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MENGELOLA PROYEK RISET

TESIS

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PROGRAM GELAR GANDA

UNIVERSITAS INDONESIA
FAKULTAS TEKNIK
PROGRAM PASCA SARJANA TEKNIK SIPIL
KEKHUSUSAN MANAJEMEN PROYEK
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VILLENEUVE D'ASCQ, FRANCE

JULI 2012

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Diajukan sebagai salah satu syarat untuk memperoleh gelar Magister Teknik

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This thesis was the work of itself, and all sources whether quoted of referenced, I have stated correctly.

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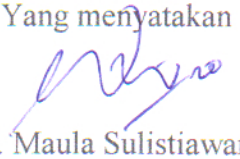

(S. Maula Sulistiawan)

ABSTRAK

Nama : S. MaulaSulistiawan

Program Study : Urban Engineering and Habitat

Judul : Mengelola Proyek Riset

Seperti kita semua tahu bahwa keberhasilan sebuah proyek penelitian dapat meningkatkan pengetahuan di berbagai bidang seperti kemanusiaan, budaya, masyarakat dan aplikasi baru. Namun di balik keberhasilannya, ada banyak ketidakpastian dan kompleksitas. Berkaitan dengan itu, IFSTTAR melaksanakan dua proyek yang berbeda, seperti: RESTRAIL proyek sebagai proyek Eropa dalam transportasi perkotaan bidang publik yang bertujuan untuk mengurangi terjadinya kasus bunuh diri dan penebus salah di properti kereta api dan gangguan layanan dan konsekuensi lain peristiwa ini menyebabkan dengan menyediakan kereta api industri dengan analisis dan identifikasi pencegahan yang efektif biaya dan langkah-langkah mitigasi sebagai sistem panduan untuk transportasi kereta api dan proyek ISART sebagai proyek nasional di bidang perkotaan transportasi multimoda bertujuan untuk memberikan bantuan kepada mereka yang bertanggung jawab untuk kontrol efisien transportasi multimoda sistem. Terkait dengan pengelolaan proyek penelitian laporan ini membahas dua pertanyaan khususnya: Bagaimana mengelola sebuah proyek penelitian dan jenis titik tambahan diperlukan untuk meningkatkan metodologi yang ada dalam manajemen proyek penelitian dicontohkan oleh RESTRAIL dan ISART. Dalam menghadapi pertanyaan-pertanyaan ini laporan tersebut memberikan saran dengan mengadopsi atau dikombinasikan pengalaman dari negara lain. Ini adalah topik diskusi dalam sebuah laporan selama pelatihan penelitian proyek di IFSTTAR.

Kata Kunci: Proyek Riset, Transport Umum, Proyek Eropa, Sistem Panduan Untuk Transportasi, Manajemen

ABSTRACT

Name : S. MaulaSulistiawan

Study Program : Urban Engineering and Habitat

Title : Managing Research Project

As we all know that the successful of a research project can increase knowledge in various fields such as humanity, culture, society and new applications. However behind his success, there are many of uncertainty and complexity. Relating with it, IFSTTAR implementing two of different projects, such as: RESTRAIL project as European project in the field urban public transport aimed to reduce the occurrence of suicides and trespass on railway property and the service disruption and other consequences these events cause by providing the rail industry with an analysis and identification of cost effective prevention and mitigation measures as guidance transport system for railways and ISART project as national project in the field urban transport multimodal aimed to provide assistance to those responsible for the efficient control of systems multimodal transport. Associated with managing a research project this report addresses two questions in particular: How to manage a research project and what kind of additions point are needed to improve an existing methodology in research project management exemplified by RESTRAIL and ISART. In dealing with these questions the report gives a suggestion by adopted or combined the experience from other countries. This is a topic of discussion in a report during research project training in IFSTTAR.

Key words : Research project, Public Transport, European project, Guided transport systems, Management

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PART I. INTRODUCTION

1.1. Overview

As we know that research is creative work to increase knowledge in various fields such as humanity, culture, society and new applications. To advace the knowledge, we can save in the form of documentation, discovery, interpretation, or research and development of methods and systems. Research project can be performed to test the validity of the instruments, procedures, experiment, by replicate elements of the previous projects or new projects. However, behind his success, the research project is filled with uncertainty and complexity of risks because to predict the overall results is very difficult.

This report will discuss how to manage research projects by analyzing methodology. This report is the result of the implementation of the training is located in a public science and technology organization called L'Institut Français des Science et Technologies des Transports, de l'Aménagement et des Réseaux (IFSTTAR) which are currently implementing various European and National projects. We will focus here, first project on the Reduction of Suicides and Trespasses on Railway property (RESTRAIL) which is an European project in the field of public transport aims to reduce the occurrence of suicides and trespass on railway property and the service disruption and other consequences these events cause by providing the rail industry with an analysis and identification of cost effective prevention and mitigation measures. This project is funded by the European Commission with the collaboration of 17 partners from 12 countries. While the second project is Intégration des Systémes d'Aide à la Régulation de Systémes de Transports Multimodaux Flexibles (ISART) which is a national project in the field of urban transport multimodal aimed at to provide assistance to those responsible for the efficient control of systems multimodal transport.

This report will not discuss the overall project, but just focus on how to manage research projects which apply in both projects, then analyze the existing methodology and compare with the another from the literature and the experiences of other countries. Then find some add value to be contributed into the existing methodology as the result of this report.

Need to know that some of the data from both projects are ***CONFIDENTIAL*** and should not for publication as it relates to the confidentiality clause contained in the consortium agreement and the rule of law from various countries.

1.1. IFSTTAR

The French institute of science and technology for transport, development and networks - L'Institut Français des Science et Technologies des Transports, de l'Aménagement et des Réseaux (IFSTTAR) is a public-sector organisation renowned in France and abroad for its expertise in the fields of transport, planning and networks, development and networks was founded on 1st of January 2011, from a merger of The Institut National de Recherche sur les Transports et leur Sécurité (INRETS) and The Laboratoire Central des Ponts et Chaussées (LCPC) .

Three unit are involved in IFSTTAR : ESTAS unit (Evaluation and Safety of Automated transport System), LPC unit Laboratory of Driver Psychology (Laboratoire de Psycologie de la Conduite, LPC). LEOST unit : Laboratoire Electronique Ondes et Signaux pour les Transports [1].

1.1.1. IFSTTAR's missions

a. Conducting applied research projects
b. Producing expert appraisals or offering consulting services
c. Promoting innovation transfers
d. Developing certification and standardisation activities
e. Helping in the establishment of technical guidelines and public policy

f. Overseeing knowledge dissemination efforts
g. Contributing to advances through training and research

1.1.2. The field of application for current research

a. Urban engineering
b. Civil engineering and building materials
c. Natural hazards
d. Transport services and safety
e. Mobility of goods and people
f. Infrastructure, uses and impacts

PART II. OBJECTIVES

2.1. Training

In the last semester, Master International "Engineering Urban and Habitat" at the Polytech Lille – Universite Lille 1 gives a chance to their students to carry out training during four months. This training gives the student the opportunity to actually practicing what they have learned. I had the opportunity for training in IFSTTAR which has the same field application in the urban engineering.

IFSTTAR are currently carrying out European research projects, such as: RESTRAIL project which is an international project in the field of urban public transport aimed to reduce the problem of trespass on railway. This project is funded by the European Commission with the collaboration of 17 partners from various countries while the other is ISART which is a national project in the field of urban transport multimodal aimed at to provide assistance to those responsible for the efficient control of systems multimodal transport.

To support the success of the project required a good method of managing research projects. This knowledge I acquired during the carrying out training in IFSTTAR. I carried out a training program in IFSTTAR began Monday, 2 April 2012 until Tuesday, 31 July 2012.

2.2. Objectives of training

a. Training for Management of Research Projects, Applications: RESTRAIL European Project and ISART- National Project.
b. To provide the contribution for improving some points of these two applications: RESTRAIL and ISART.

2.3. Work achieved

a. Bibliographic study : How to manage Research project

- RESTRAIL project; Urban Public Transport
- ISART project; Urban Transport Multimodal

a. Analyse of the methodology of research project management
b. Add some points to improve in existing methodology

2.1. Goal

Providing contribution some add point to completing an existing project methodology in European project by adopting and combining another experience from the other countries.

2.2. Scope of Discussion

This report will not discuss the project in detail, just focus on how to manage research projects that illustrated by the above two projects and then analyze and compare the existing methodology with the another methodology from the literature and the experience of other countries. Then find some points to be contributed into the excisting methodology of the adoption or a combination of methodological choices as the result of this report. Need to know that some of the data from both projects are confidential and should not for publication as it relates to the confidentiality clause contained in the consortium agreement and the rule of law from various countries.

PART III. PROJECT APPLICATION

This part will be explained about the overview of managing research projects, example implementation of research projects undertaken by IFSTTAR and other experience from Federal Railroad Administration (FRA).

3.1. Managing Research Project

The management of a research project is full of uncertainty and complexity. Research has substantial elements of creativity and innovation and predicting the outcome of research in full is therefore very difficult. Basically research project consists of two elements/activities: [3]

- creating a technical structure for the project (the "hard" or technical side of project management; e.g.scheduling, financing, planning, controlling)
- managing the human processes in the project (the "soft" side of project management; co-operation, communication and project culture).

When compared with project management, there are some difference, especially for the technical structure. As for difference, among other:

Project Management Theory	**Research Project Management**
Divide into distinct project phases and sub-tasks	Phases and tasks in research overlap and are non-linear
Projects are repetitive	Research projects are particular and singular
Projects are intra-organisational	Research projects are often inter-organisational
Project participants work (almost) full-time on the project	Most researchers have many competing and conflicting obligations on their time e.g. teaching, administration or other projects

Plan and control (rationality)	Planning and control is difficult Uncertainty is high and project participants have high degree of autonomy. Furthermore too rigid control may be counterproductive
The project manager generally knows what to do and gives professional advice and instructions concerning the concrete work	The research project manager often lacks the required professional knowledge. Instead it is the project participants who know
Set clear goals	Goals may be abstract and subject to change
Goals have a commercial and/or applied technology orientation	Goals may have both non-commercial/commercial and applied technology/non-applied technology orientation
There is a customer relation or clear impression of end user of the result	There may be no customer other than the researchers' peers and the impression of potential end-user may be vague
Limit uncertainty; safety first	Uncertainty is part and parcel of research and innovative research must take risks
Management (plan and control; emphasis on the producer and administrator management roles (Adizes (1979))	Leadership (innovation and integration; emphasis on the entrepreneur and integrator management roles (Adizes (1979))
Evaluation: Purpose is to efficiently reach planned result (plan and control)	Evaluation: Purpose is learning and reaching optimum result. Pre-planned result may prove second-best or unrealistic. Effectiveness.

According to the previous study [4] the successful management of a research project depends upon the researchers ability to plan, coordinate and perform the research. There are some of the key tools which can utilised within research project to lead to more successful outcomes

a. Clearly understanding what success means for your project

   The starting point for managing projects effectively is to have a clear understanding of what you are trying to achieve.

b. Stakeholder planning and management

   Stakeholders are "those who have an interest and involvement in the project". This can lead to communication problems and conflicts in the project if not managed properly. This requires an approach in managing stakeholders well, among others:

   - Identify key stakeholders.
   - Understand the transactions involved in the interaction with stakeholders.
   - Describe the relationship between stakeholders and group them.

   In addition, if the stakeholders would be more complicated multiorganisational in regulating individuals in the planning process. It required a special strategy, namely to create a steering group that is separate from the working group as an executive group consisting of representatives of each stakeholder of the project. This is useful when you need a quick decision and with the steering group, all members feel involved in every decision [7].

c. Developing timelines – a rolling wave approach to planning

   Is the basis to create a timeline. WBS is only made by taking the project and splitting it into several smaller tasks. The benefits are:

   - Understand exactly what is involved in the project
   - Identify the major tasks
   - Provide a framework for the delegation and the identification of resources
   - Provide a method for managing and measuring progress
   - Provide the basis for developing cost estimates

Once you have the WBS and the duration of the task you can then begin to develop a Gantt chart for the project. In developing the Gantt chart you would like to:

- Think about how you can design your project so that activities can be run simultaneously.
- Applying the constraints between tasks that describe the logical order in which you have to do the activity.

d. Managing Risk within the Project

In every project, there is a risk that if there be an impact on project success. As for risk, there is at every stage of the research project life cycle. To manage risk well is to think through what might be wrong, what causes it, what impact and what's the solution. This can be done using the risk matrix.

e. Managing the Project Budget

Once you have gone through the planning process you have to think about how you will actively manage the project. In this category there are two key elements:

- Understand how the project is progressing
- Decisions to get the project back on track

To understand how the project is progressing is to use a combination of reports and meetings. If you are identified through the reporting of the progress that this project does not go as planned then you will need to take action.

- First is to avoid blame for the problem
- The second is to take a decision on the action. In taking the correct action is very important that we take action on the cause and not the symptoms.

f. Finding time to manage the project

The regulations governing research project exactly how you should set your budget will depend on your funding, but some basic concepts apply to all budget management.

- Understand your commitment and who will manage the budget.

3.2. Examples Research Project from IFSTTAR

3.2.1. RESTRAIL – Public Transport

Public transport is a shared passenger transportation service which is available for use by the general public, include buses, trolleybuses, trams and trains, rapid transit (metro / subways / undergrounds etc), ferries, airlines, coaches, and intercity rail. Urban public transport may be provided by one or more private transport operators or by a transit authority.

As we know that train is public transportation that is able to load passengers and goods on a large scale. Because of its nature as an effective and efficient mass transit, some countries such as European countries are trying to exploit the full potential as the primary means of transportation both land transportation in the city, intercity, and interstate. However, there is a potential problems such as trespass on railway property that could have negative effects on the timeliness, the image of reliability and safety implications [5].

Trespassers are people who are illegally on railway property. They are crossing the railway lines at places not intended for that purpose or walking in the railway area (i.e. using railway property for activities unrelated to railway operations). Most frequently the motive for trespassing is as simple as taking the shortest or most convenient route from one place to another [6]. According to data show that in 2010 there were 1,256 people were killed and a further 1,236 seriously injured on railways of 27 EU countries. Among the 1,256 fatalities reported, 60% (750) were other party victims: unauthorized persons on railway premises (suicides and trespass) [7].

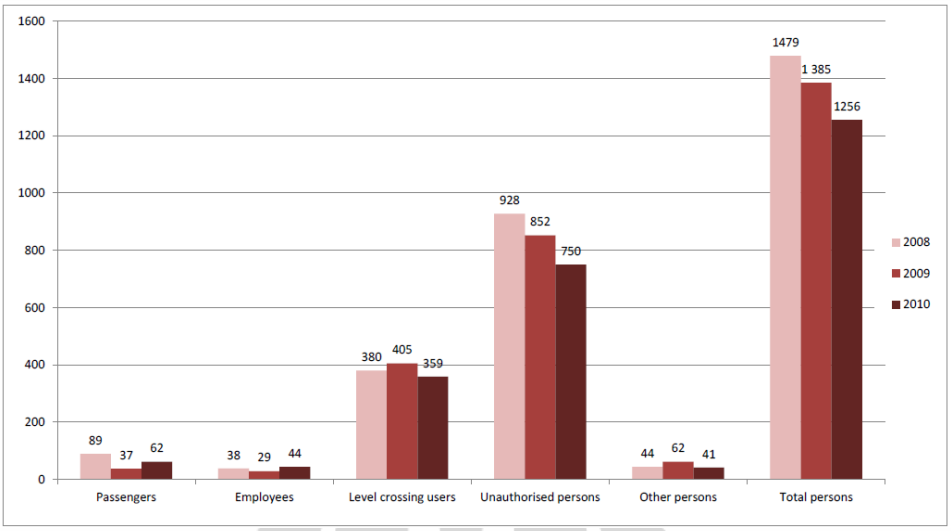

Figure 1. Number of fatalities in railway accidents (EU–27 countries) [4]

This is of particular concern to the European. One of the European efforts is the Reduction of Suicides and Trespasses on Railway property (RESTRAIL).

RESTRAIL is one of the railways safety research project which is a collaborative from 17 partners consist of 1 coordination (UIC), 7 UIC members (DBAG, FFE, IK, INFRABEL, PRORAIL, TCDD, TRAFIKVERKET), 3 rail research centres (CIDAUT, IFSTTAR, VTT), 3 Universities (HMGU, KAU, Unott), 3 industries (ASTS, MTRS3, NICE). This project will last 36 months (01 October 2011 – 31 September 2014) at a total cost € 3.868.392,60. The aim of this project is to reduce the occurrence of suicides and trespass on railway property and the service disruption and other consequences these events cause by providing the rail industry with an analysis and identification of cost effective prevention and mitigation measures. The methodology of the RESTRAIL project approaching by :

- Analyse the causes of suicides and trespass on railway property based on existing data, studies and research results
- Identify the various available prevention and mitigation measures and analyse their conditions for success in the rail environment
- Field test selected measures and evaluate their effectiveness

- Propose a toolkit of the most relevant and cost-effective measures and recommendations at European level both to reduce the occurrence of incidents as well as to manage incidents and reduce consequences

The work plan of the project extends for 36 months and is structured in five work package (WP) in charge of the technical work of the project, one WP in charge of the administrative and financial management activities and one WP in charge of the dissemination.

WP1 (Qualitative analysis of suicide and trespass on railways properties which is led by VTT) provides research findings (inside and outside Europe) combined with an analysis of factors (internal to railway or external such as media communication) influencing the occurrence of suicides and trespasses on railway property and their consequences based on official data source and other collected data. Based on the result of WP1, subsequent WPs will consider the assessment of countermeasures (technical and soft measures) for reducing railway suicides (WP2 - Assessment of measures targeted to reduce railway suicides which is led by TRAFIKVERKET), preventing railway trespasses (WP3 - Assessment of prevention measures targeted to reduce railway trespasses which is led by IFSTTAR).

WP4 (Mitigation of Consequences by Improving Procedures and Decision Making which is led by MTRS3) will consider the enhancement of existing methods and tools in order to achieve the most effective and cost efficient means of mitigating the potential impact of suicides and trespasses occurring on all railway infrastructures.

Then WP5 (Field pilot tests and evaluation which is led by CIDAUT) will demonstrate some selected measures based on defined scenarios in order to evaluate the findings and finally develop the recommendations and guidelines.

WP6 (Dissemination and explotation of the results which is led by UIC) will contribute to the scientific and technical progress of the project as well as to a broad implementation of the project results.

WP7 (Administrative and Financial Management which is led by UIC) will Ensuring an efficient project management for the whole consortium and making sure that the project objectives will be met within the given budget frame and schedule then set up project specific management tools and procedures with the aim of ensuring a proper and accurate and the last reporting and accounting to the European Commission

The final outcome will be a toolkit, accessible through a user friendly interface (for consultation and continuous update) in order to support the decision-makers in taking practical steps to reduce suicides and trespasses and to mitigate the consequences once an event occurs.

This project is led by railways since it is a rail related topic which aims to answer the concerns of the rail industry. However an essential feature of the project is the involvement of professional experts as the Advisory Group. This will ensure the project output is of practical use to all who can be involved with suicides and trespasses [8].

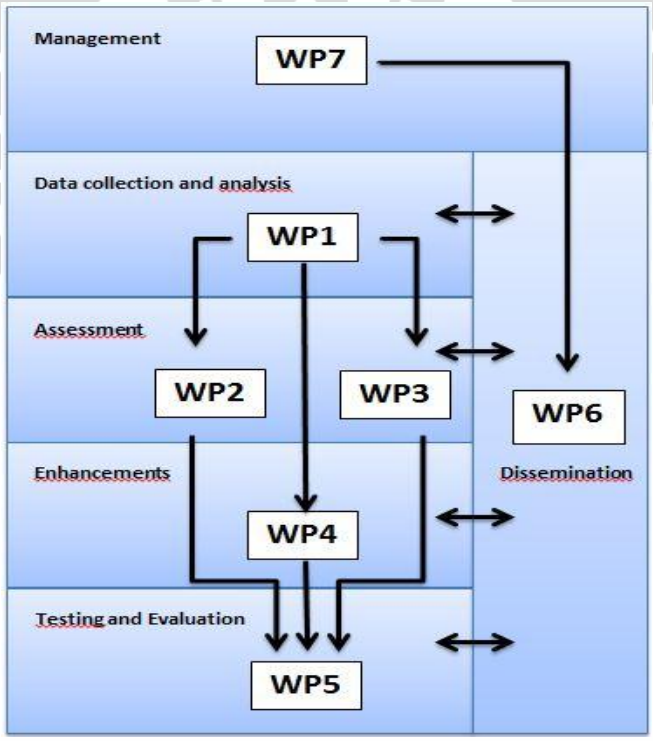

Figure 2. Project Workflow [8]

3.2.2. ISART

For economical and ecological reasons, the role of multimodal transportation systems has become increasingly important. It is now

crucial to provide the human operators in regulation rooms with systems for making easier their management. Multimodal transport is a transport system usually operated by one carrier with more than one mode of transport under the control of one operator. It involves the use of more than one means of transport such as a combination of truck, railcar, aeroplane or ship in succession to each other [9]. Advantages of multimodal transport, among other: Minimises time loss at trans-shipment points, provides faster transit of goods, reduces burden of documentation and formalities, saves cost, establishes only one agency to deal with and reduces cost of exports.

Currently, different types of multimodal transport operations involving different combinations are taking place, such as: Land-Sea-Land, Road/Air/Road, Sea/Air/Sea, etc [10]. The most important thing in Multimodal transportation is the role of an operator / MTO. An MTO should have the knowledge and skill to organise the transportation of goods through different modes of transport. He should be aware of what is happening in the areas of technological development, political stability of countries, congestion of routes or mergers of operators. The MTO needs this information because he arranges with the trucking company, railways, shipping lines and other transport operators to transport the goods from one place to another within the shortest time which may not necessary be the most direct [11].

Relating with this, number means of transportation in France are increasing. This was followed by the increasing complexity of the operation and regulation of the multimodal transport system that must be faced many problems as the impact of spatial and temporal effects of the operating schedule delays. To reduce these impacts then carried out a "Control Support Systems of Flexible Multimodal Urban Transport" - Systèmes d'Aide à Ia Régulation de systèmes de Transports urbains multimodaux flexibles (SART) [12], consisting of:

- "Support System Operations"- Systéme d'Aide à l'Exploitation (SAE) to transmit passenger information to be automatically and

- "Aid to the System Information"- Systéme d'Aide d l'Information (SAI) to transmit passenger information to be manually with the initiative of regulators.

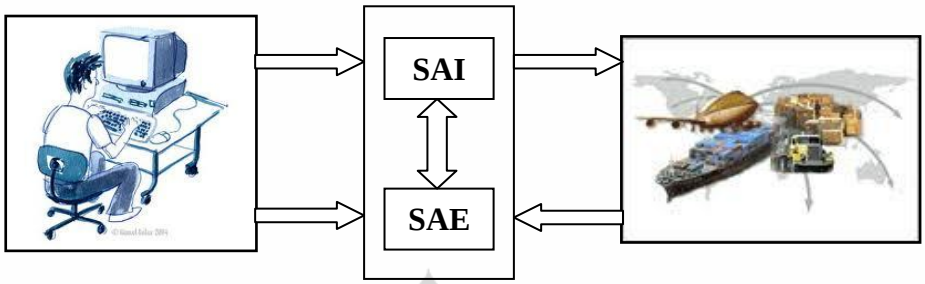

Figure 3. System Helps of SART [12]

However, the problems of detection and resolution of conflicts, are treated until now. Manually by operators of regulation, are particularly complex and decisions must be taken in near real time. This change must take into account a large number of constraints such as the impact of delay on connections or limit the delay of trams and buses below a pre-specified threshold [13].

For that, is needed a new system for support the decision making and managing dysfunctions and disruptions of the transportation system, which provided by "Integrating Control Support Systems of Flexible Multimodal Urban Transport" - Intégration des Systèmes d'Aide à Ia Régulation de systèmes de Transports urbains multimodaux flexibles (ISART) project [14].

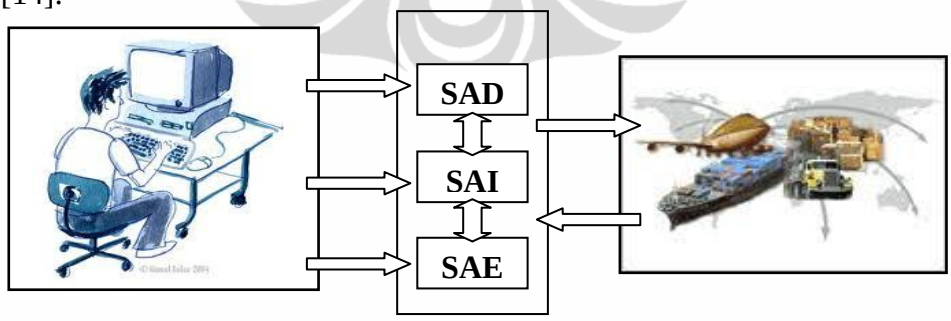

Figure 4. Integrated System Helps to Regulate [12]

The validation of our approach occurred within the framework of a project involving an industrial partner, the TRANSVILLES company, as well as several research laboratories (LAGIS, LAMIH and INRETS). TRANSVILLES is the company which actually runs the urban transport

network (tramway and bus) in the town of Valenciennes. This project is sponsored by the Nord/Pas-de-Calais regional authorities and by the FEDER (Fonds Européen de Développement Régional - European Fund for Regional Development). This project implemented for the period 2008 – 2010 with a total cost € 1.082.300 [15]. The goal of this project are:

- To decrease utilization of motor vehicles in urban areas and the pollution, the environment, efficiency energy also economic by providing an assistance to those responsible for the efficient control of systems multimodal transport,
- To design "Decision Assistance System" - Systéme d'Aide à la Décision (SAD) for managing dysfunctions and disruptions of the transportation system as an additional system in project development.
- To establish ISART integrating the various systems of aid existing SAE and SAI.

3.3. Example Research Project from United States

This experience methodology is taken from Federal Railroad Administration on December 7th 2007 which is considers the approach to be an effective method of managing safety hazards related to the gap at high level passenger platforms and a way to ensure maximum levels of safety for passengers [16]. There are five main steps in performing the hazard analysis process:

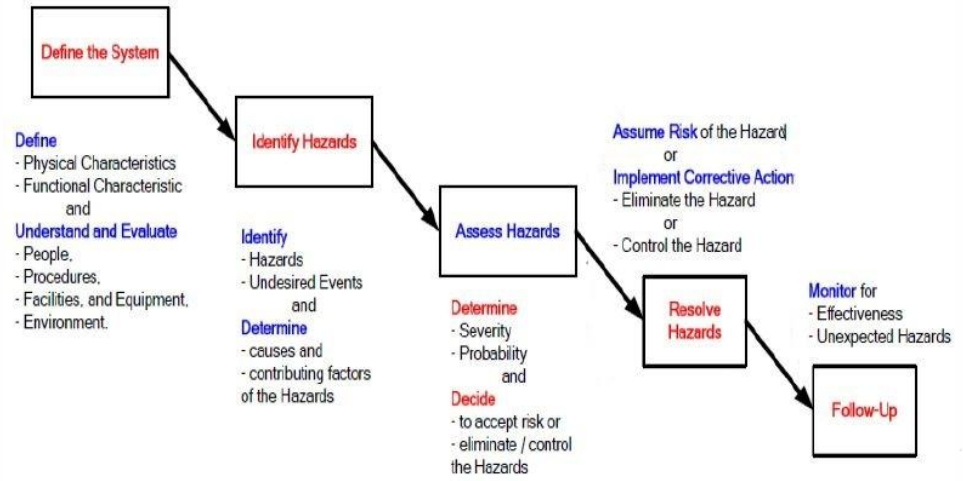

Figure 5. Hazard analysis and resolution process [16].

Step 1 is to Define The System under consideration. The system definition should be a narrative statement that fully describes. It is important that the individuals who develop the definition list include all elements that could potentially affect safety.

Step 2 is Hazard Identification which is looking for potential hazards that may exist. Hazard identification is a "What if?" activity that looks for the potential causes and results. The hazard management team "brainstorms" to come up with as many viable hazards as possible for use in the hazard analysis. The hazard management team should consider the physical characteristics when identifying the hazards.

Step 3 is Hazard Assessment by doing classification and assessment of hazards that challenging and probably the most intense part of the hazard analysis process. This activities will use assessment tools. The hazard assessment approach involves assessing each hazard for severity and frequency to determine the relative risk of different types of occurrences. The assessment can be based on statistics (quantitative) or the collective opinions of the hazard management team (qualitative). Since quantitative data are often not available for accident severity or frequency, a qualitative analysis, properly executed, is an acceptable method to perform hazard assessment. The hazard assessment should follow ground rules for hazard resolution. The hazard resolution procedure should be established early to prevent disagreements on accepting or rejecting mitigation strategies. The hazard assessment should include several steps [14]:

1) Hazard criticality

A risk matrix should be developed to provide a framework to categorize hazard severity and frequency and allow the hazards to be prioritized so that the most important hazards are addressed first. It is to classify the hazards identified in the hazard identification step into criticality categories.

Category	Description	Definition
I	Catastrophic	Death, system loss, or severe environmental damage.
II	Critical	Severe injury, severe occupational illness, major system or environmental damage.
III	Marginal	Minor injury, minor occupational illness, or minor system or environmental damage.
IV	Negligible	Less than minor injury, occupational illness, or less than minor system or environmental damage.

Tabel 1. Hazard Criticality Categories [13]

2) Hazard frequency

Once the hazard criticality is determined, the frequency of the hazard should be established. The frequency of the hazard can be determined quantitatively using failure rates or accident/incident statistical data. The frequency can also be established qualitatively based on the relative frequency of expected occurrence. An estimate of how often a hazard may occur during the life of the system may be helpful in establishing frequency.

Level	Description	Quantitative Definition (Frequency x)	Qualitative Definition	Time
A	Frequent	$x > 1x10^{-1}$	Likely to occur frequently, continuously experienced in the system.	Once a week
B	Probable	$1x10^{-1} > x > 1x10^{-2}$	Will occur several times in the life of an item, will occur frequently in the system.	Once a month
C	Occasional	$1x10^{-2} > x > 1x10^{-3}$	Likely to occur some time in the life of an item, will occur several times in the system	Once a year
D	Remote	$1x10^{-3} > x > 1x10^{-6}$	Unlikely but possible to occur in the life of an item, unlikely but can reasonable be expected to occur in the system.	Once every 10 years
E	Improbable	$1x10^{-6} > x$	So unlikely that it can be assumed occurrence may not be experienced, unlikely to occur but possible.	Less than once in 10 years

Tabel 2. Hazard Frequency Categories [13]

3) Risk matrix

The next step in the process is to establish a risk matrix to assess each hazard and provide guidance on how to eliminate or control the hazard. Table 3 contains a risk matrix that combines the frequency and criticality for each hazard. The frequency and criticality can be used to find the level of risk for each hazard. Associated with each level of risk are recommended actions that provide guidance on how to respond to each identified hazard.

	Hazard Categories			
Frequency of Occurrence	I Catastrophic	II Critical	III Marginal	IV Negligible
A – Frequent	1A	2A	3A	4A
B – Probable	1B	2B	3B	4B
C – Occasional	1C	2C	3C	4C
D – Remote	1D	2D	3D	4D
E – Improbable	1E	2E	3E	4E

Tabel 3. Risk Matrix Hazard Categories [16]

4) Appliying the tools to classify hazards

So now that we are in the process of assessing the probability and severity of the hazardous events. It is very important to track hazards and verify that they have either been controlled or the risk accepted. A list of recommended responses appears in Table 4.

Risk Matrix Hazard Category	Suggested Action
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable, eliminate hazard.
1D, 2C, 2D, 3B, 3C, 4A, 4B	Undesirable, upper management decision to accept or reject risk.
1E, 2E, 3D, 3E	Acceptable with management review.
4C, 4D, 4E	Acceptable without review.

Tabel 4. Suggested Responses to Risk Matrix Hazard Categories [13].

5) Hazard analysis worksheet

The results of the hazard identification and hazard assessment steps should be captured on a hazard analysis worksheet. The hazard analysis work sheet contains all of the information collected on each hazard and serves as the record of how hazards are to be controlled or mitigated. Use of the work sheet ensures that all identified hazards are systematically addressed. The left side of the hazard analysis worksheet contains information on each hazard under consideration. The hazard description and the cause and effects are included in this section along with an estimate of the severity and the frequency or probability of the hazard (can be seen in appendix 8.1).

Step 4 is Hazard Resolution which is developing a mitigation approach to reduce the severity or the frequency of the hazard. Once a mitigation approach is determined, the effect of the mitigation strategy on the severity

and the probability or frequency of the hazard is estimated and the revised risk matrix figure is recorded on the worksheet. Some hazards will require more than one mitigation strategy. The mitigation strategies or actions should be categorized as short term, medium term, or long term actions.

After that, there is hazard precedence approach which is a technique for controlling hazards during different phases of the system life cycle. Keep the hazard precedence approach to hazard mitigation in mind when developing mitigation strategies. The approach is most often used on new systems because many hazards can be eliminated during the design stage - before the system is initiated and put in service. The hazard precedence approach, however, is also useful when assessing existing systems although changes to the design become retrofits and are generally far more expensive.

Step 5 or the last step is Follow Up by doing regular review of the hazard analysis worksheet to ensure that mitigation strategies are fully implemented and all hazards are satisfactorily closed out. Medium term and long term actions should be tracked to completion. The hazard analysis can also be used to justify capital dependent mitigation strategies and help maintain visibility during budget requests but should not be a one time activity [17].

PART IV. SUGGESTION

Once described in the previous chapter, that in managing research project with a full the condition of uncertainly and complexity, there is a difference in project management theory, which of these differences, there are several risk factors that could potentially threaten the success of research projects [3]. It is known that research projects are highly risky: in research project, the added value should be as high as possible and should be obtained as quickly as possible [24]. Therefore, we need a methodology of risk-based for research project, as described in the study [4] in the key concepts, one of which is managing risk. Of course, not just the risk that need to be managed, but it is expected to risk management as an initial step to simplify the management of research project

4.1. Literature Review

4.1.1. Risk in Research Project Lifecycle

In previous study, has identified the risks in each phase of the research project lifecycle as describe below [24].:

Figure 6. Research Project Life Cycle

- Research Opportunity / Idea Conceptualization (lack of interest on the market and precarious economic situation)
- Research Project Proposal Development (loss of a good idea, acceptance of a poor idea, embedded low quality of the idea)

- Research Project Contract / Funding Source (unrealistic budget estimation, poor negotiation capacities, unfavorable legislation, unrealistic duration estimation)
- Research Project Management Plan / Initiation (lack of experienced collaborators, poor planning, unclear objectives, poor control)
- Research Project Status Report / Execution (multidiciplinary difficulties, poor communication, misunderstood overall vision)
- Research Project Completion / Closing Down (behind schedule risk, risk over-budget, lack of quality results)

4.1.2. Qualitative Risk Analysis Methods

a. Risk Classification Matrix

A risk classification matrix or table is a simple way of ranking different potential projects in terms of their potential benefit and the likely risk or cost in implementing them. Some projects may be very attractive in terms of the potential benefits that they offer but have serious implementation difficulties. The use of such risk matrix to set priorities and guide resource allocations. This method is same as that used in managing gap safety project by Federal Railroad Administration. Characteristics of this method is the identification of risk with the matrix that displays frequency and severity so that risk can be sorted and maintained according to levels [22].

b. Fishbone Diagram

This method is commonly used by reliability and safety engineers to analyze or predict faults in design and construction. In project risk management fishbone diagram is usefull to examine risk cause and effect relationships. Fishbone diagram can also be used to analyze failures or poor performance in project organizations or communications. This method does not sort the risk based on the frequecy and severity, however cause the decomposition of risk to the root of the problem is not just a symptom [27].

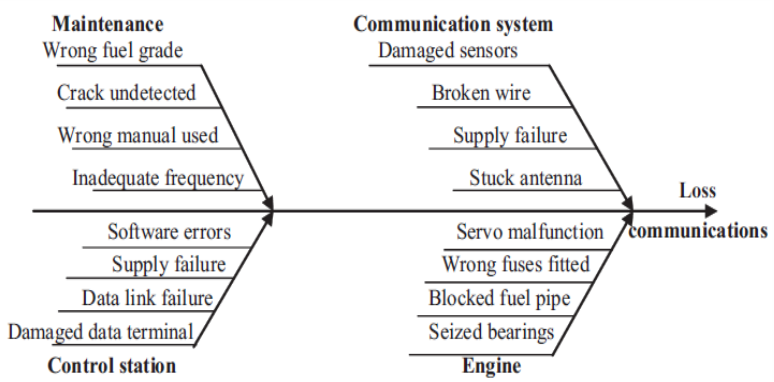

Figure 7. A Simplified Fishbone Diagram

4.1. Discussion

After providing an overview of the risk to be managed well through some alternative options risk management process, this report recommends risk based methodology, which looked at risk management as a first step in starting a research project. Risk based methodology is done by identifying the risk in every stage of research project [24]. Then each identified risk describe causes using the method fishbone diagram. Fishbone diagram that is used during risk identification to define the various main causes and secondary causes of risk in research projects [27]. After that, proceed with the risk matrix that is used during risk assessment to define the various levels of risk as the product of the harm probability categories and harm severity categories. Of the risk matrix will be obtained by the cause, the impact of risk in the event, which describes the risk level sequences of combinations of risk seen between the frequency of occurrence and impact if the risk occurs and preventive measures to eliminate any risk or mitigate its impact [16]. For the risk matrix (can be seen in appendix 8.2)

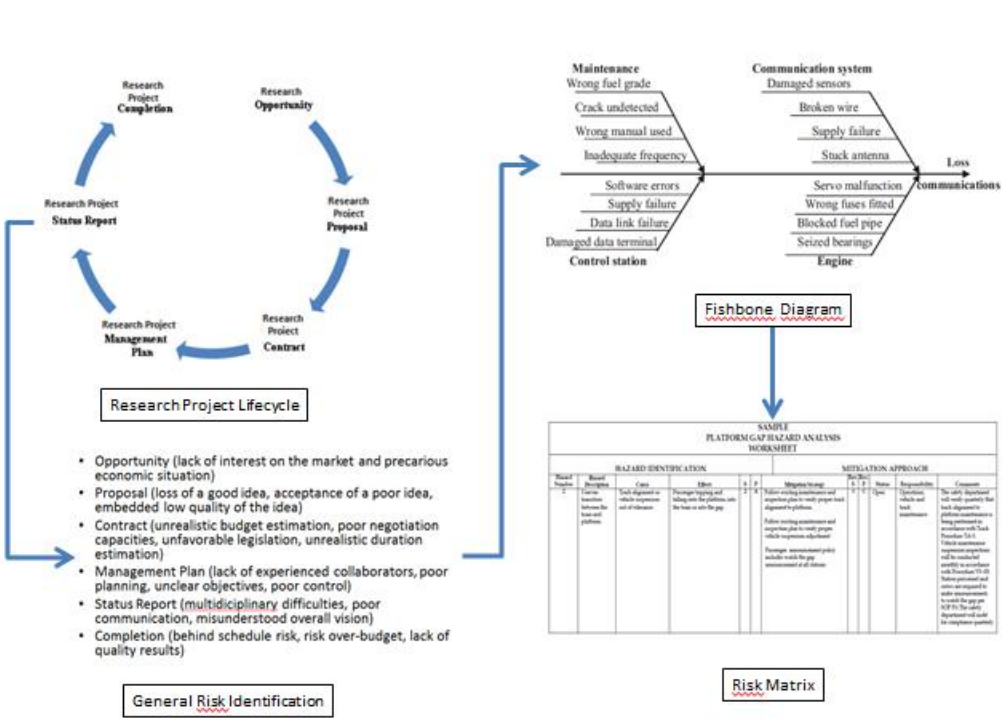

Figure 8. Risk Based Methodology for Research Project

CONCLUSION

The research project is full of uncertainty and complexity. Research has elements of creativity and innovation and accurate prediction of the research outcome is therefore very difficult. In these circumstances, the organizations admit the importance of managing all risks. It is necessary for the management of risk in every stage of the project as a continuum over the project life cycle.

After seeing the experience in methodology from Federal Railroad Administration in the Managing Gap Safety Project found a risk based methodology that can be used in research project management. As exemplified by the two research projects conducted by the RESTRAIL project as the European project with 17 partners from several countries in the field urban public transport and ISART as the national project in the field urban multimodal transport. Therefore, it suggested to use a risk based methodology for success of the research project. Not just in one step but in all phases of the research project as a continuum over the project life cycle.

Finally, this report concludes that the research project requires risk based methodology to prevent things that can cause project failure. From this report, I got a new knowledge of risk based methodology in research project, which I previously did for the type of construction project. It does look little different from types of risks identified, but in general is similar.

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APPENDIX

8.1. Hazard analysis worksheet

SAMPLE
PLATFORM GAP HAZARD ANALYSIS
WORKSHEET

HAZARD IDENTIFICATION						MITIGATION APPROACH					
Hazard Number	Hazard Description	Cause	Effects	S	P	Mitigation Strategy	Rev. S	Rev. P	Status	Responsibility	Comments
2	Uneven transition between the train and platform.	Track alignment or vehicle suspension out of tolerance.	Passenger tripping and falling onto the platform, into the train or into the gap.	2	A	Follow existing maintenance and inspection plan to verify proper track alignment to platform Follow existing maintenance and inspection plan to verify proper vehicle suspension adjustment Passenger announcement policy includes watch the gap announcement at all stations	3	C	Open	Operations, vehicle and track maintenance	The safety department will verify quarterly that track alignment to platform maintenance is being performed in accordance with Track Procedure TA-5. Vehicle maintenance suspension inspections will be conducted monthly in accordance with Procedure VS-03. Station personnel and crews are required to make announcements to watch the gap per SOP P-1 The safety department will audit for compliance quarterly

8.1. Risk Identification in Research Project

RISK FACTOR	CAUSE	IMPACT	RISK RESPONSE	STAKEHOLDERS
THE AVAILABILITY OF DATA	The reluctance of some companies to provide their data which are very sensitive and confidential	Project delay	The confidentiality clause to be added in the consortium agreement	
PROGRESS DELAY OF THE OBSERVATIONS	The regulations and laws of the Personal Data Private	Project delay	The experience of the partners	
LACK OF COORDINATION AND POOR COMMUNICATION	Conflict of interest	Miss communication	Manage task of each partners and hold a meeting to evaluate the implementation of the work	
	The project's communications plan was not completed	Project reporting is sluggish	Find out the communications requirements of all team members and stakeholders, document them in a comm. plan, and follow the plan	
	The project's communications plan does not have enough detail	Team members do not have the information they need	Effective communication between different organization (Dawson, 1992)	
	Complexities management structure of multi-institutional project	Different perception	Having steering group separate with working group as executive group (ESRC, 2006)	
INADEQUATE RESOURCES	There was no pre-commitment of resources to the project	Tasks take longer than expected to complete	Document which resources and skillsets are needed to get the job done	
	There was no analysis and documentation of all skillsets required	Deadlines and milestones get missed	Pre-assign the required resources to the team	