TECHNICAL PROJECT MONITORING AND RISK EVALUATION: A NEW METHOD FOR ENHANCING THE EFFICIENCY OF ENERGY PROJECTS

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Abstract*-This paper wants to present the experiences and new responses to ever greater problems which have emerged at investment projects in the Energy field. The essential problem is that, especially Engineering risks before and during planning and construction have been underestimated or neglected. The study will show one solution of how to give a holistic response to the question of construction risk and its management. Important factors of risks and its relations will be subject of scrutiny. The result will show that we can design one model, based on which we can suggest a response from the side of the Engineers which will have to deal with this aspect much more in the future.*

1. INTRODUCTION

1.1 Context and Rationale

Upon the introduction of new banking rules in the Basel II international Banking agreements in 2004, all international Banks have agreed to set up new standards. This means setting up new systems, procedures and sometimes Departments, who will deal specifically with all elements of risk control in loan policies, especially for large project financings in for example, energy and real estate industries. International bodies are checking these new obligations and a Bank's rating also depends on the implementation of these standards. The implication is that people with construction and engineering backgrounds are being recruited to work in Banks to fulfil all the technical aspects of these new obligations. The technical experts have to introduce, implement and execute regular project supervisory checks on sites, write reports, agree on loan disbursements, assess project progress and recommend a disbursement in an existing loan. They are also increasingly being invited to attend loan committees of Banks when it is being decided if loans are to be approved or not.

The crucial problem is not that engineers were not involved in supervising large bank financed projects but their role was traditionally to look at execution of projects as 'external' consultants who did not have any influence on the banks internal risk management controls. This approach created problems as the Banks lacked the knowledge internally to look at the 'risks' early in process of a loan application. As a result of the lack of technical knowledge within the Banks, many projects ran into problems which caused heavy losses for the financial services sector contributing to some extent to the current financial crisis. The research will therefore investigate how to tackle project technical risks in large construction projects in environments where institutions are not up to the level of quality assurance to mitigate the operational risks involved and to comply with the existing guidelines of Basel II. This is particularly true in developing countries.

1.2 Aim, Objectives, Research Questions, Hypothesis

Aim:

To develop and test a conceptual model for analysing and actively managing operational and construction risk in large bank financed projects by introducing amongst other a profile of a project monitoring Engineer.

Objectives:

1. To identify the nature and types of risks (including operational risk component) in international bank financed investment projects
2. To examine of the risk control procedures required for project financing under new Basel regulations
3. To demonstrate how project monitoring and supervision contributes to risk management from approval to completion of construction projects in the context of the Basel framework.
4. To explore the risks associated with the engineering component and the engineer's involvement in risk management
5. To propose new professional competencies and knowledge requirements for the new role of 'engineers' to provide an effective project monitoring of risks to adhere to international regulations and prevent financial crises.
6. To develop and test a model for a active management of risks incorporating all elements of Objectives 1-5.

Research questions:

(1) How do banks respond to the new requirements in Basel regulations and what are the necessary procedures for risk management in all phases of the project life cycle?
(2) What types of monitoring, supervision and risk control tools are required for modern project financing?
(3) What types of knowledge and competencies are required to fulfil the function/role of project monitoring to deal with risk management?
(4) How can we devise models and tests to verify our replies to questions 1-3 .

Hypothesis:

A high level of investment underperformance protection can be achieved when the operational risk of the project is controlled by matching the characteristics of the lenders and clients.

This main hypothesis can be broken down into the following THREE sub-hypotheses:

1. The operational risk is a function of the lenders framework. The lenders framework depends upon the following:
   A. characteristics of the lending bank
   B. characteristics of the loan

C. procedural requirements based on Basel II/Operational risk management
D. the introduction of an internal operational/construction risk management solution
E. The scope, competence and steering of external surveyors and consultants employed by the lender.

2. The operational risk is a function of the client framework. The client framework depends upon the following:

A. characteristics of tendering
B. characteristics of project
C. characteristics of client
D. characteristics and scope of work and contract of designer
E. characteristics and scope of work and contract of consultant

3. The lenders framework and the clients' framework are in a feedback loop influencing each other on every project as a result of :

A. The project characteristics are integrated in the loan conditions and vice versa(e.g. dynamics and amounts of disbursements).

B. The client characteristics are integrated in the loan and vice versa (e.g. choice of technical solution, changes of project team and time plan)

C. The characteristics of tendering are integrated in the loan and vice versa (e.g. choice of tender partner and criteria of selection of partner)

D. The characteristics of work together with the scope of work, the contract of designers builders and consultants are all together influencing the characteristics of the loan (collateral structure of loan is different where extensive development work has to carried out).

E. The characteristics of lending bank project are influencing the project characteristics (international financing banks makes more requirements usually in terms of technical aspects and choice of consultants than commercial banks).

4. That putting the first 3 together we can see the full picture of the working model of operational risk which follows our aim.

2. RESEARCH METHODOLOGY

The general approach and methods employed are as follows:

(1) Review/studies of relevant literature focusing on different topics relevant to the study aim, objectives and research questions. At the beginning of the work it was necessary to identify the key elements of the Basel II framework, risks in bank financed projects, explain the key problems especially in developing countries, the rationale for project monitoring including an in-depth analysis of why Basel II is an important milestone for risk management. The literature review is examining the key issues relating to Basel Framework, technical risks in bank financed projects. The two different branches of engineering and finance must be explored to identify knowledge and competencies from the two disciplines to meet the new requirements for technical project monitoring.

(2) Developing concepts notes and a conceptual framework to identify key issues and themes central to project monitoring of bank financed projects. The development of the conceptual approach should be based on a combination of the findings from the literature review (Stage 1 of methodology used), experience as a project monitoring professional involved in the international financial industry relating to the bank financed projects and surveys and case studies carried out.

(3) Surveys conducted mostly with industrial partners and professional organisations

(4) Case studies with selected industrial partners and professional organisations.

The selection of sample to participate in the surveys comes from stages 3 and 4 forms the basis of the case studies. The studies/review of the literature (stage 1) are of importance here and (2) the conceptual framework to identify key questions for the survey and case studies focusing on developing and developed countries and various aspects of project monitoring structure and risk management. The output from stages 1 to 4 must be used to develop a project monitoring framework identifying knowledge and competencies required to fulfil the function of technical project monitoring.

2.1. Selected methodology

Based on the research so far the suggestion is to use:

- a quantitative research approach to data collection.
- a problem solving approach (action research) and
- a statistical format of secondary data collection

The reasons for selecting this methodology compared to other methodologies are as follows:

A hypothesis is to be tested, which should have been tested in various industrial environments and therefore a critical amount of tangible quantitative results should exist, hence the attempt to go into quantitative research.

It is the intention of the researcher to review the current situation, identify the problem and get involved into a solution. From the point of view from a researcher and practitioner who has identified the problem during his work action research is definitely to be preferred.

Finally the statistical format for secondary data collection is chosen as statistics are available on various aspects of the topic, mostly by engineering associations.

2.2. Research roadmap/ Framework

(See research framework Appendix 1 - Diagram attached)

3. RESULTS/FINDINGS

The initial literature review has been divided and discussion summarized based on the five original themes to allow the integration of theoretical and empirical literature.

Theme 1 Basel II Framework
Theme 2 Implications for Bank Financed Projects
Theme 3 Types of risks /Operational Risk and Risk Control Summary
Theme 4 Engineers Involved in Risk Management
Theme 5 Competences Required for Engineers

3.1. The Basel II Framework

Generally the starting point of the research is the non-binding framework introduced by the Bank for International Settlements (BIS) in Basel, Switzerland, the so called Basel Committee overseeing matters relevant to all lending Banks. In 1988, the committee decided to introduce a capital measurement system commonly referred to as the Basel

Capital Accord. Historically Basel I was established in 1988 as the initial document.

In 1997, BIS developed a set of "core principles for Banking supervision" which provides a comprehensive blueprint for an effective supervisory system and in 1999 the "Core Principles Methodology" was devised (Basel Committee on Banking Supervision, 1999)

In 2006 the core principles and the methodology were revised and released in October 2006 (Basel Committee on Banking Supervision, 1999) the current Basel III is an update and incorporates the important parts on operational risk management of Basel II.Basel II is designed to introduce a capital measurement system and provides for the implementation of a credit risk measurement framework with a minimum capital standard (Basel Committee on Banking Supervision, 2006). Basel II is the whole set of rules for equity capital for the supervision of Banks (lenders) in the past years. Basel II consists of 3 Pillars

The First Pillar – Minimum Capital Requirements

The Second Pillar – Supervisory Review Process

The Third Pillar – Market Discipline

The focus of this study is to be found in the first and second pillar Minimum Capital Requirements and Supervisory Review Process (Bank for International Settlements-BIS, 2006) as both relate to operational risk management and supervision and monitoring of risks.

The literature on Basel II and its controversial aspects is discussed in many international journals.

Wahlstroem (2009:.53-68) also argues that the resource intensiveness of Basel II is seen as a drawback as extensive sets of new regulations have to be implemented which causes problems. Moreover, Wahlstroem (2009 found that as a result of its complexity, parts of the organisation (e.g. Bank)may find it very difficult to understand and to follow as it as it is written in a highly technical and abstract language. This is also a problem of implementation.

Another negative effect is that because of its complexity of a herd behaviour is being observed where Banks are acting in a certain direction en masse. In effect small Banks that often cannot see the complete picture of these very complex structures of Basel II will simply follow what is being done by the bigger players, trusting that they have a better understanding. This could create economic cycles with an also adverse effect.

Danielsson ,Embrechts et al (2001) highlight in their paper on an academic response to Basel II their concern that the proposals failure to address important issue, for example the heavy reliance on credit rating agencies or the procyclical nature of financial regulation can have destabilising effects and thus harm the global financial system.

How right they were with this statement is obvious when we look at the current financial crisis 11 years later.

Furthermore they voice their concern over the fact that the Basel Committee has not considered how financial institutions will react to the new regulations.

To sum up the authors do not find the Basel II accord obsolete or bad, but they clearly indicate that some elements of the accord have not been thought through to the end, thus bearing in them the risk of failure.

Cardim de Carvalho (2005) critically assess Basel II looking at Basel I first and then agreeing that it did not need more sophistication in the calculation and that Basel II is too sophisticated. That is important because already some leading Bank regulators are approaching Basel Ii with prudence. For example in the UK and France only a small number of Banks are expected to qualify for advanced methods, even though the European commission has already decided to accept and to implement Basel II.

To sum up he argues that it is wise to proceed with care with a flawed battle plan as Basel II as compliance to it is complex and costly and supervision is generally unlikely to be very efficient.

Kaufman(2003) argues that Basel II has been announced with great fanfare but that it did not live up to the expectations. Again mostly because of its complexity it has been largely rejected in the US but also on the inadequacy of pillars 2 and 3 as they brought nothing really new in certain countries.

To sum up it is his view that regardless of his shortcomings Basel II has both increased our knowledge of the nature of measurement of risk in banking and increased the sensitivity of all stakeholders and the public to risk management. Indeed he argues that Basel II major lasting contribution is that it will ensure the continuing of an ongoing process, even if it will not be implemented for a very long time.

A particularly interesting view comes from Hai et al (2007) as they are investigating the implementation of Basel II the issues and challenges and implications in particular for Developing countries. The paper shows that the right balance between regulation supervision and market discipline requires the mutual cooperation and assistance amongst the central banks.

In particular they emphasise the role of educational institutions , banks training institution in developing the human resources in this regard.

Specifically ,the need for home supervisors and host supervisors of internationally active banking organisations to develop and enhance communication and cooperation in the implementation of Basel II to make the banking industry as a whole more efficient.

Gregoriou (2009:251) argues that Pillar II of the Basel II Capital Accord has a serious drawback in so far as any losses resulting from a certain risk factor stands alone in this classification, meaning that any losses resulting from risk factors are booked to the category in which the initial event incurred. There hence cannot be any observable correlations between the individual categories are undesirable –whether immediately after a risk event or after some delay. Real life factors such as process interdependencies, internal cost, procedures and systems may therefore not be supported by that scheme and for that reasons constitute a limitation of Basel II.

Hakenes and Schnabel (2011:1436-1449) argue that the impact studies of the Basel committee have pointed towards a sharp reduction in capital holding by banks. In some of Banks the levels of capital holdings where above the levels required by Basel II. It is therefore agreed that Basel II to a certain extent has destabilized banks because it has triggered reduced buffer levels by bigger banks to be thrown as cheap capital on the market.

The basic argument is that the accord neglected the endogeneity of risk and tended to have pro cyclical effects (e.g. Kashyap and Stein,2004; Danielsson et at.;2004) meaning that Banks will based on the risk requirements of Basel II be more reluctant to extend loans to small lenders

Thus causing a liquidity problem for them and more closures. In turn smaller Banks will be forced to lend to smaller customers facing a higher risks which could lead to smaller Banks Closing or being taken over. Hence bankruptcy of the small business leans to bankruptcy of smaller lenders and is in that way acting pro-cyclical in an economic crisis.

Finally the BIS itself has answered to the criticism in a paper presented by Crokett (2003) displayed the 5 largest criticisms that have been levelled at the new accord.

For instance that it is too complex, that it enforces the procyclicality of the financial system, that it puts too much weight to the judgements of rating agencies etc.

The importance of this paper is that their one finds the responses of the authors of Basel II to the criticisms of the academic world to Basel II.

To sum up the argument the author is arguing that many criticisms to Basel II are endemic for our whole financial system and have very little to do with Basel II in itself, admitting however to the point that Basel is intended to apply fist to the large Banks who are internationally active from the G10 countries.

3.2. Implications for Bank Financed Projects

Basel II has a number of implications for bank financed projects affecting

(1) Project risk allocation,
(2) Lending markets and
(3) Projects in developing countries.
(4) Operational risk management and control,

Ad 1.

Basel II introduces change to risk allocation in loan based projects , which is primarily to be distributed not only between the lender and the loan taker .but that there need to be risk reduction measures, within the lenders ,between the Lender and the loan taker and between the lender ,the loan taker and the consultants of both sides.

Basel II asks for this new risk allocation to be managed within and by Banks more actively.

Ad.2

Lang et al 2008) is showing the effect of Basel II on the lending market in the credit card segment in the US..

For other lending markets their findings are largely similar. In the US there will be ,at least for some time the option to stay with the less stringent Basel I accord versus Basel II

In short the Basel I rules require the same capital charge. In contrast Basel II rules are more risk sensitive with minimum capital requirements based on banks' internal estimates .This is distorting the competitive position of Banks adopting Basel II relative to Banks remaining under the current capital regime. In effect a distortion of the market in US is predicted here.

Ad3.

Another interesting topic is the question, if the interest of Developing countries who are in desperate need for Bank financing to develop their infrastructure can be sufficiently protected Griffith-Jones et al (2002) raise the question on the possibility of developing countries to fulfil the required standards and obtain the required funding. It is argued that the standards and procedures are difficult to reach for these countries which need these financings the most and also where such a procedure is mostly required.

However this position is not shared by Liebig, et al (2007:.401-418). Who argue that evidence indicates that the new Basel Accord should only have a limited effect on lending markets as most international Banks have already adopted modern risk assessment tools.

Ad4.

Basel II and its requirements relating to operational risk management are the driving factor for project monitoring on a semi-legal institutionalized level of the Finance sector.

Basel II is the motivation for a holistic approach through project management to the question of multi-disciplinary, multi-dimensional risk control.

In the context of Bank financed projects Basel II had the effect that management is very much aware about the importance attached to this topic as opposed to the pre-Basel II period. This can be seen in the implementation phase on the level of the responsible managers who appear to get in right , adopting a process-technology-people approach. This means they take the processes and controls right from Basel II and follow this up with technical and organizational development initiatives. Porter (2003:9-12) speaks in more detail about that topic.

In the following section we shall review the central topic of our research which is Operational Risk and how to manage it.

3.3. Types of risks /Operational Risk and Risk Control Procedure

III.3.1 Operational Risk Management from the perspective of the Basel II framework:

For the purposes of our research topic we need to focus on the operational risk management component of Basel II.

The Basel Committee defines operational risk as:

`The risk of loss resulting from inadequate or failed internal processes, people and systems or from external events`. (Bank for International Settlements-BIS, 2004)

As the Committee intends to continue an ongoing dialogue with the industry on risk mitigation in particular for operational risk and, in due course, may consider revising the criteria for and limits on the recognition of operational risk mitigation on the basis of growing experience, further guidelines are constantly being developed. That means that we are in the middle of a very modern ongoing process.

However, the Basel Committee recognizes that operational risk is a term that has a variety of meanings and therefore, for internal purposes, banks are permitted to adopt their own definitions of operational risk, provided the minimum elements in the Committee's definition are included.

As one of the prime sources of reference there is the BIS consultative Document on Operational Risk (2001) where under section XI paragraph 51- 55 it defines Operational Risk Management Standards.

In particular in our context we have to highlight the effectiveness of the bank's risk management process with respect to operational risk exposures, the systems for monitoring and reporting operational risk exposures, procedures for timely and effective resolution of operational

risk exposures and events and its internal controls, reviews, audit and the mitigation efforts of the bank.

In short the BIS is looking at the internal decision and risk steering methods, procedures and

The internal monitoring function in the lending bank itself.

By contrast it is relatively difficult to identify or assess levels of operational risk and its many sources. Historically organizations have accepted operational risk as an unavoidable cost of doing business. Many now though collect data on operational losses - for example through system failure or fraud - and are using this data to model operational risk and to calculate a capital reserve against future operational losses. In addition to the Basel II requirement for banks, this is now a requirement for European insurance firms who are in the process of implementing Solvency II [3], the equivalent of Basel II for the banking sector.As some internationally active banks will wish to use the Standardized Approach, it is important that such banks have adequate operational risk management systems.Consequently, an internationally active bank using the Standardized Approach must meet the following additional criteria: (BIS 2006:149-section 663).

(a) The bank must have an operational risk management system with clear responsibilities assigned to an operational risk management function.The operational risk management function is responsible for developing strategies to identify, assess, monitor and control/mitigate operational risk.For codifying firm-level policies and procedures concerning operational risk management and controls; for the design and implementation of the firm's operational risk assessment methodology; for the design and implementation of a risk-reporting system for operational risk.

(b) As part of the bank's internal operational risk assessment system, the bank must systematically track relevant operational risk data including material losses by business line.

Its operational risk assessment system must be closely integrated into the risk management processes of the bank.

Its output must be an integral part of the process of monitoring and controlling the banks operational risk profile.

For instance, this information must play a prominent role in risk reporting, management reporting, and risk analysis.

The bank must have techniques for creating incentives to improve the management of operational risk throughout the firm.

(c) There must be regular reporting of operational risk exposures, including material operational losses, to business unit management, senior management, and to the board of directors.

The bank must have procedures for taking appropriate action according to the information within the management reports.

(d) The bank's operational risk management system must be well documented.

The bank must have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operational risk management system, which must include policies for the treatment of non compliance issues.

(e) The bank's operational risk management processes and assessment system must be subject to validation and regular independent review.

These reviews must include both the activities of the business units and of the operational risk management function.

(f) The bank's operational risk assessment system (including the internal validation processes) must be subject to regular review by external auditors and/or supervisors.

* For other banks, these criteria are recommended, with national discretion to impose them as requirements.

The approach to managing operational risk differs from that applied to other types of risk, because it is not used to generate profit. In contrast, credit risk is exploited by lending institutions to create profit, market risk is exploited by traders and fund managers, and insurance risk is exploited by insurers. They all however manage operational risk to keep losses within their risk appetite - the amount of risk they are prepared to accept in pursuit of their objectives. What this means in practical terms is that organizations accept that their people, processes and systems are imperfect, and that losses will arise from errors and ineffective operations. The size of the loss they are prepared to accept, because the cost of correcting the errors or improving the systems is disproportionate to the benefit they will receive, determines their appetite for operational risk. (BIS 2004: 207-208).

Out of the Basel II framework we have operational risk as the central type of risk in our focus of research. The new framework calls for a separation between operational risk and other risk factors. Also Basel II makes greater demands on qualifying operational risk. This implies that a constant monitoring and qualifying of impact of operational risks is required (Pungsley, 2007).

We will come back to the topic when we will speak about Project monitoring later.

To sum up and highlight the analysed connection between Basel II and operational risk management in general for the purpose of further analysis in more detail is that, Basel II combines all items into one single integrated measurement and management framework.

This is especially important in our example, large project financings, loans for instance in the Energy and Real estate Industries.

For the purposes of this analysis we shall focus on commercial risks (also known as project risks) which are relevant for us as project management comes as a result of this type of risk.

As discussed risk evaluation must me at the heart of project finance.

Project finance risk analysis is based on:

1. A due- diligence process intended to ensure that all the necessary information about the project is available

2. Identification of the risks based on this due diligence and the subsequent precise and timely reporting of these at the beginning of the loan processing process before the decisions in the loan committee of the lender is taken.

3. Allocation of risks (to the extent possible) to appropriate parties to the project through provisions in the Project Contracts.

4. Quantifying and considering the acceptability of the residual risks that remain within the project company, and hence its lenders.

We should note that risk assessment by lenders is based as much on the financial impact that a particular risk may have on the project's viability as on the likelihood of it actually happening.

Risk allocation is an important sub category of Operational risk management and plays a crucial role to reply to the topic at hand.

From the perspective of the lender it is important to introduce risk allocation already in the loan conditions/loan contract this of course depends on the negotiating power of the Bank and the client. On the other side the lender has to recognize that the ability to take risks is limited if it wishes to rise highly leveraged project finance.

The already mentioned Porter (2003: 9-12) discusses a very important feature and problem of operational risk, in so far that is it not easy to define, to model and predict as is the case with other risk factors. However, the general consensus is that operational risk is something that happens as soon as the doors open and affects every financial institution all across industry sectors. Another problematic characteristic of operational risk is that it is also a type of risk which does not occur frequently but when it does the consequences can be quite severe. This of course could be seen as an "open flank" of the Basel II structure.

Franklin (2008) looks at operational risk under Basel II as a model for extreme risk evaluation and finds that the diversity of operational risks creates methodical difficulties both in quantifying and in estimating the interactions of the different risks.

In particular he talks about extreme risk which is defined to be an event which may happen very rarely or never.

To conclude he says that the structure of extreme risk evaluation means that the advocacy method, so far best instantiated in bank operational risk evaluation, has the potential to be exported to all fields involving extreme risk.

Analysing risk, it is clear that Basel II requires the development of new methods and procedures for technical supervisors in Banks to achieve risk reduction and as a measure of control introduced by international banks following new international Banking rules. (BIS, 2004:208).

In particular Amyotte (2006) regards risk management as an area in which all engineers should be familiar. As part of operational risks within Basel II and is advising are more intensive involvement by industry government and university in Canada.

Yescombe (2002:139) defines more precisely a very wide variety of sub aspects of operational risks to be considered. From the point of view of Engineering putting this sub category together calling it commercial risk

Commercial risk is divided into

1. Commercial/financial viability
2. Completion risks
3. Environmental risks
4. Operating risks
5. Revenue risks
6. Input supply risks
7. Force majeure risks
8. Contract mismatch

Finally looking at this subcategories one can immediately see that persons with Engineering backgrounds must in the best position to control and supervise these risks.

At this point we have also to make the context to the broader picture which is and must be Sustainability.

1. Mc Askill (2011) conducted a study about the aspect of Risk Management as a Framework for Applying Sustainability Concepts on infrastructure projects which indicated

that at the moment there is a lack of comprehensive considerations of sustainability theme risk identified in risk management.

2. For example saying that the environmental and social context of projects alongside more traditional project risks considerations of time cost and quality should also be considered. 3. That it important because the considerations of environmental aspects and social aspects more and more affect the overall success of a project.

4. To synthesize this argument, this wider look at project risk is not widely applied.

Arguing that we should move to change the concept of sustainable development as well (Ciegis et al, 2009) 5.

The argument on this topic appears to be sound and well documented and needs to form the basis of any further considerations.

2. On the other side she argues that sustainability integrated into a project risk framework still needs a re-conceptualization of the sustainability concepts. On the other hand she argues that a purely risk based approach will not solve all issues associated with current sustainability assessment as part of the nature of sustainability is its subjectiveness.

For example traditional sustainability assessment frameworks (both multi criteria analysis approaches and rating schemes) stand alone for itself and are not already integrated in project risks frameworks

That is important because this integration is still not a standard part of the project decision making process. Therefore there is no unified picture reconciling project risk with sustainability.

To synthesize the two aspects the project team needs to use separate tools should they want to put the two aspects together.

Evaluating this aspect we have to see how far the requirement for sustainability really goes

within the demands for risk management.

Finally, the importance of the understanding the links between the different risks when conducting a risk assessment is important as highlighted for example in the adopted ISO 31000 standard.

The importance of this aspect is very high as academic frameworks already attempted to do so and international standards increasingly highlight this aspect, yet again standard project registers do not reflect this.To sum up this part of the argument a risk network concept still requires further work to eventually become standard in the industry (Chapman, 1997).

3.4. Risk Assessment and Construction Risk Assessment in Engineering

Approaching to our core problem of Risk identification in construction Projects from the aspects of Life Cycle and Stakeholder perspectives in particular

Patrick .X.W.Zou, G.Zhang, Jia-Yuan Wang (2006) in there scientific paper tried to identify key risks associated with the achievement of all project objectives in terms of , cost, time, quality environment and safety.

The basis of the research was a survey with the industry practioners owing robust experience in construction projects.

For example identifying 20 key risks, out of which "tight project schedule" was found to have the most significant impact. The relevance of this paper is very strong as little research has looked at the risks from the perspectives of project stakeholders e.g. financing Banks.

To combines their findings that no matter how construction risk focused practioners (e.g. Engineers) are the whole life cycle of a project has to be looked at, whilst of course all project objectives have to be achieved. Thus bringing us again back to sustainability.

Another contribution from Scott Cullen (2008) on Risk Management is arguing that good risk management should also involve the entire project team, this process is ongoing, a never ending cycle and an interactive process of identification, management and monitoring.

As an example he is suggesting risk management with a probabilistic modeling.

This is important as it is quantifying observed risks and is putting priorities on managing the project and monitoring the project successfully.

To sum up this aspect he is suggesting a strictly documented and quantified approach to risk management.

This position is to be upheld from the aspect of a practitioner and Engineer as it reduces significantly the usual project contingencies to a range between 3-8%.A.Klemetti (2006) is arguing in Risk Management in Construction Project Networks

points out that there is a vast amount of studies on construction risks but they are mostly not in use at construction sites.

Instead Construction project risks are mainly managed through formal contracts, naturally the number of disputes is enormous. She is arguing for a co-operative risk management where multiple actors would manage risks together.

For instance she is arguing that new rules should be adopted , taking into account more company level relationships than personal relationships and reducing completion only based on price.

That idea is important because the projects at hand are large investments where the sources

Of risks are complex and not always only on the construction side. To synthesize this position one can agree that his notion of applying the theory that is readily available on site is the only way forward and the best mechanism to remedy risk factors.

The risk sharing or the cooperative management of risk especially in bank financed project

Is again an issue taking us back to the Basel II requirements?

3.5. Competences and Involvement for Engineers in Power Plant construction Risk Management

This new role of engineering supervision and monitoring within the Banking industry in international projects is important especially with regards to projects in developing countries. Under the new rules there is an implicit need for a technical expert within the Banks. Bogdanovic (2005) has found that the role of the supervisory Engineer's work in a banking environment is crucial and requires technical skills to fulfil the obligation to develop and execute new procedures and standards in the Banks in particular. Supervisory engineer is expected to have core technical skills in risk management, meaning that this person must have a profile of a quality and quantity surveyor combined with a risk management education and Banking knowledge. It is a project management function combined with internal project risk steering. "Steering" proactively risks is of particular importance in larger projects in developing/emerging markets as there financing and disbursements are usually bound to strict procedures with independent control to achieve the aims of the project. There is also a geographical aspect as the need for controls is much more significant for developing countries/emerging economies than for the developed countries where these procedures usually work quite well.

The crucial problem is not that competent persons were not involved in supervising large bank financed projects before but, that the role was traditionally to look at execution of projects as external consultants who did not have any influence on the banks internal risk management control.

This approach created problems as the Bank always lacked the knowledge internally and the understanding to look at the technical risks early in process of loan application. As a result of lack of technical knowledge within the Banks many projects ran and are still running into problems which caused heavy losses for the financial industry contributing to some extend to the current financial crisis. The lack of especially technical knowledge on the part of the Banks brought them into the dependencies of external consultants. External technical consultants and supervisors are still part of the solution; however there still is no interface within the Bank who cans properly asses all necessary components required for a clear lenders perspective. This interface is necessary to prevent any sources of conflict of interest. In practise they arise from the fact that lenders want to lend as their work performance is measured by placements of capital, consultants have complex relationships to EPC contractors etc.

M.H. Faber (2008) in this work Risk Assessment in Engineering from the joint commission on structural safety (JCSS) is giving a more philosophical, but useful suggestion on Risk assessment, decision making and decision support.

The focus is on the decision maker in the first instance which is the responsible Engineer/Supervisor representing the stakeholder.

For example a decision maker who is responsible for the management of risk may optimize his/her decision making in the sense of transferring the risk. This transfer of risk generally has a price and effect the economic situation of a project. As a consequence this is one of the legitimate cornerstones of risk assessment and risk steering.

The aim and objective of this study is also to define and precisely analyse the necessity, requirements and objectives of a different profile of engineering supervisor who is in a project not only for technical control, but is part of a proactive "risk steering" mechanism. This mechanism is to actually hand over much greater competencies for surveyors than so far traditionally understood. More precisely, coming from practice the aim is to introduce and make a case for this completely new profile, the so called, Project Monitoring Officer with his/her own department has therefore been introduced. Going from the consequences back to the cause, Project monitoring in the loan based environment means for Basel II that the rules of Basel II find their practical and operational implementation and create a positive change in the industry towards more risk awareness and risk management

This new profile is an Engineer ,with Supervision specialization who follows the complete project cycle of a Bank /Loan financed investment project usually in excess of 5 Mio Euro. A new profile of a supervisory Engineer who has to combine and adapt his Engineering skills to a non-technical environment with the prime concern of Risk management of these loan placements and proactive intervention if the project is not performing as envisaged. A total project/construction lifecycle in full correlation to the lenders loan procedures and under all aspects of especially the above mentioned commercial risks from loan approval to completion of the project.This is at the same time the shortest possible definition of Project monitoring from a lenders perspective under Basel II. This arrangement constitutes the "operationalized Basel II" in relations to project financings allowing as previously mentioned for some discretion of the Banks itself. Project monitoring is a measurable, quantifiable and verifiable response of the lender to the Basel II requirements. It can be assessed, presented to any supervising or rating institution and it helps the responsible bodies to reach a decision on granting loans in the loan application phase and to monitor the loan disbursement in the project implementation phase of these loans.

Looking now at the phases of the project finance cycle from our analysis above project monitoring allows in the due diligence phase /loan application phase a complete analysis on

1. Legal-risks-political-administrative risks
2. Commercial/technical risks

The result of that first phase of Project management is a full understanding on the risks of a loan placements .It defines risk mitigation and risk allocation measures and gives crucial impartial input for the loan committee to assist in their decision.

In the next phase of the loan allocation we are usually also at the outset of the construction/ erecting phase. Here project monitoring shows its essential feature which is its engineering, supervision nature. The project monitoring team must be able to professionally assess progress on quality, quantity and risks during construction work in progress. The role of project monitoring is to intervene in loan disbursements as work progresses, to pre- approve in front of Bank any disbursements and to recommend pay outs or to raise "red flags".

In this phase project monitoring assists the loan officers when disbursements are being executed and make sure that the Bank is paying out exclusively based on real construction site progress.

On completion project monitoring has to comment on the final quality of work and on final benchmarking of the project and report to the loan committee. Often a final value estimate of the completed project is carried out under supervision of the project monitoring group.

In short project monitoring insures Total Quality Management and Risk Management on the part of the lending institution.

This is a method to keep real-time knowledge based risk-management in place in the full project cycle. The role of the supervisory Engineer's work in a banking environment is crucial and requires technical skills to fulfil the obligation to develop and execute new procedures and standards in the Banks in particular. As it turns out the context of "steering" proactively risks is of particular importance in larger projects in developing/emerging markets as particularly there financing and disbursements are usually bound to strict control procedures where independent control is crucial to achieve the aims of this support. Hence this topic also has a geographical and a development component incorporated and is much more significant for those countries than for the developed countries where these procedures usually work quite well.

We conclude that a new profile of engineer is required for that role. This new profile is an engineer with supervision specialization who follows the complete project cycle of a bank loan financed investment project usually in excess of 5 Million Euro. A new profile of a supervisory engineer is required to combine and adapt engineering skills and to apply it to a non-technical environment with the prime concern of risk management of loan placements and proactive intervention if the project is not performing as envisaged. A different profile of engineering supervisor who is in a project not only for technical control, but is part of a proactive "risk steering" mechanism.

3.6. Gaps in the Literature and knowledge

I see primarily 4 groups of the knowledge and literature gaps in this area which there are to be filled:

1. The knowledge gap is relating to the knowledge gap of the financial industry on the capacities of a holistic approach to PM and its importance for the functioning of the financial system and the banking system.

2. The knowledge gap of the engineering professionals of exactly which new methods and roles of supervision can be developed apart from the traditional supervisory role in Construction surveying.

3. The knowledge gap of the users of the project financing facilities to the extent of the educational benefit for them from the introduction of PM procedure as part of the loan requirements. This especially applies to Loan recipients in Developing countries.

4. The knowledge gap of the financial institutions relating to how to implement and internally organise such a PM facility in accordance with the Basel II accord.

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Appendix 1
Research Framework Diagram