks according to project progress in the level of project or whole company.

(2) Risk recognition

Risk recognition defines which is included in which field of risk management on the ground of viewpoints of project life cycle. This phase explores the origin of many risks and responses by using reasoning, interview, brainstorming and checklist, and then classifies and identifies those risks so as to provide a structure suitable for collecting and decentralizing them. Through a series of processes like this, we can reach clear and common comprehension for the opportunities and threats a project faces. Risk recognition lists all risks that are regarded suitable in terms of company

management in accordance with risk category structure which determines how to organize a list of project risks for analysis. However, academic incubation project actually has relatively insufficient empirical data or information in terms of those risks.

Thus, we have to identify every risk inherent in a project, such as risks related to evaluation criteria, Ws and PLC as well as the 2nd risk against basic responses. In particular, incubation project is based on the adjustment of different interests through contracts concluded among parties concerned in considerable level ranging from the conclusion of R&D contract to results allocation.

(3) Risk evaluation

Risk evaluation refers to a process for evaluating how much lethal each risk is by using a common measure prescribed among parties concerned so as to determine the importance of risks. Especially, we have to examine and explore interdependence or links among project activity, risk and response, as well as consider and evaluate such interdependence.

In the process of risk evaluation combining quality and quantity analysis, two elements are critical: *direct expenses* showing the results that a damaging cause brings directly to our assets; and *indirect expenses* related to damages that directly result from such damaging cause. In particular, it should be noted that indirect expenses are often hided, although indirect expenses may have more influences than direct expenses.

(4) Selection of risk management strategy

After completing the description of risk map, you have to explore a risk management measure suitable for general enterprise risk management, and thus to make effective risk control strategies through analyzing expense-profit involved with such measure. Primarily, risk control involves strategies, programs, measures or methods our companies adopt in order to prevent, eliminate and reduce any potential or current damage resulting from risks and uncertainty. In other words, it means enhancing potential profitability, minimizing potential damages or maximizing profits. Moreover, it may include some measures available for reducing such uncertainty.

(5) Management of risk management plan

From the launching of project, this phase involves four tasks such as managing planned actions, monitoring, managing crises and rolling action plans forward. In this phase, it is very critical that you should have insight into what occurs and may occur other than your desired intention in terms of the motive of participants concerned for changing plans to actions, and have clear vision about what is important or not. However, it is necessary to focus on 'capturing an available opportunity' and create values rather than make detailed plans.

4. Risk management strategy based on the incubation PLC case

(1) Risk management for life cycle of incubation project

Laboratory incubation led by academic entrepreneurs features a project that

involves technical transfer from campus to an organization. In fact, technical transfer is available in various ways such as the embodiment of product, process or human resources(Chen, 1996). Whichever type of technical transfer it is, it goes through sophisticated and dynamic processes and resulting success is affected by various elements occurring from different sources(Kumar-Kumar-Persaud, 1999; Walter, 2000).

In the risk management process for each life cycle of different projects, we need to observe which type of risk management activity is performed. A project itself may be changed and something known about it may also vary. That is why we have to attempt risk analysis for each life cycle of project. In addition, it should be noted that we may face any new environment and variable for each project phase, because the incubation project of academic entrepreneurs covers extensive fields ranging from R&D to market advancement. Therefore, it is recommended that we should cope with ever-changing circumstances by making contingency plans, rather than recognize and encounter any potential risk for each PLC phase.

Moreover, it is required to sufficiently evaluate the importance of risks and interdependence among each project life cycle. In whichever of PLC phases we are, we have to consider risk analysis as contributing to risk management throughout a project. On the other hand, the risk management strategy, which our companies adopt to prevent, eliminate and reduce any loss resulting from risks and uncertainty, is usually available as 7 risk management measures such as risk holding, risk evasion, risk transfer, risk/uncertainty reduction, loss prevention, loss reduction and risk neutralization.

However, in the incubation project for marketing new product development, it should be noted that risk management has its limitation in using risk management measures based on previous empirical data. In particular, it is required that risk management policies and procedures for the incubation project led by academic entrepreneurs should provide an environment to avoid or minimize risk events for each life cycle and then provide alternative solution for any potential problem in every project phase.

(2) Case study

This study analyzed the type of risks in incubation project of academic entrepreneurs by using cases about the incubation project linked with industry, academy and government. In this project promoted by special cooperation among industry, academy and government, we analyze project risks that academic entrepreneurs feel by leading all phases of project management, and thus examine corresponding countermeasure.

A research professor who captured R&D ideas through laboratory research prepared a research plan and then concluded a R&D contract linked with industry, academy and government. From this opportunity, his research team which have developed polymer composite pipe mapped out a final program for establishing plan, outsourced for making production facility plant and led its operation. The plant established through these processes has its site of 6,200 pyong and building lot of 475 pyong with total project investment of 5.342 billion Korean Won. Its capacity for

mainly producing polymer composite pipe reaches 24,000 pcs a year(based on diameter: 800□, length: 4m). The research team closely participated even in management strategy as well as possession structure. Besides, the team was responsible for nurturing and providing technical manpower required for plant operation and quality maintenance.

Now I analyze risk events for each life cycle of incubation project on the basis of the significance of project risk management.

1) Risk in idea conception

□ Leadership risk in promoting incubation: For the incubation project in laboratory, there are different parties concerned as well as research team. Accordingly, this risk may occur in decision-making process without establishing leadership for adjusting various interests and leading project.

□ Risk of right and responsibility: This risk results from lack of clear and formulated prescription of right and responsibility that refer to allocated roles among parties concerned around research team.

2) Risk in R&D contract conclusion

□ Risk in selecting partner: It involves a process to search partner with financial capabilities for providing project funds available for commercializing newly developed products as well as supporting R&D budget.

□ Risk in evaluating economics: It results from evaluating the possibility of value creation through preliminary feasibility study for new products, because there is extreme limitation in evaluating economics based on objective data.

3) Risk in R&D performance and evaluation

□ Risk in changing partner: If we should change the existing partner because of his circumstances or mutual conflicts, this risk may involve additional problems such as interrupting R&D, searching new partner or adjusting given mutual interests.

□ Risk of failure in developing products: It may bring our failure in developing products as we expect, though most of related plan has been already reviewed. Otherwise, it may bring us the marketability unsuitable for desired performance and cost level.

4) Risk in establishment/operation of production facilities

□ Risk in ordering facilities: This risk may occur in selecting a manufacturer for making facilities to produce new products and performing works through trial and error.

□ Risk in releasing know-hows: It involves any potential release of know-hows resulting from R&D led by research team during the process of making production facilities.

□ Financing risk: It relates to acquiring enormous funds required for producing new products.

5) Risk in market advancement

□ Risk in distribution paths: This risk may occur in informing customers of new

functions or performances of a new product and leading them to final purchase.

 Price risk: In general, the new products designed by academic entrepreneurs on the basis of high technology, though inexpensive in price vs. performance, are relatively expensive than existing price level. So those new products have difficulty in deploying competitive price policies.

6) Risk in arrangement

 Risk in allocating royalty: In spite of success in market advancement, there may be some conflicts in terms of criteria for calculating royalty or management reward size payable to academic entrepreneurs as well as payment methods.

 Risk in enhancing products: If there is not any clear determination for future roles of academic entrepreneurs, this risk may involve the interruption of technical development for maintaining continuous competitive edge after technical transfer.

Likewise, most risks in each life cycle of incubation project led by academic entrepreneurs results from contract conclusion, because existing academic entrepreneurs have insufficient expertise on those risks, though most of those risks occur in decision made by contract conclusion.

Thus, it is very critical that there should be any system or procedure for allowing academic entrepreneurs to conclude contract - as a typical risk field - and take reasonable follow-up measures so that they can recognize and cope with the risks in their incubation project.

5. Conclusion

Venture business, which orients 'high risk and profit', mainly consist of companies found based on research results of professors or researchers. In this way, it is necessary that laboratory incubation should be handled in the level of project management, because it features a project with a series of phases from new product development through R&D to market advancement.

In particular, project risks occurring for each life cycle of incubation project have different nature than risk management of other projects in existing companies. Thus, this study categorized the life cycle of laboratory incubation project led by academic entrepreneurs into several processes, who commercialize the results of laboratory research: idea conception, R&D contract conclusion, R&D performance/evaluation, establishment/operation of production facilities, market advancement, arrangement, and so on.

And by using the characteristics of traditional RMPs and the approaches for enterprise risk management, this study subdivided existing project RMP into several phases for analysis, such as project definition, risk recognition/evaluation/analysis, selection of risk management strategy and management of risk management plans. On the ground of theoretical bases like this, the study analyzed project risks that academic entrepreneurs experienced in their incubation project linked with industry, academy and government.

Though the results of this study could not be generalized because of peculiar case for cooperation linked with industry, academy and government, however, we could identify most of critical risks that academic entrepreneurs have during the

technical transfer. With the results of this study, it is expected that we will be able to find any clue to develop policies available for effectively managing risks recognized in each life cycle of project as well as supporting future academic entrepreneurs.

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