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Dissertation

Thema

APPLICATION OF SYSTEMS ENGINEERING IN CONSTRUCTION FROM IDEA TO FINAL BUILDING STRUCTURE AND RELATION THROUGHOUT THE PROCESS

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em. o.Univ.Prof. Dr.techn.Dr.hc.mult. Peter Kopacek

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von
Lulzim Beqiri

1029693

Rr"12 Prilli" p.n; 31000; Istog; R. of Kosovo

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When I was child my mother uses to say:
You better make people know your name by making them relay on you.
And as well following word of wisdom of world wild known people as it is Isaac Newton that says
“If I have seen a little further, it is by standing on the shoulders of Giants”. (Isaac Newton)
I realized that I have to get that “high” to see little further and I think I’m in a good way.It is not possible to get that “high”, stay that “high” and enjoy being that “high” without going through life challenges, without support from people you love, trust and believe, without professional, financial and moral assistance.

In this concept I would like to use this opportunity to thank all people that did contribute to educate my personality up to this level that have two sides: moral-personal and academic.
In a moral side I would like to thank my glories parents for a wonderful education transmitted to me and their support during my life; my wife and my kids for their sacrifice and much needed support during this period, family and friends. In Academic side I will use this opportunity to thank my wonderful supervisor Pr. Dr. Petar Kopacek that motivated, supported and advised me in a very high professional and academic level. He is at the same time great scientist, mentor and with honest and wounderful personality

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Kurzfassung

Der Einsatz von integrierten Managementsystemen in der Bauindustrie unter Berücksichtigung von Verzögerungen, Kosten und Zeitkontrollen erweist als ein wirksames Instrument um die Ressourcen zu optimieren und darüber hinaus den Umweltschutz, die Qualität, die Arbeitssicherheit und den Gesundheitsschutz einzubeziehen. Ziel ist die Verbesserung der Prozessqualität in der Bauindustrie beginnend mit der Idee bis zur Fertigstellung unter Reduzierung von Verzögerungen, Kosten und die Zeit für die Umsetzung. Weiteres sind gesellschaftliche Anforderungen (Umwelt), Forderungen des Kunden (Qualität, einschließlich Kosten und Zeitdruck) und die Forderungen der Arbeiter (Arbeitssicherheit und Gesundheit) sowie gesetzliche Anforderungen zu berücksichtigen. Dies sind die primären Forderungen der Branche für eine bessere Lebensqualität aller Beteiligten.

Um dieses Ziel bei einen Bauprojekt zu erreichen, besteht dringender Handlungsbedarf vom Beginn an über die Planung, Ausführung, Nutzung bis zur Verwertung.

Die für die Genehmigungen zuständigen Behörden, lokale und zentrale Regierungen, Eigentümer und/oder Investoren, Bauleiterleiter und Baukoordinatoren sowie alle am Bau Beteiligten, spielen eine wichtige Rolle bei der Erreichung dieses Ziels. Sie sollen eine Strategie festlegen die alle vorgenannten Interessengruppen zufrieden stellt, einen „Fahrplan“, der für jedes Projekt anwendbar ist, Prioritäten und Bedürfnisse definieren die nicht nur, wie derzeit üblich, Kosten und Zeit spart, sondern auch Fragen der Umwelt, Qualität, Arbeitssicherheit und Gesundheitsschutz erfüllt, definieren.

Sie sollten dem System welches für die täglichen Arbeiten verantwortlich ist, Autorität und Macht geben ihnen zugeordnete Systeme (oder solche die in ihrem Namen handeln) die Verantwortung für die Umsetzung der Strategie zu übertragen, personelle und materielle Ressourcen zu verteilen die für die Umsetzung der Strategie erforderlich sind.

Wie in jeder anderen Branche, so auch in der Bauindustrie, ist es unumgänglich die Methoden des „Systems Engineering“ durchgehend einzuführen um die vorgenannten Ziele zu erreichen

Daher wird in dieser Arbeit ein neues Modell für die Anwendung von „Systems Engineering“

überwiegend in der Bauindustrie für den gesamten Prozess von der Idee bis zum fertigen Bauwerk vorgestellt. Im Vergleich zu den bisher verwendeten Modellen, basiert dieses neue Modell auf Verfahren welche direkt auf die Kosten, Dauer und Ressourcen einwirken. Dadurch ist es möglich die Prozesse an die schnelle Entwicklung der Branche besser anzupassen und Prozesse zu erleichtern die direkt mit diesen Entwicklungen der Branche in Zusammenhang stehen.

Systems Engineering wurde erfolgreich in mehreren Branchen implementiert, was die erwarteten Ergebnisse und Entwicklungsmöglichkeiten brachte. Die Umsetzung des System Engineering in der Baubranche, von der Idee bis zum fertigen Bauwerk, beschleunigt sicherlich die Entwicklung mit dem Schwerpunkt auf Verkürzung von Verzögerungen, welche direkten Einfluss auf Zeit, Kosten und Ressourcen Reduzierung hat.

Schlüsselworte: Systems Engineering, Baugenehmigung, Planung, Bau

Abstract

The implementation of integrated management systems in construction, together with delay, cost and time controls, is recognized as an effective tool to optimize the resources to implement and maintain environmental, quality and occupational safety and health systems. The objective is to promote the improvement of the quality of processes that construction industry faces and have to go through from the idea to the final building structure, to reduce the delays, cost and time for implementation of final building structure. Societal demands (environment), client's demands (quality, including cost and time constraints) and workers' demands (occupational safety and health), as well as legislative requirements, are the primary forces leading the industry to a better quality of life for all parties. To achieve this objective on a construction project there is a need to act, beginning at the inception, design and planning phase of the project through its execution and utilization /exploitation phases. The permit issuing authorities, local and central government, owners-investors, company managers and all stakeholders involved in construction process, play a strong role in this objective. They should define the policy that satisfy all stakeholders needs, a road map that is applicable for each project, considering and prioritizing the concerns not only of cost and time, as traditionally, but also taking into account the environmental, quality and occupational safety and health issues. They should also give the authority and power to systems that will be dedicated to their day to day job, systems that are assigned by them (or acting on their behalf) the responsibility to implement and maintain their policy, and allocate the human and material resources that are needed to carry out the policy. As any other industry, construction industry as well appreciate systems engineering application in all steps from the initial idea to the final building structure that bring this industry benefits by reducing time, cost and resources for project implementation.

The aim of this research is to introduce new model that applies systems engineering to the entire process starting from idea to the final building structure. Comparing to the models used until now, this model manages to reduce proceeding time and directly reflect to the cost, delay and resources reduction.This will be possible to better adjust processes for rapid development of the

industry and facilitate processes that are directly related to this construction industry development.
This Model, introduced below, will contribute to a fully application of systems engineering in construction field and Bring attention to gaps identified through case studies.
Systems Engineering was successfully implemented in several industries by bringing appreciated results that and possibility for development, in this context implementation of the systems engineering at the construction industry, from the idea to the final building structure, will stimulate and accelerate development with main focus on delay reduction that has direct impact on time, cost, and resources reduction.

Keywords: Systems Engineering, Building Permit, Design, Construction

LIST OF ABBREVIATIONS

BC	Before Crist
CAD	Computer Aded Design
CM	Construction Management
EU	European Union
GDP	Gross Domestic Product
ICB	International Competence Baseline
ICT	Information and communication technology
IFBS	From Idea to Final Building Structure
INCOSE	International council of Systems Engineering
IPMA	International Project Management Association
IPMA Level A	Level of Certification according to IPMA
IPMA Level B	Level of Certification according to IPMA
IPMA Level C	Level of Certification according to IPMA
IPMA Level D	Level of Certification according to IPMA
ISO	Internatonal Standardisation Organisation
NASA	National Aeronautics and Space Administratio
NGO	Non Government Organisation
PDRI	Project Definition Rating Index
PIA	Permit Issuing Authority
PRO DO.C.S.	Progetto Domani Cultura e Solidarieta (Italian NGO)
RFP	Request for Proposal
R.Kosova	Pepublic of Kosova
QBS	Qualification Based Selection
SE	Systems Engineering
SEMP	Systems Engineering Management Plan
SME	Small and Medium Enterprices
2-D	Two dimension
3-D	Three Dimension

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1.0 INTRODUCTION

For the long time, the management of construction of entire system (from idea to final building) has been of my interest of research, and in this context I did followed development of this field which was focused on project management and system engineering of construction companies, architectural design companies and investors and their communication during design, implementation and use of the building.

The focus will be more on Systems Engineering on construction field, benefits of entire process management from idea, design, construction and communication throughout this process applied at countries in transition- case study Construction of the centre for artificial insemination in Peja Municipality-R.Kosova as case to be explored and give a model that contributes on cost and time saving, by improving management of the entire process from initial idea to the final building structure.

The human kind recognized several stages of country development through the process of society and country build up process and there are different stages that countries in transition can face or go through:

- Countries that recently had conflict-Post conflict Country
- Countries in transition as result of government change
- Countries in transition as result of implementation of radical economic development policy

Research in this field is essential for the development of the county and its economy, and especially to construction companies and all companies that are related to the construction field, that are going through the development process. Through this process the construction field (all stakeholders) is attempting to create stability in developing a system that ensures them a sustainable development and sustainable market. Therefore, exploring their needs and supporting them in this stage is of crucially important to all factors involved

1.1 Countries in transition

Construction activities or construction process has been target of several critics in almost all countries that re in their development stage or transition stage from different reasons (conflict, government change, economic reforms etc). Faults, through which that construction industry was target to be accused, usually have a close relation and depend from nature of the project.

The main weak points in this process can be determined as:

- Illegal payment-corruption,
- Increase cont over the limited or estimated budget
- Poor quality, far away from requirements and expectation
- Delay on payment to subcontractors, suppliers
- Tax evasion etc.

Above mentioned phenomena are not new and as well not especially related to this area. Different industries have same phenomena manifested in another ways, as those negative phenomena always existed during the history of civilization. More development of construction industry, quality control and systems approach make us believe that some time we can overcome these problems and their negative impact that have always created obstacle on construction industry development. For the countries in transition construction industry is usually considered as vital sector for economies that are in transition phase as well as whole country. I take a great part of the country economy turnover and employs big number of people for certain period. Above facts make construction industry become important for log period (centuries) as this industry has born and developed together with mankind. Construction industry will always be main industrial branch as mankind will continuously have need to protect themselves against the phenomena of the nature. Furthermore, food and clothes and all development of the mankind will be supported by the equipment produced at the industrial building, movement from different points to another points through transport equipments produced in industry, and infrastructure elements as well produced in industrial buildings. There are many other development –industrial demands that are related directly to the contribution of the construction industry and existence of building structure. Despite other industries that are somehow static and remains usually at the point, construction industry gather materials, manpower and equipment at the points where the

builds are built, that is public and can e evaluated in every building phase by public, visitors, and end-users. The opinion for the building, for its structure, necessity to be part of that site, building function, building structure, material, building shape and any other characteristic can be discussed in media, public event, public discussion and even from the experts related to the construction and design field, but there are some issues related to the construction cannot be recognized by everyone and as those processes does involve only stakeholder that are involved in construction process, such as designer, permit process, building of construction structure. Every country has unique approach to the every building structure to become part of the neighbourhood as every building is unique from the design phase to the final building structure, sometime even within same country there are unique treatment for every building. Final building structure will be be accepted well by the environment, professionals and in those case reflect more credits to the designer, or sometime will remain without recognition. There are cases that building has no enough value recognized by the public, values given by designer and constructor, and therefore building itself did not managed to fulfil requirements of all stakeholders, mainly to the end-users and fit the project scope. Not always problem remains with design and construction, there are times that gaps and indifference during the permit process and urban condition reflect to the final building structure acceptance. A part from engineering value-design, construction and permit process, the cost and time extension can be part of dispute and reason for value reduction and acceptance. It is fact that the environment of the realization of projects are unique and happen in unique conditions that are not repeatable that brings usually difficulties on project definition as concept. Construction projects as a nature, are difficult to implement, monitor and control comparing to the other industry, from the beginning phase to the final handover to the end-users. The end user remains to the level of comparison and give individual opinion by creating another imaginative view that building can be according to imaginative new that one create as satisfaction to express their dislike to the new building structure. Based on above-mentioned particularities, the construction industry is exposed to the suspicion that assumes corruption, quality, competence and focus to the local product usage and involvement of local labour force as well as controlling the subcontractor and their involvement in the project. Above mentioned negative associations usually are most typical for construction industry in all segment and levels. It is clear, unfortunately, that there are some elements that make us believe that those accusation

are to certain level true. The project nature itself is the objective reasons for above accusation. Based on above facts, nowadays we do witness governmental strict control to the construction projects and construction activities itself through the strict regulation and law. However, nature of the construction activities and construction industry is complex issues to be monitored and control and sometime new regulation and law for this industry instead of solving problems, bring even more problems. This research does not aim to solve construction problem industry in depth or to discuss them. The focus of the author is more to the small segment of the entire construction industry that facilitate the processes of getting permit for construction. Main focus remain facilitation of construction process by analyzing process evolution and development and finding model that best fits to problem solving for construction permit. As development of society, and in this sense construction industry as well, reached certain level, the approach is to analyse all efforts done to contribute facilitation of the construction process and therefore try to give answer to all open question raised during the history. By analysing all factors and their impact during the history we will be able to contribute with solution and solve certain problems that bring difficulties to this industry.

1.2 Construction cost overrun

In almost all construction works and implementing the building project there is usually a cost over run for a certain percentage from the predetermined budget. Several researchers in this field identified that the phenomena of the cost overrun is present to more that 85 % of the cases. This result can be considered as acceptable as every construction project is unique and is not repeatable and cost analyses can be done with high accuracy. Analysing cost overrun brings us to identification of many reasons that have impact in cost overrun: starting from the very beginning as idea, inadequate planning, delays in the permit process and modification requested during, and after, permit, during the implementation –building the physical building structure that as well is associated with delays and those delays are converted to financial cost that are not foreseen in the total budget. The value of any delay is converted to money that are not calculated in total budget that bring situation to the final decision to continue or stop construction activity, or has some impact to the quality by redesign to use quality material and services. Financial issue has been taken in account, although money did not exist, since the construction industry exist, and value

of the building was evaluated with the value of the materials used during construction or material for exchange with equivalent value (Vitruvius 24BC ;Vitruvius, 1914).

"Would to God that this were also a law (i.e. for punishing, the architects in case the costs overrun the budget determined previously by them) of the Roman people, not merely for public, but also for private buildings. For the ignorant would no longer run riot with impunity, but men who are well qualified by an exact scientific training would unquestionably adopt the profession of architecture. Gentlemen would not be misled into limitless and prodigal expenditure, even to ejectments from their estates, and the architects themselves could be forced, by fear of the penalty, to be more careful in calculating and stating the limit of expense, so that gentlemen would procure their buildings for that which they had expected, or by adding only a little more. It is true that men who can afford to devote four hundred thousand to a work may hold on,
if they have to add another hundred thousand, from the pleasure which the hope of finishing it gives them; but if they are loaded with a fifty per cent increase, or with an even greater expense, they lose hope, sacrifice what they have already spent, and are compelled to leave off, broken in fortune and in spirit.". (Vitruvius 24BC; Vitruvius, 1914).

Nowadays, to some extent, the cost of the project implementation exceed the cost that was estimated during the project cost analyses, and in this case construction project are not excluded. We have to identify reasons for cost overruns as mention above. In the fragment from the Vitruvius presented above, He has oriented the cost overruns to the architect as he was not careful enough during design and he was negligent during cost calculation of architect was not aware of the financial situation of the client. In some cases the cost overruns was as result of builders or constructors performance as main reason for cost overruns. Nowadays still cannot be identified what will bring to the cost overruns as there are several factors that are potential for cost overruns. Law that Vitruvius urged, that was in favour of having the architect responsible for the problems, was in different ways interpreted and presented. For instance, in a situation when the mistake cost some human life. Architects were not often impeached for design of a building structure that did not take in the account financial situation of the client. We have to

give additional strength to architect protection but charges do not allow thorough preparation and investigation in depth. There are project, construction related, that cost overruns are almost inevitable because of the nature of the project and activities to be performed, such as reconstruction, revitalization, conservation, underground structure, because during design and preparation and project owner-investor are not ready to pay in that phase of the project. Some projects, local level, that are financed by the public budget are initiated, approved and financed by the local community, and based on this fact local community give priority local companies to implement project. Foreign companies can only implemented any project initiated by local community if local companies does not have resources and capacity. The local community is in favour of the local companies as they pay taxes to the local government and they spend their money locally. The idea is to invest and have still money that will come indirectly (taxes, investment etc) by engaging the local companies. There are views that believe that cost can be optimized by having contractor that is employed and therefore they can take and implement any project with low price. Nowadays the almost entire world is capital-driven. The problem we are treating and trying to bring best solution will not be accepted and solve problems in the future, as will do today's time.

1.3 Times important factor – idea to final building structure (IFBS)

Analysing time spend to complete idea to FBS is nearly to be considered that it is same to different sector, as the approach in different sector changes in attitude and control. The entire process has differences in implementation – time spend to implement project in different sectors, Therefore there are two main sectors that those categorization can be clearly identified:

- Time for IFBS at the public sector
- Time for IFBS at the private sector

Beside categorization between two sectors, public and private, there are some issues to be taken in account related to the timing for the IFBS process such as:

- Process for IFBS for small projects less than 1000 m^2
- Process for IFBS for medium projects less than 10 000 m^2
- Process for IFBS for large projects over 10 000 m^2

The project composition of the IFBS can be considered as complex as involves different stakeholders from the idea to the FBS that plays important role on systematic approach and implementation.
There are as well other factors to be taken in consideration for the entire process.

1.4 Quality

The IFBS involves as well quality that is triangle that has in consideration following factors:

- Time
- Finance
- Quality

Figure 1 - Project management project triangle (www.dba.co.uk)

There are experts that believe that one can not hold with thwo hand three angles of the triangle, in fact this can be considered naturaly true as one has anly two hands. One of the angles in this case fails in the shoulders and one can determaine if this will be time, finance or quality.

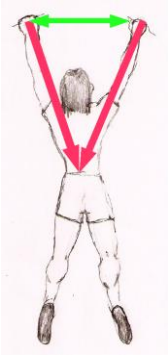


Figure 2 - Triangle analyses –holding triangle with two hands (www.google.com.)

Quality, as very important factor that sometimes increase cost more than estimated in very beginning, will always be an issue as long as contractors does not make profit by using bad quality materials and bad quality work performance to implement construction projects. A part from profit, there are other reasons that leads to a bad quality. Here we can say that time limit or time pressure can be considered as main factor that can lead to that bad quality implementation and using bad quality materials and technology. Every business approach is to have more profit by decreasing cost and within limited time, but this cannot taken as approach if we have to implement this approach and lower the level of quality.

1.4.1 Code of Hammurabi, Babylon

The Babylonian king, Hammurabi, introduced his code carved in stone in the 18th century BC. Even among these ancient laws, we can find ones about the responsibilities of the builders and the serious consequences of malpractice (Tamás K, Miklós H, Orsolya B-2011)

“228. If a builder has built a house for man, and finished it, he shall pay him a fee of two shekels of silver, for each SAR built on.

229. If a builder has built a house for a man, and has not made his work sound, and the house he built has fallen, and caused the death of its owner, that builder shall be put to death.

230. If it is the owner's son that is killed, the builder's son shall be put to death.

231. If it is the slave of the owner that is killed, the builder shall give slave for slave to the owner of the house.

232. If he has caused the loss of goods, he shall render back whatever he has destroyed. Moreover, because he did not make sound the house he built, and it fell, at his own cost he shall rebuild the house that fell.
233. If a builder has built a house for a man, and has not keyed his work, and the wall has fallen, that builder shall make that wall firm at his own expense." (Tamás K, Miklós H, Orsolya B-2011)

1.5 Summary

In the past time (centuries and millennia) the construction industry has gone through good and bad experiences and there are cases that nowadays still an example to be taken in consideration. The focus for further positive development should be focused more in the cases that reflected positivity and good example in construction industry within the centuries that present bigger number that the bad cases, that as well should be considered during research and make comparison with good ones. After project closeout, we do agree that it could be done with less budget, be more organized and spend less time for its implementation, but every project is unique and is not repeatable, therefore implementing the lesson learned from a project to another will not be that easy. (Tamás K, Miklós H, Orsolya B-2011)
Because construction project happen for the first time and possibility to be repeated almost does not exist, it is acceptable that implementation will be associated with mistakes and irregularity. Although, construction projects will not be repeated, still some of the experience can be applicable in every future construction project. Whenever you see a final building structure a very few number of people will think about the difficulties faced during construction, about time spend while construction was completed, manpower, technology and budget spent to complete this final building. As the building have not limited lifetime, some of the building structure do not resistant in time, physical invasion by mankind and nature and therefore not all building structure will remain part of the neighbourhood for a long time. Qualitative implementation, material and maintenance of the construction project-building structure determines a good place and for a long time in the view of the neighbourhood landscape.

2.0 REVIEW OF LITERATURE

To make a model that helps analysing the issues that researcher is focused on, we have to take in consideration last publication, literature and any academic, professional contribution for the field that the research is dedicated in order to make sure we have clear development of the issue and try to make further steps in this field through our contribution.

The model presented in chapter 5 has been built after analyses of following literature related to:

- Stakeholder management
- Design and Construction as an Integrated System
- Systems Engineering
- Project and program management

Review of the literature is conducted to use the state-of the-art elements to build up a model that will combine elements from the perspective of:

- Systems Engineering in construction
- Project Management.
- Stakeholder theory.
- External stakeholder management.
- Permit procedures
- Risk acceptance.
- Conflict management.
- Consensus building.
- Urban planning.
- Planning theory.
- Effects of planning on facility development
- Integrated Management Systems
- SME in transition countries
- Transition countries
- Architectural Design
- Sustainable Design

The literature consists of papers, journals, books, internet, E-library.

2.1 Stakeholder management- the design and construction process

From the idea to final building structure (IFBS) is completed by several parties that have part (stake) in entire process, therefore focus on stakeholders and their management is of interest for successful project implementation. A stake is an interest or a share in an undertaking while a stakeholder is an individual with a stake. There are researchers (Moloney,n 2006) that defines the stakeholders as person-individual or a group of that have their benefit to the organization, company, project etc. In this contest the stakeholders benefit has close relation with organization, company, project performance, they can be affected by bad performance or have great benefit at the positive performance.

Stakeholders have a key role at the organization influencing organization success, achieving goals or organizational existence in general.

The research will deal with stakeholders that are temporary as the construction projects are temporary developed until their final implementation and closeout. Those temporary stakeholders contribute to achieve project goals and as well they ca oppose your mission and activities. Based on effect that stakeholders can have they can be of good benefit or can be considered as threat for organization (Gibson, 2000). In some cases stakeholders will trigger project schemes in other organisations (Orndoff, 2005) and stakeholder can be supportive to a organization or play role of negative impact to obstruct an ongoing project (Vogwell, 2002). The influence of the stakeholders can oscillate from small to great impact and can be expressed and understand as deliberately or incidentally. Knowing this organization or individuals as well should be wary of their stakeholders, analyse their behaviour potential and influence. There are several drivers that have impact on stakeholder's behaviour, as they are influenced by economic or any other concern. Mintzberg (1995) reckons that stakes can have cultural or political origins too. Shareholders, as they constitute in a group, have their focus on profit that organization will make as the profit directly goes to their part of the stake. Stakeholders with the negative impact to organization will always seen as obstacle and there are opinions that we do not have to bother with them but in certain level of development of organization or project we cannot go further without them. External stakeholders are often supportive for resources, information and services. Organisation operations, activity, project and development is completed with stakeholder's interaction.

2.1.1 Construction industry and stakeholders

Stakeholders, as at any other endeavour, are part of the development in construction undertakings as construction, as any other field, cannot avoid having stakeholders. The number of the stakeholders in construction project, as it is a big number of factors involved, (Newcombe, 2003; Smith and Love, 2004), is larger and usually following stakeholders are part of construction project:

- Owners of facility
- users of facilities,
- project managers,
- facilities managers,
- designers,
- shareholders,
- legal authorities,
- employees,
- subcontractors,
- suppliers,
- process and service providers,
- competitors,
- banks,
- insurance companies,
- media,
- community representatives,
- neighbours,
- general public,
- government establishments,
- visitors,
- customers,
- regional development agencies,

- the natural environment,
- the press,
- pressure groups,
- Civic institutions, etc.

All above mentioned stakeholder does intent to have, have or will have influence in some stage as they are part of the process with adequate contribution. The level of the influence, depending on stakeholder's interest, is different in size and time. If diverse stakeholders are present in construction undertakings, then the construction industry should be able to manage its stakeholders.

2.1.2 Necessity for stakeholder management in construction

Nowadays clients in construction tend to manifest as dynamic configurations of stakeholders who engage with a multifaceted market (Newcombe, 2003). Construction projects with involvement of multifaceted clients, big number of the team engaged and as well several other stakeholders involved, lead to a need to have a great professional coordination that will facilitate and make easy relation between all stakeholders within the process of construction project implementation. This role of the client is underachieved (Latham, 1994; Egan, 1998, 2002; Boyd and Chinyio, 2006). Management of the stakeholder enhances competency in several direction as relational issues, control of processes, facilitate implementation and contribute to a risk minimization, as mentioned above stakeholders can as well some time threaten the implementation process. Successful stakeholder's management, during the entire project management, leads to a positive projects outcomes (Sutterfi eld et al., 2006). The principles related to stakeholders management can be used as experience from another field, construction industry has its specifics that influence, or are a good indicator that principals of construction stakeholder management has to developed based on analyses of the stakeholders in this industry.

Based on research (Caroll and Buchholtz, 2006) the key considerations in practical stakeholder management should include the following:

1. Who are our stakeholders?
2. What are their stakes?
3. What opportunities do they present?
4. What challenges or threats do they present?
5. What responsibilities do we have towards our stakeholders?
6. What strategies or actions should we use to engage our stakeholders?

There are some issues to be clarify in order to successfully manage the stakeholders in construction, by having clarify those issues we do support better implementation of stakeholder management strategy. The main question is who stakeholders are and what is stakeholder management. Number of researcher and studies have been dedicated on stakeholders and stakeholders concept, still no concept has been as universal and accepted as adequate for stakeholder management. As mentioned above stakeholders can be an individual, but as well a group or an organization that has a stake, or any inters in construction project in this case.
Great number of the studies determine two groups of the definition of the stakeholder concept:

- Narrow definitions
- Broad definitions

In different literature can be identified many narrow definitions for the concept stakeholder (Clarkson, 1994, 1995; Cleland and Ireland, 2002; Bourne and Walker, 2005; Olander, 2007). It is cleare that stakeholders is necessary to have part , right or any ownership in organization bear some risks in the investment of capital, human resources or something of value in a firm (Clarkson, 1994) or have a stake in the project outcomes (Olander, 2007). The above view provide a way to identify parties that with organization are related through economic relationship. But as well we should not ignore other factors that are not related with project or organization through the economic relationship but still can support or oppose the project

implementation. In this context we can mention local residents that they have not a direct stake to an organization or project but their involvement can be considered as risk or as priority based on their approach toward the organization or project. Stakeholders, in this case, are not based on economic factor, but still they need to be considered within stakeholder management.

The term stakeholder can also be defined broadly to include those who only have an interest in a particular issue those who actually affect or are affected by the achievement of organizational objectives (Freeman, 1984); those who have a vested interest in the success of a project and the environment within which the project operates (Olander, 2007) or those who have a contractual, financial or ethical interest in the decisions and actions of the organization (Rotarius and Liberman, 2000). However, such definitions are open to the criticism that there is little value in the stakeholder concept if everyone is a stakeholder (Mitchell et al., 1997; Phillips, 2003).

Construction projects normally involve such diverse stakeholders as clients, end-users, customers, consultants, contractors, financial institutes, green groups, governmental agencies and local communities. In order to gain an overall view of construction stakeholders, it is helpful to classify them into different categories. Construction stakeholders can be categorized into two groups according to their legal or contractual relationship with a project: internal (or primary) stakeholders and external (or secondary) stakeholders (Madsen and Ulhoi, 2001; Cleland and Ireland, 2002; Winch, 2002; Olander, 2003). Internal stakeholders refer to those who are members of the project coalition, provide finance or have a legal or contractual relationship with the project. External stakeholders are those who influence or are influenced by the project, but are not normally engaged in transactions with the project and may not be essential to the survival of the project. Parties such as owners, consultants, suppliers, customers, users, contractors and financial institutes are usually internal stakeholders, while the public community, local residents, local or national authorities, interest group may vary according to the project. Whether a stakeholder is classified in the internal or external group depends on his or her or its specific situation in each project. For example, a government department (e.g. a highways department) may be an external stakeholder in a project for the development of an estate and, simultaneously, be a client of other projects for the construction of bridges, roads or highways.

Each the construction project. Since participants' inputs are often inter-dependent, often the conflicts may arise in different circumstances that often is difficult to foresee. For example, a

developer (as an internal stakeholder) expects to fully utilize a designated site area and cut down all the trees on it, while a green group (an external stakeholder) will state the need to protect the natural resources and environment. Stakeholder management requires stakeholders to simulate as many risks and conflicts as possible, identifying project goal specificity and ensuring goal commitment among stakeholders in the implementation process. It is essential to effective stakeholder management to ensure that stakeholders work in a team throughout. However, one cannot expect stakeholders to attain the necessary synergy automatically, given that each stakeholder has his or her own interests in a particular project. Therefore, the identification of key stakeholders and their objectives are important to achieve project success.

2.1.3 Risk associated with stakeholders in building and construction

A project is initiated to satisfy a client's specific needs. However, clients' requirements are not always as clear as they should be in the initial project stage. Often, conflicts between those with differing professional knowledge may be involved, or conflicts regarding governmental regulations or the concerns of various interest groups may arise during the project. Clients need to accept a dynamic environment and adjust their expectations throughout the project according to the actual situation. Any information that not accurate or any change in a client's requirements can directly induce a revision of the project scope, an adjustment of the project budget and schedule or other significant changes. This then affects the implementation of the construction project in the subsequent stages; for example, there will be design changes in the sketch and detailed design stages, the selection of contractors or sub-contractors in the tendering stage may become irrelevant and the variation orders may have to be issued in the construction stage.

Thus, the client has to seek support from project consultants from the initial stage of a construction project. The capabilities of project consultants are thus critical to project success. However, the incompetence of consultants (e.g. project managers, architects, engineers, surveyors and other participants in the project) and an ineffective teamwork may also cause inaccurate investigation, incorrect assumptions, inappropriate designs, design discrepancy and inaccurate cost estimations, and subsequently delay the overall management and governmental

approval processes. Incomplete tender documents may result in the contract being awarded to inappropriate or unqualified tendered at the tendering stage.

The construction work that is implemented by different parties such as contractors, sub-contractors and suppliers based on the main contract documents and the sub-contract documents. Their capabilities and experience play particularly important roles in the construction stage. In sum, both the internal stakeholders (clients, consultants and contractors) and the external stakeholders (public and private external parties) can bring various risks to construction projects. By not taking care at each stage and ignorance of these risks may well cause substantial problems for a project. Successful project management needs to bear this in mind and to ensure that all the key stakeholders and associated risks have been identified and appropriate strategies have been developed to engage with them. It should also be noted that the stakeholders are not isolated from each other, and the interplay between the stakeholders in construction have significant impacts on construction projects success.

2.2 Integrated system approach of design process and construction

For construction facilities planning, it is important to acknowledge the close relationship between design and construction part. These processes can best be looked at as a joint integrated system. I wider terms speaking, design process is creating the description of some such as new facility, usually that is represented by detailed plans and specs; construction planning is a process of identifying activities and resources required to make the design a physical reality. By so, the construction is the implementation of the designs planned by the architects & engineers. In both phases of the design and construction, many operational tasks have to be performed with a variety of precedence and other relationships for different tasks. In this matter, several elements are unique to the planning of facilities construction that should be kept in mind even at the very early stage of the project life cycle. These would include the following items:

- Almost any facility is custom designed and constructed, and often requires a certain time to complete.

- Both the design and construction of a facility must satisfy the conditions respectively for site specifics and meet the standards.
- Every project is site specific, execution is influenced by its specifics of natural, social and other local conditions such as weather, labour supply, local building codes, etc.
- Facility service is oriented for a longevity, forecasting future requirements it may be difficult to foresee.
- Technology complexity, trends of market demands, and changes in the design specs are very common.

In an integrated system, the planning for both design and construction can proceed almost at the same time, looking closely various alternatives that are desirable from both viewpoints and thus eliminating the necessity of extensive revisions under the guise of value engineering. Furthermore, the design review with regards to their constructability can be carried out as the project progresses from the planning stage to design. For an instance, if the sequence of assembly of a structure and the critical loadings on the partially assembled structure during construction are carefully considered as a part of the design structure, the design impact on construction false work and on assembly details can be anticipated. Anyways, if the professional designers are expected to assume such responsibilities, then they must be rewarded for sharing the risks as well as for undertaking these extra tasks. Similarly, when construction contractors are expected to take over the responsibilities of qualified engineers, such as devising a very elaborate scheme to erect an unconventional structure, they too must be rewarded accordingly. Therefore as long as the owner does not assume the responsibility for resolving this risk and reward issues, the concept of a complete integrated system for design and construction cannot be realized.

It is interesting to note that European owners are generally more open to the latest technologies and to share the risks with designers and builders/ contractor workforce. To begin with, they are much more willing to accept responsibilities for the unforeseen subsurface conditions in geotech-engineering. The designers and contractors are also more willing to introduce new techniques in order to reduce the time and cost of construction. In European best practice, owners typically present contractors with a concept design, and contractors have to prepare detailed designs, which are validated by the owner's engineering team that serve as a validation of the design.

Those detailed designs may be alternative designs, and contractors may also prepare the detailed alternative designs meantime that may be compared or checked for creativity. The willingness to assume responsibilities does not come easily from any party in the current litigious climate of the construction industry in the USA. On the other hand, the owner or the architect, engineer, or any other groups that is part of the representation of the industry do not jointly fix the responsibilities of various tasks to designated parties, the standards of the practice is that it will eventually be decided by the court. Trying to provide a guidance to the entire spectrum of participants in a construction project, the organization of American Society of Civil Engineers in 1990 issued a manual of professional practice entitled quality in the construction. . The manual intends to offer help bring a turnaround of the fragmentation of activities in the design and construction process.

2.2.1 Innovative approach supported by technology

When planning for a construction project this begins with the generation of good concepts for a facility which will meet owner's needs, future needs as well as the market demands. The innovative approach concepts are valued highly for a better contribution with the intention to reduce costs and to the improvement of aesthetics, comfort ability and convenience as embodied in a well-designed facility. Anyways, the builders as well as the design professionals must have an appreciation and full understanding of the technological complex systems involved and often associated with innovative designs in order to provide a safe and sound constructed facility. Since most of these concepts are often preliminary or tentative, the screening studies are implemented to determine the overall technological viability and economic attractiveness without pursuing these concepts in very detail. Because of the ambiguity of the objectives and the external events uncertainty, the screening studies call for the uninhibited innovation in creating new concepts and judicious judgment in selecting the appropriate ones for consideration.

The selection of construction technology and methods involves both tactical and strategic decisions for appropriate technology and the best sequencing of operations. Decision strategies of this sort should be integrated with the process of facility design in lot of cases. At tactical

level, detailed decisions how to accomplish particular tasks are needed, and these decisions can often be made at the site.

The planning for construction part should be a major concentration in the development of facility designs, cost estimates preparation, and bids preparation by contractors. Unfortunately, well planning for construction of facilities is often treated as an afterthought by design professionals and many of these aspects are treated at the time.

2.2.2 Innovative approach and economic possibility

Innovation is viewed as an engine which brings forward improved changes, introduction of construction economics and advanced labour productivity. This is obviously very true for certain types of innovations in the sector of industrial production technologies, design, capacities, and construction equipment and methodologies. There can be often limits due to many factors and not feasibility of such innovations, in specifics in some segments of construction sector which are also fragmented with licensing and entry permit, same it can be for the residential housing.

It is noted that there are also many barriers to technological innovations of residential housing process, demand instability, and building codes. As with the market demand for the new housing it is followed with demographic trends including other economic and social conditions, the variation in housing construction has been pretty much anything but at a regular. The profitability of the residential housing industry has been close to aggregate matched output levels. As the entry or the exit in the housing industry are relatively not complex, it is very common that during periods of demand drop to find builders leaving the market for certain time period until market recovery. The drops of changing levels of kept earnings over a period of years, even among the better established builders, are likely not to support the research and development efforts which are required to nurture innovation. Furthermore, because the housing construction industry is fragmented with a vast majority of homebuilders active only in local area, the typical homebuilders will find it to be costly to move forward with the experiments with new concept designs as it will be a financial burden. The risks associated in case of a failure would risk their financial resources and existence in the market. Changes in the in local building

codes has also caused many inefficiencies although there has been many attempts to standardize building codes.

In recent years, an almost entirely new set of materials is emerging for construction field, largely from other industries such as aerospace and electronics. These materials were also developed from new knowledge about the structure and properties of materials as well as new techniques for improving existing materials. Adding additives to traditional materials example for concrete and steel are in particularly prominent. For example, it has been known for a while now that polymers would increase concrete strength and water resistance with ability to insulate when they were added to the cement. However, their use has limits due to high costs since they have had to replace as much as 10 percent of the cement to be as it should be effective. However, the Swedish researchers have assisted to reduce costs by using polymer microspheres 8 millionths of an inch across, that take little less than 1 percent of the cement. Concrete made with these microspheres meet even the strict standards for offshore structures in North Sea. The Research on micro-additives will potentially produce useful concretes for repairing roads and bridges as well.

The list of several actions taken in the conceptual design process may be well described as follows:

- Formulation refers to the description of a design problem in broad terms through the synthesis of ideas describing alternative facilities.
- Analysis, the problem definition or description by separating important from peripheral information and by pulling together the base detail.
- Search gathers a set of potential solutions for performing the specified functions and satisfying the user requirements.
- Decision has a meaning of the potential solution is evaluated and compared to the alternatives until the best solution is obtained.
- Specification describes the chosen solution in a form which contains enough detail for implementation.

- Modification is a change in the solution or re-design if the solution is found to be wanting or if new information is discovered in the process of design.

As the project moves from conceptual planning to the detailed design, the process of the design it becomes more in a formal way. In general, the formulations of actions, searches, analyses, decision making, specs and modification that still holds as they represent specific process steps with less random interactions in design details. The formulized design methodology may be applied to a variety of design problems.

The basic approach to design relies on decomposition and integration. Since design problems are large and usually complex, they have to be decomposed to yield sub problems that are small to solve. There are many alternative ways so problems of the design can be decomposed, such as functions of the facility, by spatial allocations parts, or links of various functions. Solutions to sub problems must be integrated into for the entire solution. The integration often creates conceptual conflicts which must be identified and corrected. For example a hierarchical structure with an appropriate number of levels may be used for the decomposition of a design problem to other sub problems. For example, in the structural design of a multi-story building, the decomposition may be done into floors, floors, and each floor may in turn be decomposed into separate areas. Therefore the hierarchy representing building levels, floors and area is formed.

Different design styles may be utilized to meet the needs. The adoption of a particular style often depends on factors such as time pressure or available design equipment, and the nature of the designing problems. Examples of different design styles are:

- Top-down design. Begin with a behaviour description of the facility and work towards descriptions of its components and their interconnections.
- Bottom-up design. Begin with a set of components, to see how there can be arrangement to be met with the behaviour description of the facility.

The designs of a new facilities very often begins with the search of the files for a design that comes as close as possible to meet the needs. The design process is guided by accumulated experience and intuition in the form of heuristic rules to find solutions at the acceptable level. As

more experience is gained for this type of facility often becomes clear that parts of the design problem are amenable to rigorous definition and algorithm solution and formal optimization methods can be applied to some parts of the problem.

2.2.3 Design function based

The objective of functional design for a proposed facility is to treat the facility as a complex system of interrelated spaces which are organized systematically according to the functions to be performed in these spaces in order to serve a summary of needs. The physical space arrangements can be viewed as an iterative design process to find a suitable floor plan to facilitate the movement of people and goods associated with the operations intended. Hence, the procedure for seeking the goals can be recycled iteratively in order to make tradeoffs and thus improve the solution of spatial layouts.

2.2.4 Design of building structure

The structural design of complex engineering systems generally involves both analysis and synthesis. Analysis is a deductive process and synthesis is an inductive process. The synthesis activities are often described as art creativity rather than a science, and are viewed more to creativity than to knowledge based. The new structural conception of structural system is by and large a matter of subjective decision since there is no established procedure for generating innovative and highly successful alternatives. At first, the initial selection of a system that is workable from numerous possible alternatives relies heavily on the judicious judgment of the designer. As soon as the structural system is chosen, it has to be subjected to analysis to ensure that it can sustain the demands in environment. The compatibility of the structural system with mechanical equipment and piping must be assured.

For traditional types of structures such as an office building, there are standardized systems derived from the past experience of designers. In lot of the situations, special systems must be developed to meet the specified requirements. The selection of materials for a structure depends not only on the suitability of materials and their influence on the form of the structure. For an instance, in the design of hangars for airplanes, a steel frame may be selected because a similar frame in reinforced concrete will limit the span of the structure owing to its unfavourable ratio.

However, if it is adopted a thin shelled roof, the reinforced concrete may prove to be more suitable than steel. Therefore, the interplay of the structural forms and materials affects the selection of a structural system that in turn may influence the methods of construction including the use of false work.

2.2.5 Management and design of construction site

While the general information about the construction site is usually available at the planning phase of the project, it is very important for the design professionals and construction manager as well as the contractor to visit the project location. Every group will benefit by first-hand knowledge gained in the field.

For design professionals, an examination of the topography may focus their attention to the layout of a facility on the site for maximum use of space in compliance with various regulatory restrictions. When dealing with cases such as industrial plants, production or the processing design & operation often dictate the site layout. Poor layout can increase construction problems such as inadequate space for staging, limits for access to materials and personnel, other restrictions on the use of certain methods for construction. Therefore, the design and construction inputs are important in the layout of a facility.

Previous to construction works beginning it is recommended site visit in order to have a better view and information related to the site, in which construction will take place, and those information are useful for general construction planning. Site visit is considered as inspection of the infrastructure (road, electrical supply etc) and for analysing the condition for planning of the temporary field office location and any other site set up necessary for successful operation of construction processes. Security plan as well can be developed better in the site as visit as observing the site gives better view for security planning. Site analyse should be focused as well in the natural factors as drainage, groundwater and other factors that may be considered as possible threat to the entire construction process. Analyses as well should be focused on materials that and possible wastes that of course are potential threat and increase cost of the project as those waste sometime should have a special treatment.

2.2.6 Value Engineering

Value engineering may be broadly defined as an organized approach in identifying unnecessary costs in design and construction and in soliciting or proposing alternative design or construction technology to reduce costs without sacrificing quality or the performance itself. It usually involves the steps of gathering needed information, acquiring creative ideas, evaluating the promising alternatives, and alternative proposal for a more cost effective. This approach is commonly applied at the beginning of the construction phase of the project life cycle.

The use of value engineering in the public sector of construction has been fostered by legislation and government policies and regulations, however the approach has not been widely used in the private sector of construction. In public sectors, the fee costs for design services is tightly monitored against the market price or may even be based upon the lowest bid for service. Such practices in setting fees encourages the design professionals to adopt known and tried designs and construction technologies without giving much thought to alternatives that are innovative but that tend to be risky. Contractors are more willing to examine such alternatives when offered incentives for sharing the savings by owners. In private sectors the owner has the freedom to offer such incentives to design professionals as well as the contractors without being concerned about the appearance of favouritism in engaging professional services.

Another source of cost savings from value engineering is the ability of contractors to take advantage of proprietary or unusual techniques and knowledge specific to the contractor's company. For an instance, the contractor may have longer experience with a particular method of tunnelling that is not specified in the first original design because of this experience, the alternative method may be less costly. At the beginning of a bidding competition, one that is a design professional won’t know which contractor will undertake the construction of a facility. Once a particular contractor is selected, then modifications to the construction technology or design may take advantage of advantages of the contractor's organization.

As a final source of savings in high value engineering, the contractor may offer better new design or construction insights which have escaped the attention of the design professional even if the latter is not restrained by the fee structure to explore more alternatives. If the contractor’s

expertise can be utilized, the best time to activate it is during the planning and design phase of project life cycle. This is why professional construction management or integrated design/construction are often preferred by private owners.

2.2.7 Construction planning

The development of a construction plan is very much analogous to the development of a good design of the facility. The planner must take into account and weigh the costs and reliability of different options while at the same time insuring technical feasibility. Construction planning it is more difficult in some ways since the building process is dynamic as the site and the physical facility change over time as construction proceeds. Then on the other hand construction operations tend to be fairly standard from one project to the next one whereas structural or foundation details might as well differ considerably from one facility to another.

Forming a good construction plan is an exceptionally challenging. There are numerous plans available for any project given. While always the past experience is a good guide to construction planning, each project is unique and is likely to have special problems or opportunities that may require considerable ingenuity and creativity to overcome or exploit. Unfortunately, it is very difficult to provide direct guidance concerning general procedures or strategies to form good plans in case of all circumstances. There are recommendations or issues that can be addressed to describe the characteristics of good planning, but this is not all inclusive and does not necessarily tell a planner how to discover a perfect plan. However, as in the process of the design, strategies decomposition that planning is divided into sub problems and hierarchical planning in which general activities are repeatable subdivided into more specific tasks can be readily adopted in many cases.

As far as from the contractors' point of view or the construction divisions of large firms, the planning process for construction projects consists of three stages that take place between the moment in which a planner starts the plan for the construction of a facility to the moment in which the evaluation of the final output of the construction process is finished.

The estimate stage involves the development of a cost and duration estimate for the construction of a facility as part of the contractor proposal to the owner. It is the phase that assumptions of resource commitment to the necessary activities to build the facility are made by the planner. Total careful approach and deep analysis of different conditions imposed by the construction project design and by site specs are taken into consideration to determine the ultimate best estimate. The contractor's success depends upon provided estimate, not only to get the job but also to carry out the construction works of the facility with the max profit. The planner has to see for the time and cost combination that will allow the contractor to be successful in his commitment. If contractor's estimates tend to be high, that would be to lose the job, and result of a low estimate could be to be the winner of the job, meantime risk to lose money in the construction process. When needed changes are completed, they should be to improve the estimate, taking into account not only current effects, but also future outcomes. It is very rare the case in which the output of the construction process exactly echoes the estimate offered to the owner.

In the monitoring and control phases of the construction process, construction manager has to keep track of both activities' durations and ongoing costs. It can be misleading to think that if the construction of the facility is on schedule or ahead of schedule, the cost will be on the planned estimate or below the estimate costs, especially if several revisions are made. An ongoing evaluation is necessary till the construction of facility is completed. When all works are completed in the construction process, and information is provided to the planner, third phase of the planning can begin.

The evaluation stage is the one in which results of the construction process are matched against the cost estimate. A planner has to deal with this uncertainty during the entire estimate phase. When the outcome of the construction is known is he/she able to evaluate the validity of the estimate. It is in this last phase of the planning process that he or she determines if the assumptions were correct. If they weren't or if new constraints emerge, should bring forward corresponding adjustments in future planning.

2.2.8 Industrialized construction and pre-fabrication

Another approach to construction innovation is to apply the principles and organizational solutions adopted for manufacturing industry. The re-fabrication and industrialized construction would involve transferring a significant portion of construction operations from the construction site to more or less remote sites where individual components of buildings and structures where they are produced. Facilities elements could be pre-fabricated off the erection site and assembled by cranes and other lifting machinery.

There are a wide variety and degrees of introducing greater industrialization to the construction process. Lot of components of the constructed facilities have always been manufactured, such as environmental conditioning units. Wood lumber, piping and other components are manufactured to standardized sizes. Even for temporary items such as concrete forms may be assembled off-site and transported for use. Reinforcement bars for concrete can also be pre-cut and shaped to the desired configuration in a manufacturing plant or in an automated plant located proximate to a construction site.

A major problem in extending the use of pre-fabricated units is the lack of standardization for systems and building regulation. The designers did adopted standard sizes for individual components in the designs, the adoption of standardized sub-assemblies is much rarer. Without standardizing, the further achievement of a large market and scale economies of production in manufacturing may not be possible. Innovative and complete industrialization of the entire building process may be a primary source of construction cost savings in the future.

2.2.9 Computer-aided engineering

In the past twenty years, the computer has become an essential tool in engineering field, design, areas accounting and almost for all fields and can't be thought without computer to do or test any anything. Innovative designs of complicated facilities as mentioned in the previous sections would be impossible without the aid of computer based analysis means and tools. By utilizing general analysis programs to test alternative designs of complex structures example of such as petrochemical plants, the engineers are able to make huge improvements to initial designs.

Example, the general purpose accounting systems are also available and adopted in organizations to perform routine bookkeeping and financial accounting. These applications analyze and exploit the capability for computers to perform numerical calculations in a pre-programmed fashion quickly, cheap and accurate.

Despite these advances, the computer is often used as only an incidental tool in the design, project management processes and construction. The new capabilities, systems and application programs are being rapidly adopted. They are motivated in part by remarkable improvement in computer hardware capability, the internet introduction, and fast decline in cost. The new concept in computer design and software are also contributing. For an instance, introduction of personal computers using micro circuitry has encouraged the adoption of interactive programs because of the low cost and considerable capability of the computer hardware. Personal laptops and computers available in 1995 have essentially the same capability as expensive mainframe computer systems of fifteen years earlier.

2.2.10 Activities before project planning

Even before design and construction processes begin, there is a phase pre-project planning that may be critical for success of the project. Since professional designers and construction are often not involved in this project scope phase, the terminology of assigned this as a pre-project process has arisen. From the perspective of the owner, defining the project scope is just another phase in the process of acquiring a constructed facility.

The definition of a project scope typically involves developing project alternatives at a level of conceptual point of view, analyzing risks to the project and economic payoff, drafting a financial plan, and decision making process to proceed (or not), and deciding upon the project organization and plans control. The next chapters will review these different problems at some length.

The danger of poor project definition comes from escalating costs (as new items come forward and added) or, in the worst case scenario project failure. A clear definition of scope of work

allows all parties in the project to understand what is needed and to work towards meeting those needs.

- Business Strategy for utilization of the building, justification, planning, economic analysis, facility requirements, expansion/alteration consideration, site selection issues and project objectives.
- Owner's thought with regards to reliability, maintenance, operation and design.
- Project Requirements for engineering added value, design portion, pre-existing facility, scope of work analysis, scheduling and the allocated budget.
- Site work info including applicable regulatory reporting and permits requirements.
- Building plan programming to include room by room definitions for use, finishes, and other interior requirements, including heating, air-cooling and ventilation.
- Parameters of the design to include entire components and a constructability analysis.
- Equipment and inventory, locations and utility requirements.

2.3 Systems engineering

Systems engineering is a methodical discipline approach for design, realization, management, operations and retirement of the entire system. One system is a construct or collection of different elements that together produce results not obtainable by the elements alone.

The elements, or parts, may include workforce, hardware & software, facilities, rules, and documentation; all elements required to produce system-level based results. The results include system-level qualities, characteristic of functions, behaviours, and performance. The system value added as a whole, beyond that is contributed an independently by the parts, is a prime created by the relationship among the parts; that is, how they are interconnected. It is a way of looking at the "big picture" when making decisions. It is a way of getting stakeholder functionality, physical, and operational performance in the intended use environment over the planned life cycle of the systems. Explaining in other words, systems engineering is logical way of thinking. (NASA Systems Engineering Handbook; NASA/SP -2007-6105; rev 1)

Systems engineering is the art and science of developing an operable system capable of meeting requirements within often constraints that are opposed. Systems Engineering is a holistic and integrative discipline, wherein the contributions of many teams of engineers such as: electrical , mechanical, designers, mechanisms, human factor, and many other disciplines evaluated and balanced out one against another to produce as a whole that is not dominated by the perspective of a single discipline. (NASA Systems Engineering Handbook; NASA/SP -2007-6105; rev 1).

Systems engineering seeks a safe and balanced design in the face of opposing interests, sometimes conflicting limitations. The systems engineer has to develop the skills and have instinct for identifying and focusing best efforts on assessments and optimization of the overall design and not favour one system or subsystem at the expense of another so there must the right balance. There is the art by knowing when and where to probe. The workforce personnel with these skills are called tagged as "systems engineers." They may have other titles such as lead systems engineer or technical manager even chief engineer— in this case we will refer it and call it with the terminology "Systems Engineer".

The exact role and responsibility of the systems engineer may change from project to project depending on the size and complexity of the project and from phase to phase of the project life cycle. For extensive large projects there may be one or more systems engineers assigned. For small projects, time to time the project manager may perform these practices. However, the one that assumes the responsibility, the systems engineering functions must perform to those needs. The assignment and defining the roles and responsibilities of the named systems engineer may also therefore vary. (NASA Systems Engineering Handbook; NASA/SP -2007-6105; rev 1).

The lead systems engineer ensures that the system technically fulfils the defined needs and requirements and that a proper systems engineering approach is actually fully being followed accordingly. The systems engineer has the duty to oversee the project's activities as performed by the technical team and as necessary directs, communicates, monitors, and coordinates all needed tasks. The systems engineer evaluates and reviews technical aspects of the project to

ensure that the systems and subsystems engineering processes are functioning properly as they should and evolves the system from concept to final product.

The systems engineer will usually play the key role in leading the development architecture of the system, defining and allocating resource requirements, evaluation design tradeoffs, technical balancing risk between systems, defining and interfaces assessment, providing needed oversight of verification and other validation activities, as well as many other tasks. The systems engineer will usually have the prime responsibility in developing many of the project documents, including the Systems Engineering Management Plan (SEMP), requirements/specification documents, verification and validation documents, certification packages, and other technical documentation.

In summary, the systems engineer is skilled in the art and science of balancing organizational and technical interactions in complex systems. However, since the entire team is involved in the systems engineering approach, in some ways everyone is a systems engineer. Systems engineering is a trade-offs and as needed compromises and it is about generalists rather than the specialists. Systems engineering field is about seeing at the "big picture" and not only ensuring that they get the design right (meet requirements) but that they get the right design. To explore this further, put SE in the context of project management. As discussed in *NPR 7120.5, NASA Space Flight Program and Project Management Requirements*, project management is a functional planning function of planning, oversight, and at the same time directing a numerous activities required to achieve the requirements, goals, and objectives to meet customer needs and other stakeholders within specified cost, quality, and schedule. Project management can be thought of as having two major areas of emphasis of equal weight and of the importance. These areas are considered systems engineering and project control. Note that there are areas where the two cornerstones of project management overlap one with another. In those areas, system engineering provides technical aspects or inputs; whereas project control provides the programmatic, cost, and schedule inputs. (NASA Systems Engineering Handbook; NASA/SP - 2007-6105; rev 1).

This document will focus on the SE side of the diagram. These practices/processes are taken from *NPR 7123.1, NASA Systems Engineering Processes and Requirements*. Each will be

described in much greater detail in subsequent chapters, more explanation is followed thorough below picture.

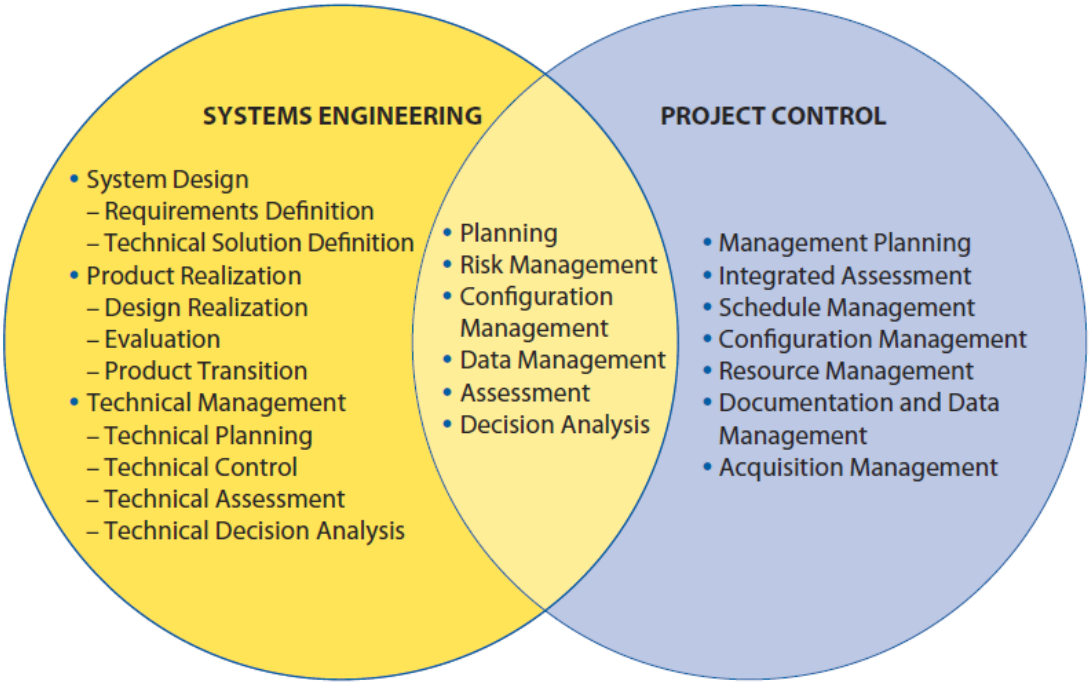


Figure 3 - Intersection of Systems Engineering with Project (NASA Systems Engineering Handbook, 2007)

Systems engineering can be found to be applicable in different fields, included construction industry as well, and it is known and understandable from the research that in construction industry application of the systems engineering is relatively new and has not that much representatives in INCOSE (International council of Systems Engineering) comparing to other industries (Erik W. Aslaksen , 2005). The degree to which (formal) systems engineering is employed in these industries is something like this:

Figure 4 - Application of Systems Engineering in Construction Industry (Aslaksen ,2005)

The construction industry , respectively, material production, equipment production and other components that are gathered as components of the construction industry, has certain application of the systems engineering in their processes, and the next step is systems engineering application on the level of the entire process of construction from the idea to the final building structure.

2.4. Management of project and program

The number of projects, programmes and portfolios is growing at an exponential pace, worldwide. In the past thirty years project management has been a discipline which has developed tremendously and increased in visibility.

More and more different kinds of projects are managed professionally. In the past, project related to the defence and construction were dominated. Nowadays they are still of importance but not in a big number, can be considered as minority. There are different field that project is applied, for example, information and communication technology (ICT), development of the organization, marketing changes, product and production development, different research projects , different events, political, legislation projects, projects for education and social projects in many different sectors of the economy. “Is project management necessary?” it is question rarely asked today. The most relevant questions are (ICB IPMA 2010):

- What are the deliverables, methods and tools of professional project management?
- What constitutes quality in project management?
- How competent should the project personnel be for a given project, phase, and area of responsibility?
- How good is the project management of a particular project? (ICB-IPMA Competence Baseline for Project Management; version 3.0, 2010)

2.4.1 Project management

To be professional, Project Management discipline has to have rigorous standards and guide-lines for definition of the work of project management personnel. These requirements are defined by collecting, processing and standardizing the accepted and applied competence in project

management.

Project quality is defined as fulfilling the requirements agreed for the project. Project management quality is defined as fulfilling the requirements agreed for the management of the project. The optimum situation for a project organization is that all the people, the project teams and resource providers involved in project management are competent to carry out their work and to take individual responsibility.

The ICB contains basic terms, tasks, practices, skills, functions, management processes, methods, techniques and tools that are used in good project management theory and practice, as well as specialist knowledge and experience, where appropriate, of innovative and advanced practices used in more specific situations

2.4.2 Competence

From the old time the word Competence has its origins in the Latin word 'Competentia' which means "is authorized to judge" as well as "has the right to speak" so nowadays the world hasn't changed so much in this regard. The aim is to look for competent project managers to manage the project activities. Increasingly, competence descriptions and requested ability and competence management have changed Human Resource Management in many organizations.

A competence can be determined as collection of skills, personal attitudes, knowledge, and relevant experience that is needed to be successful in performing the certain function. To help candidates measure and develop themselves and to help assessors to judge a candidate's competence, the competence is broken down into competence descriptions and competence ranges.

The ranges are mainly dimensions that together describe the function and are more or less independent. Each range contains competence elements that cover the most important competence aspects in the particular range.

In the third version of the ICB (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010), it was decided to describe competent project management in three different ranges:

- The **technical competence range**-to describes the fundamental project management competence elements. This range covers the project management content, sometimes referred to as the solid elements. The ICB contains 20 technical competence elements.

- The **behavioural competence range**- to describe the personal project management competence elements. This range covers the project manager's attitudes and skills. The ICB contains 15 behavioural competence elements.

- The **contextual competence range**- to describe the project management competence elements related to the context of the project. This range covers the project manager's competence in managing relations with the line management organization and the ability to function in a project focused organization. The ICB contains 11 contextual competence elements (ICB-IPMA Competence Baseline for Project Manage. version 3.0, 2010).

2.4.2.1 Project

Definition of project is that project is a time and cost constrained operational to realize a set of defined deliverables (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010) (the scope to fulfil the project's objectives) up to quality standards and requirements. Project management typically involves personnel from project management associates up to senior project managers (IPMA Level D to B). However, an organization may decide to appoint a projects director (IPMA level A) to manage a crucial project or programme (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010)

2.4.2.2 Programme

The aim of a programme set up is to achieve a strategic goal. A programme is a set or consist of related projects and required organizational changes to reach a strategic goal and to achieve the defined business benefits. Project related to the programme are different activities related to achieve strategis goal. Programme management typically involves senior project managers or projects directors (IPMA Level B or A) (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010)

2.4.2.3 Portfolio

According to IMPA s portfolio is a set of projects and/or programmes, which are not necessarily goal related, that are brought together for the sake of control, coordination and optimization of the portfolio in its totality. Important issues on a portfolio level are reported to the senior management of the organization by the portfolio manager, together with options to resolve the issues. This enables them to reach a decision on what should be done based on factual information. An organization can have several portfolios in existence at the same time. For instance, there could be a corporate-level portfolio consisting of several organizational units and directly supervised by the highest management level. Likewise, each of those organizational units might have its own portfolios that are under the control of that unit's management. Portfolio manager is a permanent function in the line management organization. The actual projects and/or programmes in the portfolios will exist for a limited time, while the portfolio itself remains. This function typically involves a projects director (IPMA Level A) combining knowledge and experience in projects with the alignment of the portfolio to the strategy of the organization. The portfolio manager needs to have high competence in project management.
The main issues and differences from a management perspective can be seen in table 1. The ICB Version 3 describes archetypes, so the candidate needs to be aware that there can and will be differences in practice (ICB-IPMA Competence Baseline for Project Management; version 3.0, 2010)

Table 1 Programme and Portfolio – issues and differences ((ICB-IPMA Competence Baseline for Project Management; version 3.0, 2010)

	Project	Programme	Portfolio
The goal of a	Is to produce deliverables	Is to achieve strategic change	Is to coordinate, optimize and align with strategy
Vision and strategy	Are related through the business case of a project	Are realized by a programme	Are aligned to and monitored in the portfolio
Business benefits	Are largely excluded from a project	Are largely included in a programme	Are largely excluded from the portfolio
Organisational change	Is often excluded from a project	Is usually included in a programme	Is excluded from the portfolio
Time, cost	Are defined in the business case and are manageable in a project	Are roughly defined within the strategy; are broken-down to individual projects within the programme	Are based on priorities and strategic targets in the portfolio

2.4.3 Explanation of the concept for project, program and portfolio level

The **project** goal is to produce the deliverables defined in the business case. Main strategic considerations and as well as the benefits for the organization are transferred to the business case. Therefore, strategy as a concept itself isn't an issue for the project manager. Every project that does support the business strategy with its performance, it is recommended to get a higher priority in relation to other organizational projects, and in this case bring many benefits for the project manager, and in the same time project still has to deliver according to the business case. The responsibility for achieving business benefits of the project is not with manager, which accrue to and are largely realized by the project, is delivered. In most of the cases the organizations held accountable for realization of the benefits the project owner. Projects are not about changing the organization; it may however, include training and educating people to fulfil

their roles in a different way and better perform their tasks. If the project required organizational change, those change are to be implemented as an outcome of the project is not managed by the project team but is managed by line management. In cases when deliverables are well defined and specified in details at the outset and the organization doesn't do change these too much during the implementation of the project, and then the delivery of the project to the required time-frame and costs are easy manageable.

A programme is set of projects that are put together to realize a strategic goal that are set out by the organization. The way to achieve this, it to initiates a group of interrelate projects to deliver successfully the product/outcomes needed to attain this goal and it defines the organizational changes needed to easy facilitate the strategic change. The programme generally defines the management process of business benefits as well as keeping in tracking the business benefits. The management of the programme the programme manager usually directs the projects through project managers as lower level, facilitates the interaction with line manager to realize the change and is responsible for benefits management, not for the benefits realization, which is still the accountability of line management. The sample of such programmes are the processes for development of a whole range of related product, a country campaign against negative phenomena as it is drug, presentation a new transportation system, campaign against noise abatement, or the standardization of the information in a complex area of knowledge. Programme is delivered in its entirety with an outcome after an agreed period of time to the strategy and the programme is terminated. (ICB-IPMA Competence Baseline for Project Management; version 3.0, 2010).

The focus of the management of **Portfolio** is concerned with coordinating both, the projects and programmes of an organization to optimize throughput (communication), monitor and balance the risk profile of the entire portfolio and to manage the alignment of projects in close relation to the organization's strategy and project and portfolio delivery within budgetary constraints. At the portfolio level, the number of projects, their complexity and project impact has increased considerably, therefore management controls have to be in place. The manager of the portfolio has tools throughout the processes, mechanisms and systems in place to ensure and explain the

senior management how the portfolio performance will achieve the strategic goals of the organization. Portfolio manager offer options for organization senior management review and decision or recommendation as to which new projects should be accepted into the existing portfolio, which active ongoing projects should still continue and which ongoing projects should be discarded in order to achieve a balance of projects which match the strategy and which can be by all means delivered within the estimated limits of the resources and estimated budget available. At the portfolio there are always too many projects on the 'which list' and it is not possible that all remains in the portfolio as some have to be discarded. Manager of the portfolio mainly is focused on the optimizing the total use of available resources. Portfolio manager, in mature organization, also facilitates the assessment of the effect of changes in vision and strategy on the portfolio.

Portfolio contains many project that should be collectively managed, are accepted, coordinated, prioritized, and supervised. The portfolio is overseen by individual (a project director) or a body (executive board) by having authority and accountability to monitor, control and sanction the use of resources and budgets to deliver those projects. Samples of portfolio are: all the large project demands of a division, all the internal ICT projects of a company, all the projects perfumed from the non-profit organization, every construction projects (no matter size) of a city. The R&D organization project portfolio can be managed applying the same processes. Seeing from another perspective the world is not black and white, there are many another colours, shades of grey and therefore in practice there will be many opposing opinions about these above distinctions. In fact everybody will be able to point out their experiences that do not conform to this presented matrix. The levels described (project, programme and portfolio) are meant as pure forms of which there are many variations (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010)

2.4.4 Success of the project management

Success of the Project management -is the appreciation and acceptance of the project management results by all relevant interested parties. A main objective of managers of project, programme and portfolio is to achieve success and minimize or totally avoid failure in their endeavours. Managers want to be sure they know what standard criteria will be considered in

determining their success or failure and how it will be assessed. Defining above mentioned criteria clearly is considered to be a major requirement from the outset of the endeavour. The overall definition of success is to achieve the project, programme or portfolio objectives within the agreed constraints. There is a relation between project management successes with project success; however, the success is not the same. Example we perform professionally a successful project management work in a project that has to be terminated due to a decision from the management for new strategic direction being taken by the organization. In this case project is no longer relevant although project management performance was very good. Process of managing project can be viewed and some time considered as a sub-project of the total project. Project management activities should be defined and managed in the same way that the context, scope of project, project deliverables, responsibilities, milestones and deadlines, project cost and effectiveness of the project must be defined and managed. Integration of project management activities and project management is crucial for project management success, involves combining project requirements, activities and results in order to achieve the defined objectives and a successful outcome in general. As the complexity increases and the more varied the expectations of the interested parties involved, the level of the integration requested is more sophisticated approach. Project management oversees, monitor and control the activities required to put together the detailed project management plan for successful implementation.

There is different terminology used for *'project management plan'*. The project management integrates all individual plans related to the project, such as the quality plan, the stakeholder's management plan, the project communication plan, the procurement plan, the contract plan, and the deliverables plan. Those plans, project management plans, have to be accepted and approved by involved parties and communicated to the relevant interested parties, with the appropriate level of detail provided for each of them based on importance and power of decision making. (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010)

2.4.5 Project requirements and objectives

The project requirements management consists of the definition, identification, and agreement of the project in order to meet the needs and expectations of interested parties, especially those of the customer and users.

Project requirements are derived from customer needs, which are driven by opportunities and threats. A business case and a project strategy are developed. A strategy is a high level view of how to attain the vision/targets of the organization at some point in the future. The strategy is reviewed at various time intervals (e.g. in a systems life- cycle, during the project life- cycle and in each and in each of its phases), as well as in specific areas, for example in procurement.

The project goal is to value to the interested parties. A project strategy is a high level view of how to attain the project goal. As determined above project objective is to bring the implementation of the project the results agreed in the beginning, especially the deliverables and results, in the time foreseen for implementation, within estimated budget and within acceptable level and parameters of risk. The project objectives are the set of targets that the project, programme and portfolio managers should attain to provide the expected project benefits to the interested parties.

The project development phase covers development of the project plans and carrying out the feasibility study.

A realistic project appraisal is important in the first phases of a project. Project appraisal covers the analysis of a proposed project, and the decision to invest in the project in preference to other competing projects or to other parts of the business. It is a pre- requisite that there is adequate justification to support the request for project authorization.

2.4.6 Project initiation by investor –owner

When a project has been approved for investment, the project owner is obliged and should produce a project charter that clearly defines the scope of the project, project objectives and project deliverables, project budget, project scheduling, review points and team membership.

By an ongoing project review process will possibly provide an assessment of progress and achieved project objectives as compared to the project objectives and success criteria that have been set and agreed at the outset. Stakeholders some time are not presenting the real evaluation of the outcome of a project as some of them do consider more successful but some of them as less successful. (ICB-IPMA Competence Baseline for Project Management; version 3.0; 2010)

2.4.7 Process of design and construction

In early phases of the project, the owner must select best fitting process for design and construction. Usually there are many choices of processes, and every choice has its advantages and disadvantages. Depending on the process selected may affects financing; selection of team members to be involved, the project cost for implementation, quality, and schedule. Beside the process selection that is important, selecting good quality and professional manpower is more important. The project success will be achieved by people working together with clear tasks and responsibilities.

There are three main phases of design and construction projects:

- Definition of project,
- Design,
- Construction.

It should be mentioned that for a total project there are business planning steps that precede design and there is an operations and maintenance phase that follows construction. The approach focuses on the design and construction of projects. Project scope definition sets the stage for design work, and following procedure is that design work sets the stage for construction work. The project definition phase involves discovery to identify and analyze project requirements and constraints. The designer and constructor should not ignore constrains that the owner has although the initial focus is on the owner's requirements and constraints. Integration, as non avoidable process, of the owner's requirements and constrains generally provides a description of the project and helps identify a plan for the time and cost of delivering the project.

2.4.8 Project management for engineering and construction

The schematic design produces the basic appearance of the project, building elevations, layout of floors, room arrangements within the building, and overall features of the project. At the conclusion of schematic design the owner can review the design configuration and the estimated cost before giving approval to proceed into design development. Design development defines the functional use and systems in the project in order to produce the contract documents, the plans and specifications for constructing the project. For these types of projects the owner may be a

private company or an agency of the government. The prime designer is the engineer, who generally prepares a complete design before construction contracts are created. The stages of design include preliminary engineering, detailed engineering, and development of the contract documents. The contract documents are the final drawings and specifications for constructing the project. Depending on the project delivery method, procurement may start during the design phase. For example, as soon as the specification is completed for a major piece of equipment, a purchase order may be issued to procure the equipment if it is a long lead-time item that must be ordered in advance of construction to ensure that it can be installed without delaying the project.
In the current practice of competitive-bid projects, contractors bid the project after the contract documents are completed. After accepting the bid, the contractor must develop shop drawings to build the project. Shop drawings are prepared by the contractor and submitted to the designer for approval. The shop drawings show the detailed fabrication and installation that will be used during construction. Thus, the contractor is also involved in design. The production of shop drawings impacts the quality of fabrication of manufactured items that will be installed at the job-site. For non-competitive-bid projects, the owner negotiates a contract with a firm to provide engineering and/or construction services. Typically, the cost of the project is negotiated on some type of cost-reimbursable basis. The agreement also specifies how the engineering design will be integrated with the construction process.

2.4.9 Advances in the engineering and construction process

The industry of construction has matured and continued to enhance the integration of activities in the design, fabrication of the construction elements, construction by technology application, and operation of constructed facilities. Major advancements has been in computer hardware and software that have produced two-dimensional (2-D) and three-dimensional (3-D) computer aided design (CAD) systems. The technology of CAD has progressed to versatile modelling systems that can be used in different project stages such as design, engineering, and construction process stages to greatly improve the capability to detect and prevent interference during field construction. The result is more efficient construction operations and less rework. The biggest improvement using CAD is better coordination of activities within an integrated process, rather than automating individual activities within the existing fragmented design1construction process.

The design intent may not be fully realized in the field using traditional information flow to the field through the use of drawings and other hardcopy documents. Traditional paper-based construction documents do not permit field personnel to interact with the 3-D model to extract information that meets their needs. Communication that uses 3-D modelling coupled with improved representation of design intent and other supplemental information can help alleviate many typical construction problems associated with material availability, work packaging, construction sequencing, and field changes.

2.4.10 Private and public projects

Generally there is another division of the project and projects may also be classified as:

- Private (private-sector projects)
- Public (public-sector projects)

The owner of a private-sector project is typically a business that provides goods and services for a profit. Examples include commercial retail stores, manufacturing facilities, industrial process plants, and entertainment facilities. Since the investor is a private business, the business administrators have the flexibility to choose any engineering and construction services that suit their specific needs. For example, they can competitive bid the project or select a sole source firm to provide engineering and construction services. They are not restricted to accepting the lowest bid for the work and can choose any form of payment for services.

The owner of public-sector projects is typically a government agency, such as city, counrty, state. For public-sector projects the owner typically uses the competitive-hid method based on the lowest bid price for securing engineering and construction services. However, in recent years there has been an increase in qualification-based selection (QBS) for securing engineering and construction services. Using the QBS process, the owner selects engineering and construction services based on specific qualifications and other factors, rather than only price.

2.4.11 Design and construction project management

Provide the overall direction of the project. The designer's team must develop a set of contract documents that meets the owner's needs, budget, required level of quality, and schedule. In addition, the work specified in the contract documents must be constructed by the contractor. The contractor's team must efficiently manage the physical work required to build the project in accordance with the contract documents. There are numerous combinations of contract arrangements for handling a project.

A design/bid/build contract is commonly used for projects that have no unusual features and a well-defined scope. It is a three-party arrangement involving the owner, designer, and contractor. This method involves three steps: a complete design is prepared, followed by solicitation of competitive bids from contractors, and the award of a contract to a construction contractor to build the project. Separate contracts are awarded, one to the designer and one to the contractor. Since a complete design is prepared before construction, the owner knows the project's configuration and approximate cost before commencing construction. Considerable time can be required because each step must be completed before starting the next step. Also changes during construction can be expensive because the award of the construction contract is usually based upon a lump-sum, fixed-price bid before construction, rather than during construction. A design/build contract is often used to shorten the time required to complete a project or to provide flexibility for the owner to make changes in the project during construction. It is a two-party arrangement between the owner and the design/build firm. Since the contract with the design/build firm is awarded before starting any design or construction, a cost-reimbursable arrangement is normally used instead of a lump-sum, fixed-cost arrangement. This method requires extensive involvement of the owner for decisions that are made during the selection of design alternatives and the monitoring of costs and schedules during construction. A construction management (CM) contract can be assigned to a CM firm to coordinate the project for the owner. The CM contract is a four-party arrangement involving the owner, designer, CM firm, and contractor. During the past twenty years there has been considerable debate regarding the CM process and the amount of responsibility assigned to the CM firm by the owner. The basic CM concept is that the owner assigns a contract to a firm that is knowledgeable and capable of coordinating all aspects of the project to meet the intended use of the project by the owner. An

owner-agent arrangement is sometimes used for handling a project. Some owners perform part of the design with in-house personnel and contract the balance of design to one or more outside design consultants. Construction contracts may be assigned to one contractor or to multiple contractors. Although uncommon, an owner may perform all design and construction activities with in-house personnel. When a project is handled in this manner, it is sometimes referred to as a force account method.

There are two general types of owners: single builder owners and multiple builder owners. Single builder owners are organizations that do not have a need for projects on a repetitive basis, normally have a limited project staff, and contract all design and construction activities to outside organizations. They usually handle projects with a design-bid-build or construction management contract. Multiple builder owners are generally large organizations that have a continual need for projects, and generally have a staff assigned to project work. They typically will handle small-sized, short-duration projects by design-bid-build. For a project in which they desire extensive involvement, a design build, construction management, or owner-agent contract arrangement is often used. An owner can select a variety of ways to handle a project. The contract arrangement that is selected depends on the resources available to the owner, the amount of project control the owner wishes to retain, the amount of involvement desired by the owner, the amount of risk that is shared between the owner and contractor, and the importance of cost and schedule.

2.4.12 Project stages-phases

Almost all projects are in a continual state of change as they progresses from their start, can be determined as a need by the owner, through design process development and finally in the construction stages. As project goes throughout the phases it is associated with additional parties that are involved and more information is obtained to better identify project key elements as scope, budget, and schedule. It is a responsibility of the project manager in every phase to keep all work within the approved key project element as budget, and schedule. May not be available sufficient information in the early phases of design development to define the scope accurately enough to know the work to be performed. The mainly attitude of the project manger is their approach as "I can do it." This attitude and approach often leads to assignment of management

position to the project manager before all work is completely defined or officially approved. Those characteristics are applicable of the investor side, company for design, or contraction company. The manpower that work around the project manager include a big number of the people such as clients, subordinates, project team members, senior management, and team member of the same level who are project managers as well. It is very difficult for project manager to efficiently utilize his or her time or effectively manage if the special requirements are made for not good defined activities. In such cases of not well defined scope the performance should be based on a time and material basis for actual work accomplished, meanwhile adequate scope, budget, and schedule should be determined. There is another option that is to define a scope, with a matching budget and schedule. When there is a deviation of actual developments from the defined scope, the project manager should recommend the owner of the readjusted budget and schedule caused by scope definition and obtains the investor approval before proceeding with construction work. The process of developing of conceptual configurations and alternatives, quality aspect and total project cost must be taken in consideration. Above consideration can be achieved through extensive information from the investor that will ultimately use the project, and as it is known that the operational cost and maintain the facility after completion is a major factor that should be considered in project design. Budget can be considered sometime as a controlling factor, which causes the investors possibility of contemplated scope to be reduced, or expanded. In cases when budget is determining the scope that full attention should be focused to ensure the project meets the minimum needs of the investor and there is a clear understanding of the level of quality that is expected by the investor. The main duty and responsibility that project development meets the investor's expectations is the duty of the project manager. The investor authorization that the final design can be proceeded reflect pressure on the designer to complete everything related to design at the earliest possible time. Attention should be focused as well in the quality of completed bid documents because of their influence on project cost. The designer should be more focused and estimate more attention to the design that will reflect positive to the project that is constructible and will perform for the investor with the less amount of maintenance and operating costs.

Important role of the manager is expressed as well in process of qualifying of companies, bid evaluation, and recommendations of the construction company to whom work can be awarded.

The main investor's requirements are objectives setting. It is of big importance because it provides a focus for scope determination, taking role of guide at the design process, and positively influences the motivation of the team involved in the project. The objectives setting process involves a quality optimization. Cost optimisation, and schedule. The investors objectives must be clearly defined, communicated and understood by all involved parties and can be used as a benchmark for upcoming numerous decisions that are should be made throughout the duration of the project. The depth of the investor's analysis varies and are directly related to the complexity of a project and the importance of the project to the investor. Analyses are important because of the concepts, ideas, goals, objectives, budgets, and schedule that have been developed and will greatly influence the design process and construction phases. The investor's analyses must lead to conclusion with a well-defined set of project objectives and needs, the minimum requirements of quality and performance, an approved maximum budget, and a required project completion date. Investor's failure to provide details of any of the above items it is possible to begin a project in the wrong direction and leads to future problems during the process. Wrong or not finally defined project scope leads to changes during design process and as well during construction process. Not finally defined scope leads to costly change orders and, frequently, to claims and disputes which lead to cost overruns, delays in the implementation process, and other problems during the project implementation. In order to achieve savings experienced managers agree the time to reduce changes is in the early life of the project, not at the beginning of construction process as at this moment the changes are very costly.

2.4.13 Needs of investor and objective of project

Identifying clearly needs and objectives that investor have it is very important before any productive project work can be started. If the investor did not clearly identified what are the project requires, then nobody from the team knows what to do. In the very beginning by defining owner needs is the first step in a big number of pre-project activities that lead to determination of scope definition. It is difficult for a project manager to create the project team to implement the project without having a clear scope definition. The process of identifying of investor needs, objectives and project output requires the involvement of a great number of people within the investor's organization. The process involves top managers and investors, personnel from the

finance field, and in particular the end-users who will use and operate the project after building is completed. Numerous activities and decision has to be taken for during the process of identifying investor's needs and objectives. To a great importance is to identify and manage separate "what is needed from "what is wanted." Without constraints of cost and schedule, focus easily shifts from what is needed to what is wanted. Above issues makes a project unaffordable and non-feasible. As there are always constraints related to cost and schedule, the investor must develop a project scope and definition based upon need. This process involves an optimization of quantity, quality, cost, and schedule. Staff of the investor organization must understand that it is their responsibility to deal and solve issues related to project needs and objectives in a phases before assigning the project to the project manager. Project manager is not responsible to identify the investors need. Identifying investors need in the later stages of project development leads to change involvement, cost overruns and conflict or misunderstandings among team members involved in the project. There is way evaluated as best way to determine needs, and information related to needs, and that is to talk to the end-users who will use the facility after construction is completed. Following description present a hypothetical example of the investors need development. The company owner may have defined a company goal that focuses on centralization of its company operations to streamline operating efficiency in the company. For achieving this goal, company management design set of the objective of consolidating the service facility of each of its five operating districts into a single location. Therefore, there is a need to design and build a service facility that will serve all operating districts. Decision making people, from every district, must meet together and agree on what is requested in a facility that satisfies the intended usage by each operating district. Decision making people should focus on what is best way and alternative overall for the company in order to achieve efficiency of company operations, that is in fact the company's goal. Those requirements identified by the decision making staff then initiate the process of project definition and scope. The assessment of the needs will not only help the identify the owners needs, as well helps to identify the total project budget as decision making staff will not approve starting design without knowing the total building cost.

2.4.14 Definition of the project scope

Project scope usually identifies those processes and activities that are required to meet the investor needs. Generally the purpose of definition of project scope is to provide sufficient information to identify the activities to be performed, to allow the design to proceed without significant requested changes that normally may affect the project budget and schedule. The experienced designers and construction company's personnel can provide valuable input to assist an investor in the development of a check list for project scope. Before design is started, scope must adequately define deliverables what will be furnished. Examples of deliverables are design drawings, specifications, assistance during bidding, construction inspection, record drawings, and reimbursable expenses. Information related to the project should be known before design has been started as it can affect the project finance and scheduling. In order to manage this, responsible from the design company must be involved in very early phases in the project, and collect as much as possible input from experienced technical people in order to represent every aspect of the proposed project. Missing information can lead to the obscurity of the scope of project that have impact on realistic budget determination. Therefore, project scope is very important to be determined and than can be developed budget and schedule that will be in line with the scope. Role and responsibility of all project managers to implement all work within the approved scope, as well as all costs and schedule within approved limits. Some times when an investor may become excited for the project and project value and anxious to begin work as soon as possible. This issue occurs usually when a new product is developed or if the location and time pressure is announced by government official for building facility. At the level of the project management, manager must review in detail the project scope and be certain that the scope is sufficiently well defined before starting any other work on the project. Failing to analyse and well define the project scope project team will try to define project scope during project implementation that leads to frustration and adverse relationships. Therefore in very beginning the main activity is definition of the project scope, make sure that all parties involved know the full extent of the required work.

2.4.15 Project implementation roadmap-strategy

The investor must develop a strategy in the early stages of project development that is plan how to carry out activities in a timely manner. The project strategy are created to determine the framework for handling and implementing project. The strategy includes the contracting, project team roles and responsibilities, design schedule, process of procurement, and construction as last activity.

Strategy of contracting identifies the overall organizational structure and defines the allocation of risk among the contracting parties. In a very beginning of the project development the investor has to determine for the work that can be performed by in-house personnel and as well have to define which of the work must be contracted to outside, outsource, organizations. There are cases when the owner has a large and professional team that can implement the entire project from the design, procurement and construction. But having complete team for implementation is not possible to all companies and investors, therefore some of the works has to be completed though contracting.

A large company may have in-house capability, still they may not be in position to implement the project staff may have their regular engagement. Investor should be careful on capacity evaluation and make a realistic assessment of the work that can be accomplished in-house and work that has to be done outside firm's capability, and based on that realistic evaluation then determine the cost and schedule trade-offs of purchasing outside services. Contract type chosen defines the allocation of responsibilities and risks for each party and influences the project schedule. Requirement for fast-track schedules in order to obtain an early return on the project investment, then a cost-plus-fee contracting strategy may be desirable. In this manner sometime are handled the government projects. In cases when there is not time pressure to complete the entire design, a traditional design/bid/build approach with a lump-sum contract may be desirable. The investor should do all analyses related to the project that planed, identify the advantages and disadvantages, take in consideration all factors and see what best meets his or her needs, objectives, budget constraints, and schedule requirements.

The project strategy includes all activities from the beginning to the final implementation as schedule for the timing to complete design, timing for procurement, and timing to complete construction tasks. The main purpose of the schedule that investors is doing is to identify and

interface overall project activities such as design, procurement activity, and construction as final phase. Schedule must be developed in the way that integrates the activities of all parties involved from the beginning until the end of the project. Changes that investor may want in a project schedule should be approved by all involved stakeholders as this may affect their performance.

2.4.16 Design company and construction company selection

Selection of the design company and construction company depends on many factors including the type of project, size, and complexity of the project; the company background knowledge in managing and implementing the engineering and construction projects, and time period that the owner wants the project completed. The method of selection depends on the owner's project strategy and the contract arrangement chosen by the owner. When the owner plans to complete all the design before selecting a construction contractor, then a procedure must be initiated for selecting the designer. Typically, an owner selects a designer that owner has used before and with which owner has had a satisfactory experience. For private-sector projects the procedure is easy, owners can simply choose their preferred designer or they may desire to obtain proposals from several design organizations that they have used in the past. A request for proposal (RFP) is issued to the prospective designers that then each prepare their design proposal. After the design company have presented or submitted their proposals, the owner will review and evaluate the proposals and make a decision for award of the design contract. For public-sector projects the process of selection is different, selection of the designer and Design Company depends on the policies and restrictions of the owner's organization. In general, designers-architects are selected from a list of prequalified firms. If the investor did not had any previous experience in workng with designers, the investor must establish a procedure to select the designer. Investor usually makes decision, after the process of evaluating of the proposed project and for design services, a list of prospective design organizations is identified. List of the design companies is done based on owner’s recommendation and based on investors experience with any of the designers that have been evaluated by owner as appropriate for design. Usually list is made with at least three companies for design that investor believe that they are the best companies for design and investor some time have individual meeting with designers for better understanding of their skills and personalities. Whenever design is 100% complete, the owner has possibility to issue requests

for bids (RFB) to select the construction company for building construction. The most common situation in private-sector projects the contract documents generally state that selection of the construction company will be based on the lowest and best bid. Typically for projects of the public-sector contract documents state the selection of the construction company will be based on the lowest qualified bidder. However, selection can be conducted, the lowest bid is generally the criteria for selection of a construction contractor, when the design is 100% complete. There are times that investor may desire to start construction of building before design is completed. For instance, the construction company may be chosen from the investor after 70% design of the future building have been completed, or the construction company may be selected at the same time when the designer and design company is selected in order to take advantage of the contractor's knowledge of building the project. Whenever investor may want to start construction before design is complete, selection of the construction company cannot be made on price alone because the design documents and detailed calculation are not completed based on what can be calculated price. When the construction company is selected prior design is completed, a procedure is established to review and evaluate prospective construction contractors similar to the procedures presented in preceding paragraphs for selection of the designer.

2.4.17 Partnering

The business environment and demand for being more competition leads to the need for the professional relationship of the companies in construction industry to increase performance and be competitive. It is well known that through the bid companies have been selected to provide any service required under contract and selection usually bring companies that provides best services based on bid requirements.

The partnering, as concept is an approach that focuses on long term commitments, with mutual goals for every partner that is involved, in function of achieving the mutual success. By getting together through partnering, partners have many advantages, however, the partnering success depends on the partner’s dedication and their readiness and their ability to overcome barriers related to doing performing business in another way than until partnering period. Through the partnering, companies agree to share resources in a long-term commitment and build trust and shared vision, with an agreement to cooperate to an unusually high degree to achieve separate yet

complementary objectives. The partnering should not be construed as a legal "partnership" that have the associated joint liabilities. The earliest known partnering relationship in construction was established between an oil company and a contractor. This was when the company owner approached the contractor with the proposal that some of the existing engineering blanket work be accomplished by using a joint relationships and accountabilities. Both companies agreed to enter into a new relation as "partnering relationship" to be able to perform multiple projects in different field and locations. Services provided by the contractor included project-execution related services, while the owner provided technical assurance and approved only primary funding documents and scoping documents developed by the contractor. It was a big number performed by this relationship between companies. Seeing from a contractual perspective, this first partnering relationship between companies are not similar with traditional contracts as the bureaucratic procedures were removed and companies were ready to negotiate openly for every issue. The owner, at his partnering relation, agreed to take the financial burden of any risk that can happen in the period of their reaction as partnering. Parties did set up the performance evaluation criteria for performance measurement for the areas that were of importance for the projects. The owner as well used the incentives for the contractor, monetary awards, for good performance of the contractor in any completed job and the Contractor as well used the incentives to employees included both monetary and non-monetary.

Changes in cultural aspect is required by all involved parties in a partnering relationship. There are identified that the three key elements for successful partnering relationship are trust, long-term commitment, and shared vision. By developing successfully these three elements, other sub-elements are achieved by maximizing the benefits to all parties. In those cases both customer and supplier will profit from reduced overhead and stability of the work load. The advantages are achieved through improved cost, increase quality, and schedule.

2.5 Requirements for application submission

Application submission demands determine number, types and types of documents required when application is submitted. Application requirement describe in detail the necessary documents required for successful proceeding of the application and assess proposed building

design, placement of the new coming building to the site through visual programs, structural design of the building and any other aspect that influence decision.

2.5.1 Approval of the plan

The process of the plan approval is associated with several expert involvement that mainly examine the proposal for the new building structure is appropriate and suits the requirements of the approved urban plan and any other requirements that new building has to fulfil. After taking all expert examination dedicated to respective project that satisfies the PIA requirements the building permit can be granted. Almost all countries of EU the process of plan approval involves the specific attention to the building design with the submission, planning and as well the aesthetic requirements, technical requirements related to type of construction.
There are some exception on the above explained rule:

- Country such as Denmark, PIA will check the technical requirements depending on technical complexity of the project, for small project as individual house only the planning demand are checked.
- France is more focused on technical requirements only for the building that are open to public and high building and attention is more focused on fire safety and as well to the access of the persons with limited abilities.
- In Portugal, the check is focused on only technical requirements that are related to the space standards. The requirement such as design should be in accordance with the building regulations is left with declarations of designers.
- Countries as Slovenia and Sweden approval of the plan does not include the technical requirements of the building design.

2.5.2 Starting point of construction activity

Almost in all countries of EU, the permit granted by the authority determines the starting point of the construction activity. Although every construction activity should start after permit is issued, there are some exception in some countries as:

- As in other EU countries, in Bulgaria and Denmark as well, construction activities can start after receiving the building permit. In order to facilitate the construction process the authority may grant permit partially or give special authorization for construction start until permit is under process of approval. The permitted part to be build usually is approved before construction take place.
- Same situation can be found as well in Italy, Latvia and Portugal, and early construction works can be started only in site preparation for the construction.
- Finland allows the piling of a building's foundations based on the piling plans submitted to the local building authority. While the casting of foundations or the construction elements of the foundation begins, construction works are considered to have commenced.
- There are cases such in Northern Ireland and England & Wales, that construction works can start as soon after application, although it is recommended that construction starts after the notice for plan approval, applicant starts construction in his own risk as the application may require any change that it may be costly to be changed in the already started construction.

2.5.3 Construction monitoring-field visit

Monitoring is part of the project implementation in order to see and control if construction works have been implemented in accordance with approved planes and issued permit. This monitoring and control can be conducted by certified persons for that activity that can be private or public entity, and as well can be combination of both. In several EU countries the inspection is carried out by the building surveyor or project designer (in some cases both) and frequency is decided based on project complexity. In general the monitoring plan exist and it is done in general construction planning. Permit Issuing Authority conduct visit to inspect construction works and in different countries is done such as randomly (e.g. Cyprus, Belgium, Estonia, Portugal, France and Romania) or they do decide what are the most critical points and construction stages to be monitored (e.g. Bulgaria, Denmark, Czech Republic, Hungary, Lithuania, Italy and Malta). In Several EU countries the authorities decide for the monitoring plan and they as well do control even more if necessary. For which type of monitoring and control and control plan usually

authorities decide based on project complexity and professional level of the parties that take part in the project. The monitoring in different countries is conducted as follows:

- Permit issuing authorities outsource the monitoring to a private authorities and they decide together for the monitoring plan. (e.g. countries as Germany, Finland and Sweden).
- Permit issuing authorities decide to monitor key stages and if necessary they do more inspection if necessary (e.g. countries as Northern Ireland, Netherlands, and Wales & England).
- Permit issuing authorities conduct a random site monitoring and inspection (e.g. Poland in EU and other European countries non EU members; such as Kosovo, Serbia etc.).

In every country of EU, Authorised inspectors and construction monitoring authority of the PIA, have no limitation on time and area to carry out the inspection and access to the site is permitted during all the time of project implementation. Inspection will be conducted for construction quality control and legal documentation control as well. There is no limitation for inspectors to control as they can check all parts of the building and all the time the inspection will be reported in written. The inspection may result with irregularity or not fully compatible with permit, in such cases the inspectors will suspend all construction activates until PIA takes decision on permit review or demolish that part of the project. In cases that inspectors identify irregularities the project implementer will as well pay a fine and all expenses related to the demolition. In almost all EU countries it is possible to do design changes in the project during its implementation. Minor changes can be declared in the end of construction works, changes that are not concern of the zoning, building permit and building's use. For changes that are considered to be substantial it is necessary to proceed with permit review before construction is taking place. The log book is part of daily record at the construction site in several countries of EU and this document should be accessible in at the construction site for inspectors or authorized private monitoring.

2.5.4 Construction work completed-final inspection

After final implementation of the construction works the construction company has to inform PIA hat construction is completed. The PIA may request several documents related to the

completion phase as building design, inspection report, log book and liability declarations by the contractor, building surveyor or designer. The declarations contains signatories attest for construction work quality and fully compatible with the approved design, if changes happen comply within acceptable level to legal and regulatory requirements. In almost half EU countries the final inspection to the site organized by PIA and other authorities is mandatory (e.g. Romania, Spain, Czech Republic, Republic Finland, Bulgaria, Cyprus, Hungary, Luxembourg,). The only reason of the final check is to control if all project implementation went in accordance with issued permit, does constructor applied standards requested for those kind of building, is the approved design implemented in detail. In another half of the EU countries the PIA does not conduct any of the final inspection as they do relay on the inspection control data reports, declaration of the constructor (e.g. countries such as Austria, Ireland, Denmark, Slovenia, Portugal and Sweden). In the countries that do not conduct final inspection, although not required, PIA may decide to conduct the final inspection. This usually happen if the irregularity occured during the document control or if there is a doubt about reliability of the Construction Company or agents involved during project implementation. In almost all countries of the EU after inspection the permit for use is granted and therefore building can be taken on use and belong to the endusers. In this context, there are some exeptions of above explained rule:

- Austria applies the rule of permitting use of building after notification on completion is submitted to municipal authority.
- Denmark building cannot be used without granted permit for use but small project as individual houses are exempt from this rule.
- France is using notice of the contractor that the construction works are completed and than building can be used, but for the building dedicated for public use and large building can be taken in use only after permit is granted
- As in France, in Netherlands, permit on use is not required only at the building open to a public the permit on use should be granted before building is used.
- Poland applies the same as in some EU countries, after PIA receive notification on construction completing, building can be taken on use but in certain cases permit for use is requested.

2.5.5 Financial requirements for permit process

Every country of the European Union applies fee for getting permit for construction of the building, and every country determines amount of fee based on several factors that are related to respective country. Acording to the research (Pedro, J B, Meijer, F, Visscher H, 2011) the following combinations of criteria were identified:

1. ***Construction cost (e.g. Denmark, France, Italy, Romania, Slovenia and Spain).***
2. ***Construction cost, floor area and type of construction (e.g. Latvia and Lithuania).***
3. ***Cubic meters of construction (e.g. Luxembourg).***
4. ***Floor area and building use (e.g. Austria and Bulgaria).***
5. ***Fixed fee per building use (e.g. Czech Republic, Finland and Poland).***
6. ***Fixed fee plus an additional per floor area (e.g. Estonia).***
7. ***Fixed fee plus an additional per construction cost (e.g. the Netherlands).***
8. ***Fixed fee or floor area, depending on building use (e.g. Ireland).***
9. ***Fixed fee or construction cost, depending on floor area and building use (e.g. Northern Ireland).***
10. ***Fixed fee plus an additional per duration of construction works and floor area, depending on building use (e.g. Portugal).***

There are associated fees that may be requested. The approach of the he different countries in EU related to fee is the there are several additional payment requested for consultation, application submitting, site visit and any other related action that request expert involvement. There are countries that applies additional fee or request additional expert engagement in the cases when building structure will be located in the area without approved urban plan and therefore applicant has to pay additional fee for those precondition works that lead to the permit for construction of the building. (e.g. In EU countries as Portugal and Sweden or non EU member countries but geographically in EU as Kosova, Serbia etc)). The only common thing is in all EU member Countries is that no construction can be carried out without completing application procedures, including fee, and without having construction permit.

2.5.6 Necessary time requirement for completing the procedures

A big number of the EU countries, by the law, set up the fixed time frame for the necessary time requested for permit procedure. In some specific cases additional time may be given by the authority especially in a big projects with high complexity and if construction has to take place in the site without approved urban plan. Those cases we can find in several EU countries as (e.g. Czech Republic, France, Italy, France, Malta, Portugal and England & Wales and as well in more European Countries that are not part of EU). As well in some countries the permit procedures not necessary take all estimated time by law if design –project is certified by design auditor (e.g. Bulgaria) or if the procedure is operated by approved inspectors (e.g. England & Wales). For most of these countries, the maximum procedure time ranges from 8 to 12 weeks. (Pedro, J B, Meijer, F, Visscher H, 2011)

Some countries are exceptions to the legal regulation set up, as follows:

1. In Austria, maximum procedure times vary by state
2. In Bulgaria, maximum procedure time is shorter if designs are certified by a design auditor.
3. In Estonia and Lithuania, maximum procedure times are short (due to phasing all times might not have been added).
4. In Italy and, especially, in countries such as Portugal, the longest time/procedure , which is a common reason for complaint (one should take into consideration that these are combined procedures)
5. In Malta, maximum procedure time is extended if buildings are located outside the development boundary of a local plan.
6. In England & Wales, according to the procedure operated by local building authorities, the maximum procedure time is short, which is probably due to the separation between planning and building permit.
7. In England & Wales, according to the procedure operated by approved inspectors, the only statutory delays are created by the periods allowed for local authorities to reject the initial notice and the plan certificate.

In the remaining EU countries, no maximum times have been set. The justification for this option is that the time taken can vary considerably depending on the complexity of the construction

work, the quality of the application and the use of design auditors. (Pedro,JB; First Meijer, Henk Visscher, 2011)

2.5.7 Complains

The process of the construction and permit, in some EU countries, gives right to the neighbours and other parties to complain for the permit or construction works that are planed after permit. But there are some countries of EU , that neighbours do not have possibility to automatically complain or somehow influence permit procedure if they are against the permit or building as a structure, however they can submit their complain to the permit issuing authority and with associated reasons for complain. Complains should be based on legal regulation or be in accordance to the urban plan or any approved plan, however pretending the legal right that issuing building permit can affect. All relevant complains will be taken in consideration for the final decision of the authorities for building permit. Big number of the EU countries the information for complaint can be presented to the permit issuing authorities before the issuing permit. However in some countries, as in France, complain should be submitted in a period of two months from the day of permit approval and placed in the property. Information of the neighbours that the construction will take place in some EU states it is mandatory (e.g. Belgium and Finland) or in some countries the application for building should be informed by public access (e.g. Italy, Malta, Portugal). As well as in some countries as England & Wales, neighbours will be informed or notified if the construction take pale close to their property. Application form and progress is with a public approach at the building authorities and public can be informed based on their interest (e.g. Malta and Portugal), and before construction starts after some hearing period (such as Portugal).

2.5.8 Presentation of the final outcomes

Based on above mentioned analyses it is easy understandable that the permit issuing procedures are almost similar to the EU countries. Based on research (Pedro, J B; Meijer, F; Visscher,H; 2011) following steps were identified:

1. *During a voluntary pre-consultation, applicants can discuss with the building authorities planning demands, esthetics and technical requirements.*
2. *Phasing the building permit procedure is possible to avoid developing a fully worked out design before the preliminary design has been checked.*
3. *Statutory submission demands determine the documentation to submit with an application; information about building regulations and permit procedures is available through the Internet.*
4. *During plan approval, the compliance of the building design with submission, planning and aesthetic demands, as well as with technical requirements is checked; plan approval usually takes 8 to 12 weeks.*
5. *Neighbours and other parties can raise objections to a building permit being granted during the plan approval phase or before the final permit has been issued.*
6. *Construction works can begin after the building permit has been granted by the building authorities, but there are strategies to allow an early start of the construction; total or part of the building permit fees must be paid before construction works can be carried out.*
7. *Building authorities must be notified before construction works start; the building permit expires if construction work is not started within a certain period or is not completed within a certain period since the date it was granted.*
8. *Site inspections are carried out to ensure the compliance of construction works with the approved building design, the building permit and the building regulations.*
9. *During construction, minor design changes are possible and can be declared at the end of construction work; for substantial variations a formal procedure is required before proceeding with construction work.*
10. *Public building inspectors are entitled to carry out inspections and if construction works take place without a building permit or do not comply with the approved design, they can be suspended.*
11. *Once construction is complete, a final site inspection is conducted and documentation that attest the compliance with the building design is submitted to building authorities.*

12. *If satisfied, building authorities issue a completion certificate or a use permit; the building can be taken into use after a use permit or a completion certificate is granted.*

A part of the similarity, there are as well the differences identified at the permit issuing procedures and therefore following are the following differences were identified always based on the research (Pedro, J B; Meijer, F; Visscher,H; 2011):

1. Agreements and information provided during pre-consultation are only binding to building authorities in some countries.
2. There are different levels of implementation of electronic case handling of the building permit.
3. Permit procedures for planning demands and technical requirements may be separated or combined.
4. Phasing the permit procedure is only statutory available in some countries; different strategies are used to divide the building permit procedure in phases.
5. The right to object to a building permit being granted is only laid down by law in some countries.
6. Different criteria are used to allow an early start of construction works.
7. The value of the building permit fee is determined by different criteria.
8. In addition to the building permit fee, other fees may or may not be required.
9. When maximum procedure times are not met by the building authorities different consequences can result.
10. A completion certificate or a use permit issued may not be required when the construction is finished.

The analyses of the permit process leads to the conclusion that permit procedure are similar as described above. There is no substantial differences identified in countries of continental Europe. More deviations from the common pattern were identified at the United Kingdom countries, and particularly England & Wales countries that present deviation.

Some distinctive characteristics were identified as following:

1) There is a specific type approval procedure.
2) Planning permit and building permit are separated, and there is also the possibility to phase the building permit procedure.
3) Full electronic case handling of the building permit is already available.
4) The applicant can choose to have plan approval and site inspections conducted by either building authorities or approved inspectors.
5) Construction works may start soon after submission of the application, not having to wait for plan approval.
6) Maximum procedure times are shorter than the average.

All above mentioned characteristics have in common the positive aim of reducing the burden of administrative aspects, and in the same time ensuring good levels of compliance.

Lately, in the last 10 to 15 years, the dominant trends identified in process of the building permit procedure were identified a decrease in the types of construction works submitted to Permit Issuing Authorities control during plan approval, and a significant reduction of building permit maximum procedure times to the permit approval. The control conducted by permit issuing authorities did not had any changes as the procedures for control are still same as it use to be. Generally speaking, there is a positive movement in order to simpler and faster building permits procedures as positive aspect acceptable from the construction industry. As process takes time to be simplified there is no major changes are expected in the building permit procedures for the near future.

The intention of above analysis is to provide a global picture of the building permit steps and procedure of the EU countries. The results can be used for analyzing the procedure of each country within the EU panorama, provide assessment of the main trends and developments and guiding strategic choices on possible unification or improvements in each country. Those comparative analysis of countries of EU, regarding organization and better set up of technical building standards and regulations, tasks and responsibilities in the building control systems and issuing building permit procedure has been accomplished. To complete this comparative study of the regulatory systems of EU countries, more analysis that will be focused on the quality

demands of public and private building-control body's continuously are required. In this context, analysis of regulatory systems should proceed with more studies about the system performance of each type of system in terms of efficiency, adequacy, and effectiveness. Analysing the entire work and outcome, many similarity and the differences were identified in the building permit procedure countries of EU. Above mentioned difference constitute several barrier to the free circulation of people and services. More uniformity among building permit procedure would contribute to better performance of the permit procedures and to the establishment and functioning of a single market for services in the construction industry in EU and global market that all parties no longer limited to working in national markets.

3.0 **MODEL DESIGN -RESEARCH QUESTION, HYPOTHESIS**

3.1 Plan of work and methodology

The research process employed in the study aimed at providing an understanding of the influence of external stakeholders. Models were developed for external stakeholder analysis in construction project management. A systems approach was adopted, and a case study has been used as the main method of research in combination with literature reviews. The case study method was selected because of the qualitative nature of the research.

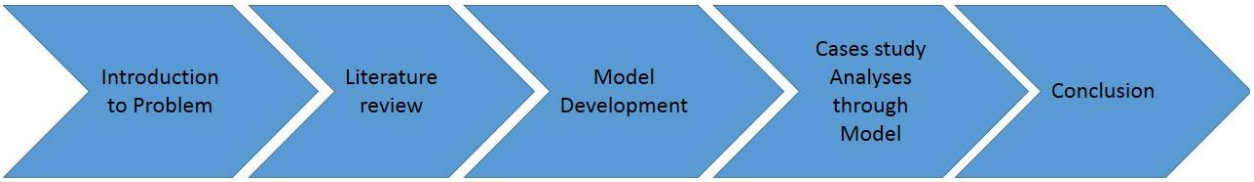


Figure 5 – Methodology

The problem of understanding external stakeholder influence is interdisciplinary in character. The research reported here was focused on project management issues whereas, largely parallel to this, sociological issues in this area were studied at the Department of Sociology of Lund University. Thus, an interdisciplinary approach was taken through two related research projects conducted simultaneously. The cooperative work was conducted in such a way

That the two projects employed a similar problem definition and certain initial studies were conducted jointly. The gathering of empirical data was as a joint effort. However, the analysis of the data was conducted separately, from both a project management and from a sociological perspective.

- Quantitative
- Qualitative
- Journals

- Publication
- Books
- Direct- Interview
- Indirect- data from government, local Institutions etc.
- Additional Support- colleagues, professors, internet etc.

There are several reasons that drive a researcher to contribute the field that he is exploring and to contribute to the development of knowledge in that field. The following are some of the reasons that drives me to do PhD research in the field of Systems Engineering in Construction field :

- Contribute to a fully application of systems engineering in construction field.
- Create a model suitable to be applied for countries in transition
- Bring attention to gaps identified through case studies

3.2 Objectives

The objectives are defined in the title of the research that I will develop in the field of systems engineering and project management of construction at countries in transition. In meeting this goal, I will have clear picture on factors that are described bellow, through the current applied construction process and recommend model that improves the construction process in general and especially at the countries in transition.

The standard approach of construction project often is linked with extra costs, delays, miscommunication between design and implementation, but also much more cost create the system that is missing in the current procedures.

Can integrated management and systems engineering approach contribute to effective and efficient of design and construction project with focus on SME in transition countries?
Our hypotheses is that combination can be very useful, especially in the case of transition

countries. Can the systems engineering find application at design and construction at post war countries in cases investment is from abroad countries?

3.3 Model design

The model is designed based on needs analyses and the main aim of the model design is to prove that the processes, below presented, can be reorganized for sake of saving money, time and other resources. The model consists of 4 main factors identified as a factors that are with impact in design and construction and each factor as well has its own components that together react as a group and sometime speed up or slow down, and in some cases stop, the entire design and construction process.

3.4 Process analysis

Analyzing the construction process it is not difficult to realize that construction from idea to the final building has several steps and phases that makes idea become visible through building structure that remains for a long time as visual fact for process of idea, project and construction realized as final phase. Different countries have a different approach for the entire process of going through from idea to the final stage of visual building structure, in this case as well the approach of all stakeholders in the design and building chain is different. The field of construction remains still a field with several involvements of different stakeholders through different processes using methods, materials, equipment, knowhow and all other resources necessary to perform and go through the process of realizing building structure from idea to its final form. The entire process, as combination of several processes, activities, materials, and knowhow, can be grouped in following main division that also contains as well the sub groups through detailed analyses that will be presented later:

- Stakeholders
- Processes
- Project Management
- Innovative Approach (Systems Approach)

The stakeholders of the entire process for construction are to be considered in time and importance are:

- Investor
- Designer
- Constructer
- Legal body (local or central authority)

Following different approaches are part of the process:

- Idea (need as driving force toward the design)
- Design in its all phases
- Construction- raw and final construction works
- Permit –necessary documentation for building structure.

The analyses of the following factor will be related to their involvement and their impact on the entire system and processes related to the road map from construction to final construction. I is very important to analyze every single factor during the model design to clarify factor role and impact in different phases of the project implementation from the design to the final construction. The model aims to present a successful and innovative approach in solving and eliminating gaps and obstacles in the construction process. This model will integrate all stakeholder involved in construction and design as a process that cannot be considered as separate and as process that can be determined as functional if it is not combined in one main process with several activities. The following pillars of the entire process should make a base in which the model can be based and develop a structure and system that will facilitate entire process from design to final construction:

- Investor (public and private)
- Permit issuing authority (local and governmental)
- Design offices (Architect and other engineers or group of person with certified architectonic and engineering skills)
- Construction company (company or group of companies in consortium)

3.5 Design and construction process description

The below description presents current stage of the design and construction process.
The schemes presents all factors involved in design and construction process and relation in different phases of those factors. In this process are identified four main steps the design and construction process contain. Those steps in fact are relation between all stakeholders involved in design and construction process. Those relations can be determined as following classification:

1. Relation of investors with authorities
2. Relation of investors with design office
3. Relation of investors with permit issuing authority
4. Relation of investors with construction companies.

The main factor in this relation is investor from the financial point of view and with high importance are the authorities that regulate, issue permit and control the entire process through mechanism that is in place almost in similar way in all countries.
Design house and construction companies not that are less important, but always are depended by the investor and authority. Relation between all factors usually are managed by the investor as main factor that initiate, develop and implement the entire process from the design to the final construction-physical structure of the building.
Management of those relation requires a lot of efforts during entire process and those skills sometime are missing, or are not enough developed, to the investor. Analyses of the relation of all stakeholders will leads to a clear picture of all processes involved and it is a strong input and demand on creating a new relation model.

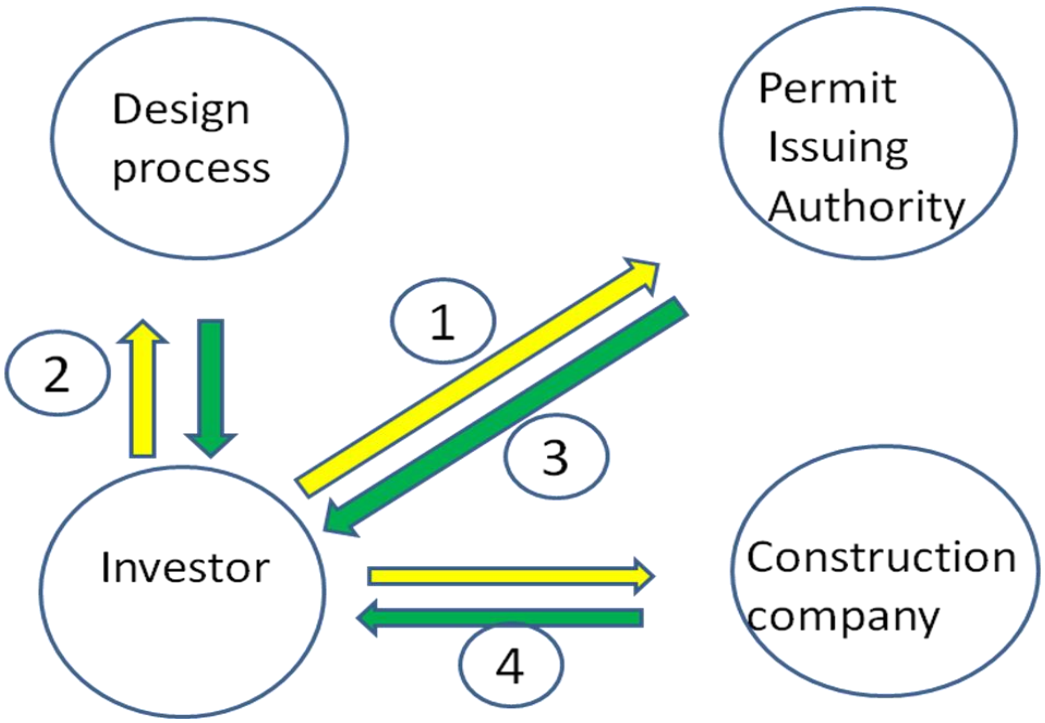


Figure 6- Relation of all stakeholders in entire process from design to final construction

3.5.1 Relation of investors with authorities

In the figure 7 are presented current relation that Investors have with authority. Previous to building design, all parameters needs to be taken from the authority and sometimes those parameters are against the investor idea but usually are in accordance with authorities approved plan for the side, neighborhood or part of the urban area for the residential buildings, and in accordance with approved plan for non-urban areas (building related to economic, agriculture, industry etc.)

Those parameters given from the authority are limits and recommendation for new construction (as well for reconstruction).

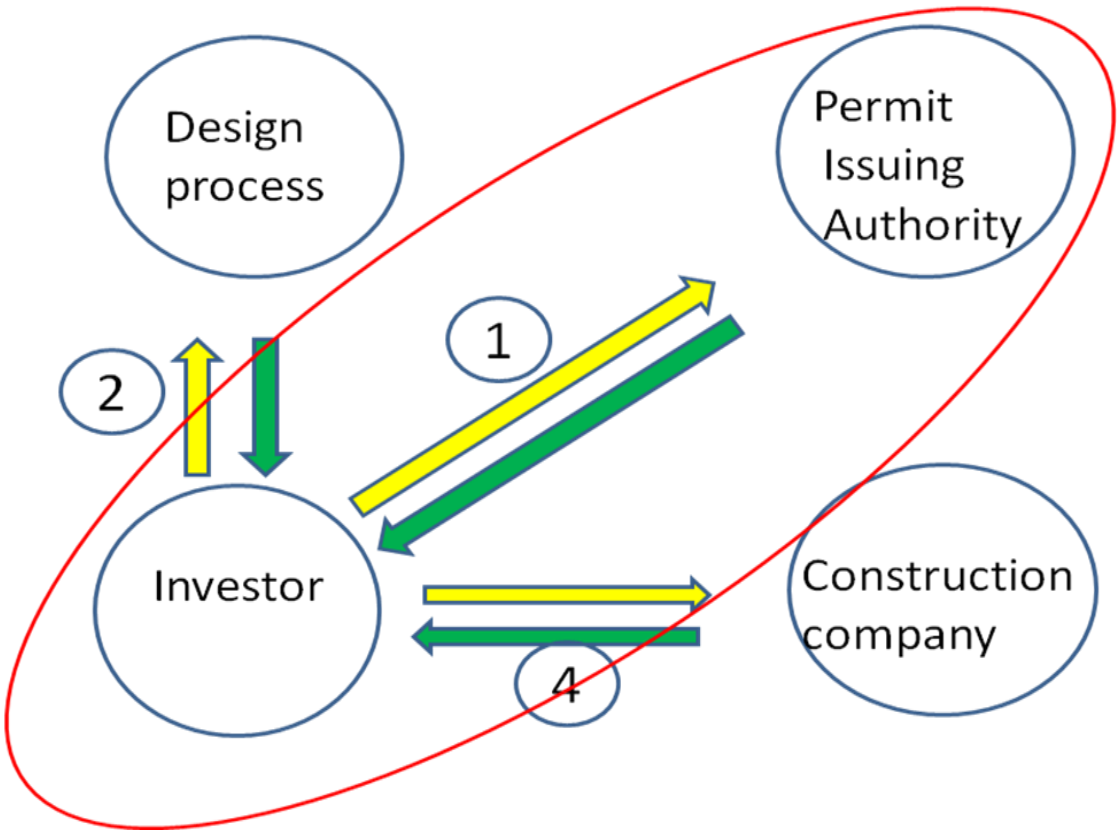


Figure 7 - Relation of Investor with PIA

3.5.2 Relation of investors with design office

The design process is one of the most important activities as this process is intersection between investor's idea, authority recommendation and design skills of the design office. In the figure 8 are presentet current relation that give us a cleare picture that relation are cleare between investors and designer but missing relation with other stakeholders in the same time. Usually the design office focus is building up investor idea and simulates new coming building structure. In this stage the design office has no relation with authorities and construction companies therefore their work the only relation has is with investor and recommendation of Authorities. The design office after several meeting manages to complete the design hat fulfills the investor requirement and based on the authorities recommendation. The design in the end is completed as final project that will be delivered to the authorities for permit based on rules and standards applied.

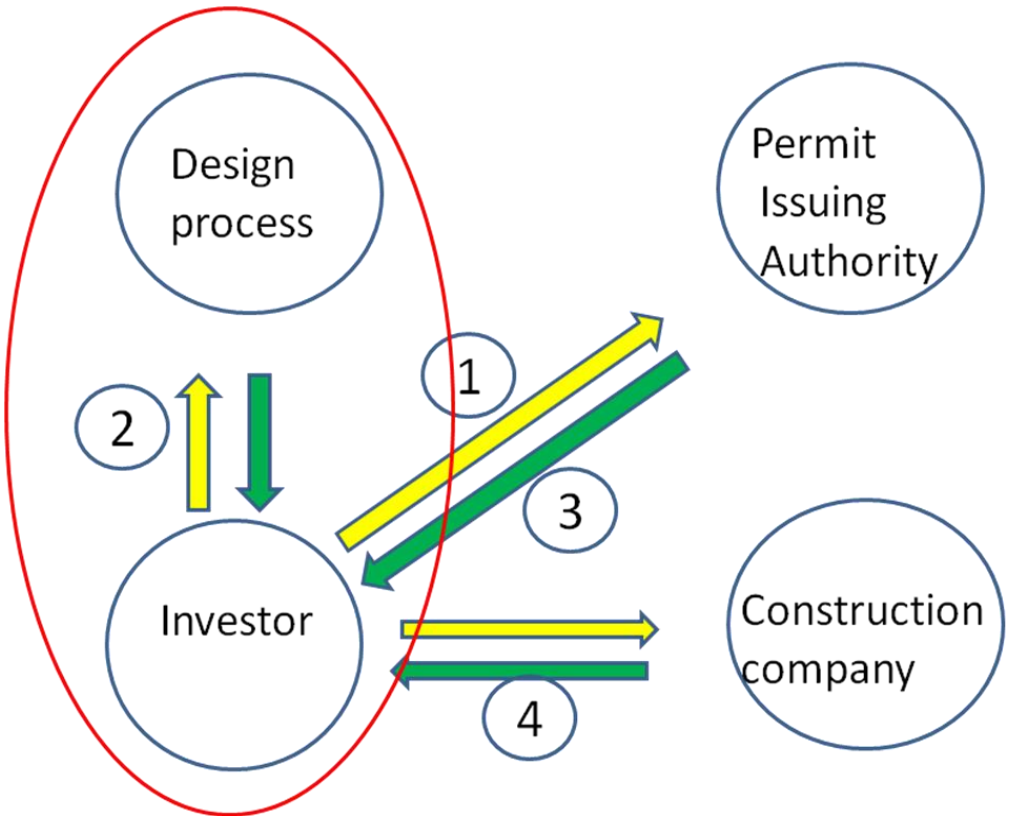


Figure 8 - Relation of Investor with Design Company

3.5.3 Relation of investors with permit issuing authority

The figure 9 is almost similar with figure 7 but the process is different, as in figure 7 is presentet relation of investor with authority before submitting final project for permit. Figure 9 prezents relation of the investor with PIA after design is completed and associated with all paperwork required from PIA in order to grant a building permit. This task is preformed after completing the design and it is performed by the investor. Process of issuing permit can require additional changes in the design or more to be adapted on authority requirements and in this case the investor repeat in certain level the step 2 (redesign or adjust entire project, or a part of it, with design office). Completed design in accordance with authority recommendation, based on applied law and standards is awarded with the construction permit.

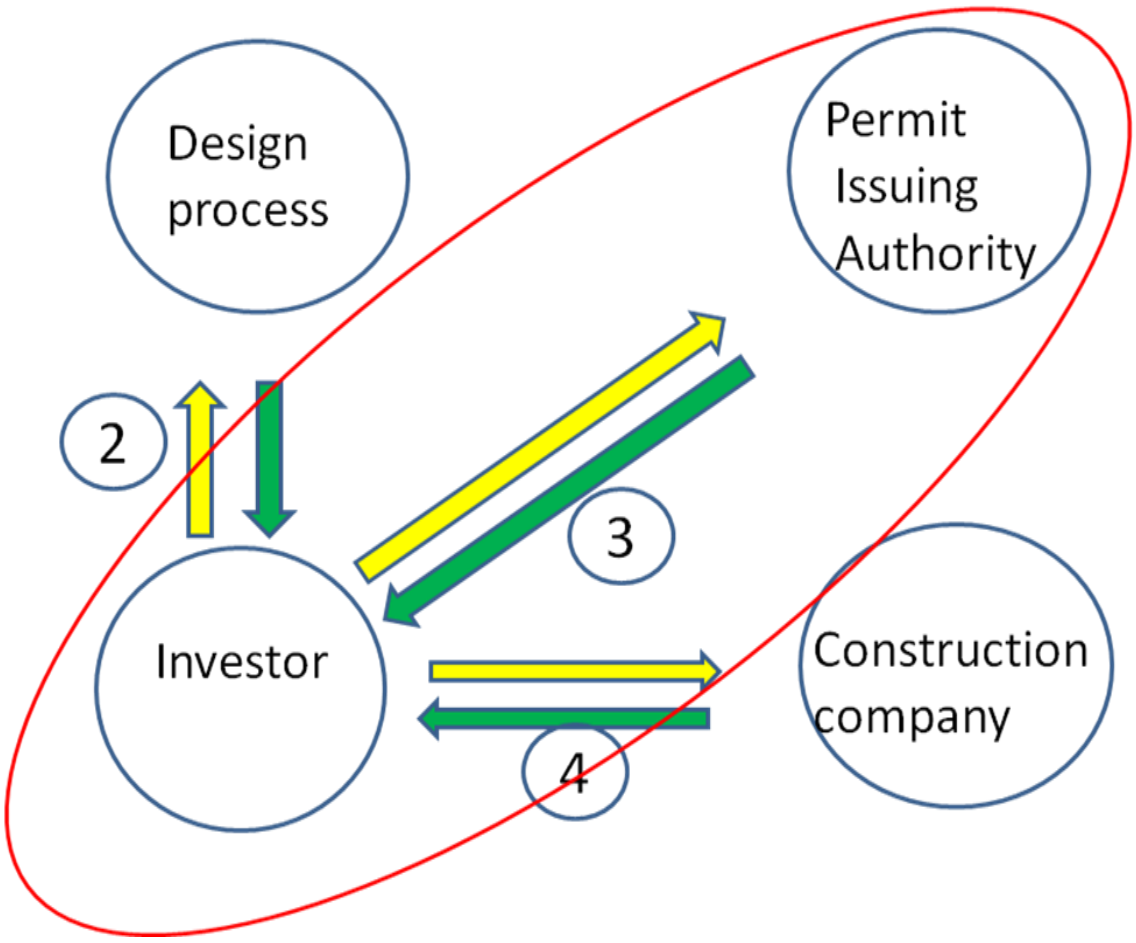


Figure 9 - Relation of Investor with PIA for issuing construction permit

3.5.4 Relation of investors with construction companies.

Design that has been approved by the authority is ready to be executed. Activity as well is performed by the investor in selection the company that will implement the design to final building structure. The figure 10 present relation of construction company with investor, again without involving other relevant stakeholders and parties involved in the construction project. Construction company in this case is monitored by the authorities and by the investor as both stakeholders are interested to implement the approval design by authorities and investor. In some cases companies have no abilities to follow 100 % approved design as lack of resources or know how and in this case additional changes ae required and those changes reschedule entire design and construction process.

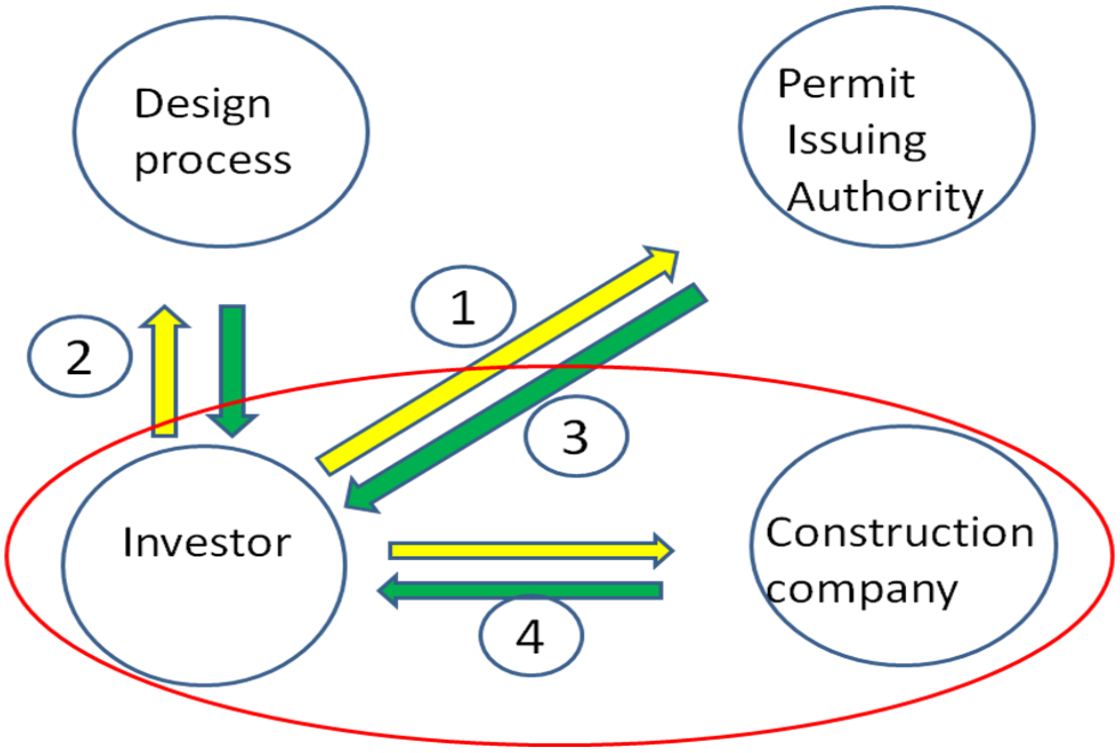


Figure 10 - Relation of Investor with construction companies

3.6 Time analysis of entire process

The above analyses deliver output that help us conclude that design and construction process is long and takes time to final implementation especially in case of change request.

Analyses are split in three case scenarios:

1. All activities are performed on time
2. Delay in the permit activity
3. Delay (because of the changes) in construction activity

In the following part will be explained three above mentioned scenarios to have a better view and identify relation that activities have and their influence whenever one of them is not proceeded on time or have any delay.

3.6.1 All activities performed on time

This is best case scenario and activities are implemented on time therefore no additional cost and resources are involved. Every activity will start after completing the previous activity. The entire process has flat development without any intersection. The project management can be more focused on quality as processes are flat and with normal flow. But analyzing the processes of design permit and construction each activity is performed on line and one by one, no parallel processing. Time used to bring idea to its final implementation (final building structure) is still to be considered as potential factor to be improved by applying systems engineering-parallel processing. This process without delay, everything done on time, we will name as process A

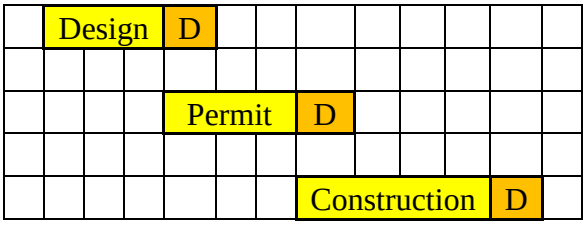
Table 2 - Diagram of all activities performed

	Design			Permit			Construction					

3.6.2 Delay in the permit activity

Second case scenario presents delay in permitting process as in this activity are detected any irregularity and time factor in this case is involved by being transformed in delay in the entire process. All changes needs to be completed by the design house recommended by authorities. After changes has been completed the process of permit is repeated and completed therefore the process as we have to add time spend in change, delay that we had on design will name with D, to be completed now we need to add to process A plus the delays, threfore A+D. The delay is reflected automatically in the beginning of the last activity that is final construction. Therefore to every activity we have to add delay because of design (D) as additional time spend and resources until final construction is completed. The table 3 presents additional time that evry activity has to wait until gets started. Delay on starting activity reflected as well on completing the same activity and start following activity. The D is added to evry activity as following activity will need Dtime to be completed.

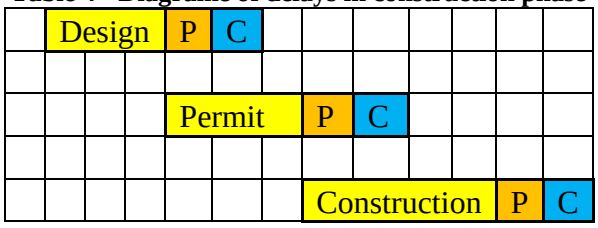
Table 3 - Diagram of delay of one activity-permit



3.6.3 Delay (because of the changes) in construction activity

After completing design and permit activity the construction can be started as activity. I this case scenario focus is on delays created from the PIA for issuing permit (P) and from construction company that may require additional changes (C). Before or during implementation of construction there are cases that changes have to be done to facilitate the final implementation of the project. In such cases if changes are to be done by the design office than the entire process has to repeated although in faster way. Changes completed by design office have to be approved by the authorities and therefore authorities will permit continuation of the construction. This process takes additional time and this time will be transformed in delay in the end of the final construction process. Table 4 present case with delays on permit procedure (P) and construction because of the changes requested (C) therefore delays are even bigger in this case scenario as we have to add every activity delays on permit and construction (P, C)

Table 4 - Diagrame of delays in construction phase



3.7 New model design - System Engineering (integrated system)

The Model is designed based on the above analysis of entire process from idea, design and final construction of building structure.

Model is based on systematic approach –systems engineering and presents the mobilization of all stakeholders with intention to save time.

The aim of the model is to set up new relation and approach to the roadmap of new procedures for the entire process of getting permit.

The model foresee a very short time and all stakeholders in the same time and place share their interest and involvement to avoid delay, miscommunication and reduce the cost.

Below figure present the process design that will manage all processes for a very short time and it is designed and dedicated only for the process from the ide to project and permit delivery.

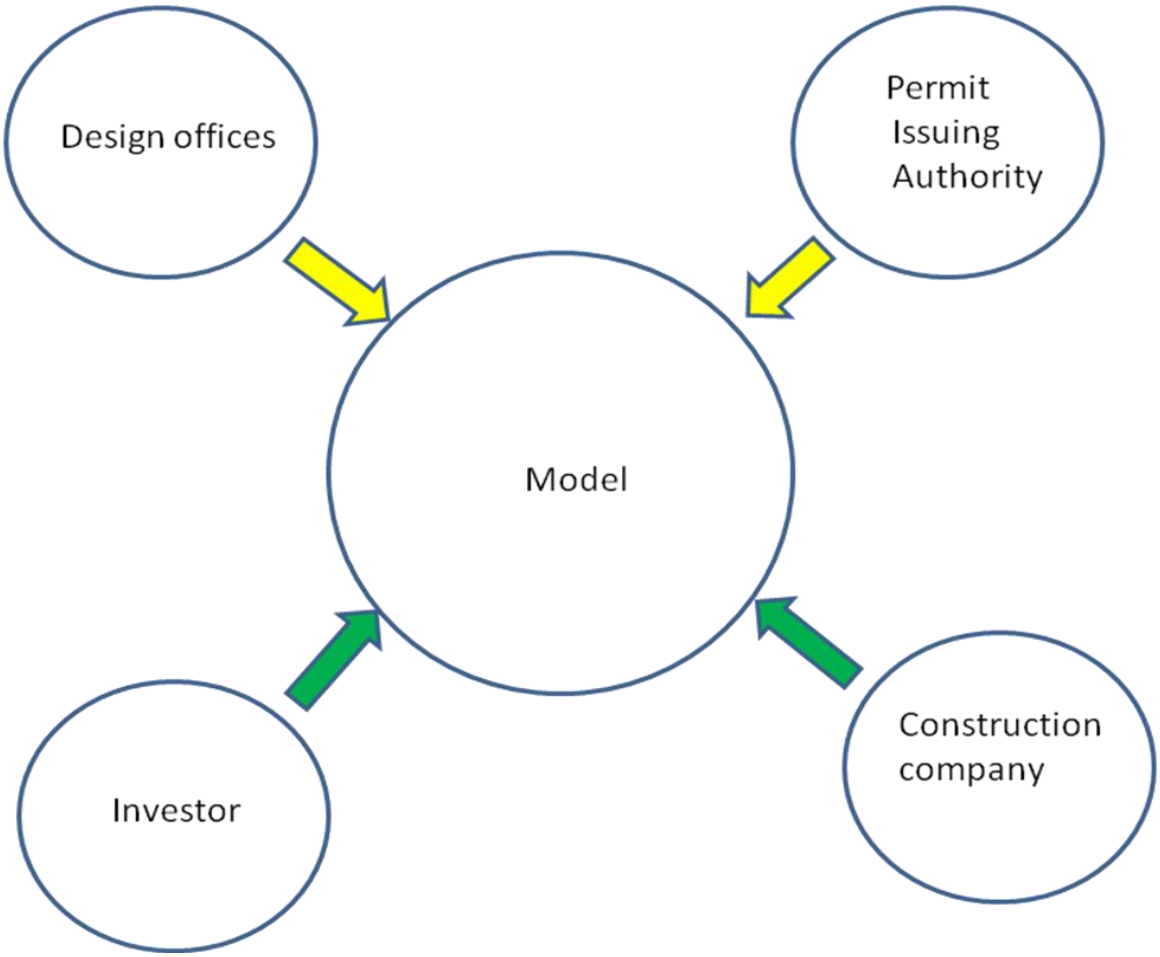


Figure 11- New model design-relation between stakeholders

3.7.1 Description of the model

As presented above, model is designed to be an integrated point of all stakeholders, part of process from the idea to the completed building structure. The model can be considered as

central point that is referring all stakeholders' interest and transforming to useful information for the rest of the stakeholders. As the process was long and with several gaps in communication, the new model manages to collect all requiremnts from the stakeholders and transform them to the useful and feedback information for the rest of the stakeholders but in a very short period of time.

Relationship listed below now are synchronized by reducing time for dealing with each stakeholder and therefore direct communication between stakeholders make possible to reduce implementation time.

1. Relation of investors with authorities
2. Relation of investors with design office
3. Relation of investors with permit issuing authority
4. Relation of investors with construction companies.

The investor, as main stakeholder, now has new relation with all parties involved in the process, as investor will have possibility to present his idea to all of them. The model determine reducing time in this process by organizing maximum two meetings (depending on project complexity) with all parties involved in the process. The process from idea to the final building structure will go through following process:

- Project initiation
- First meeting of all stakeholders
- Project completing phase
- Second meeting- project presentation that may end up with permit of recommendation for small changes.
- Permit issued by PIA
- Implementation- building structure

As the permit issuing authority has a main role for giving project parameters, and based on those parameters issuing permit, the first information meeting (presentation meeting) will be organized at the permit issuing authority initiated by investor that has idea for building that needs to be explored and adapted to a urban, technical and other parameters.

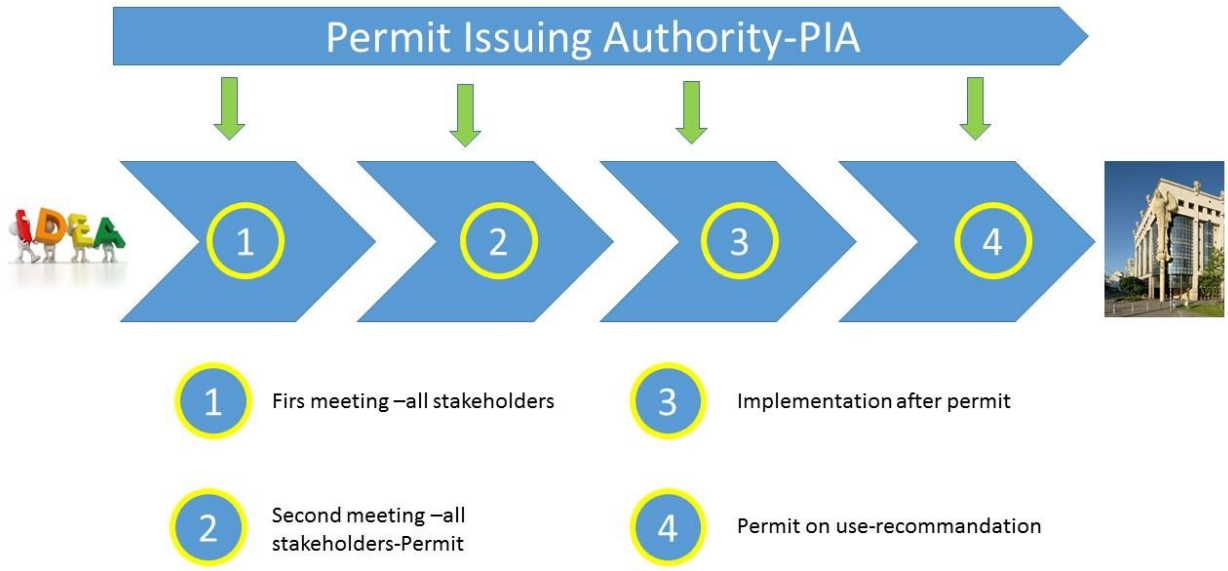


Figure 12 - Steps from idea to final construction according to new model

3.7.2 Project initiation

Project has to be initiated by the investor as main stakeholder in entire process and this determine the idea as initial phase. The process will be initiated to PIA through the request delivered physically or online (both methods are applicable currently).

This step taken from investor allow PIA to initiate a procedure for issuing construction permit and organize a first meeting with all stakeholders in order to give explanation and parameters requested by law and standards. In this meeting all parties that will be involved in the project will get information on idea, building format and investor's requirement that are presented by PIA.

3.7.3 First meeting of all stakeholders

This meeting, presented in figure 13, determines all requirements and standards to be respected and implemented from all stakeholders. All stakeholders should take part in the meeting as it is obligatory for process success. The owner, idea initiator, presents the ide and their requirements

and expectation from the final construction. The permit issuing authority as well will present condition that owner and designer should follow according to urban and other authority approved plan and regulation in force. As this is only presentation and standardization of the entire process, the design office-architect and other team member from the design office have no presentation of any idea, a part from the capacity presentation to follow the regulation of PIA and take all necessary documents and explanation to formulate the idea and transform to the design project that will be presented in the second meeting. The designer will be engaged by investor with previous agreement signed.

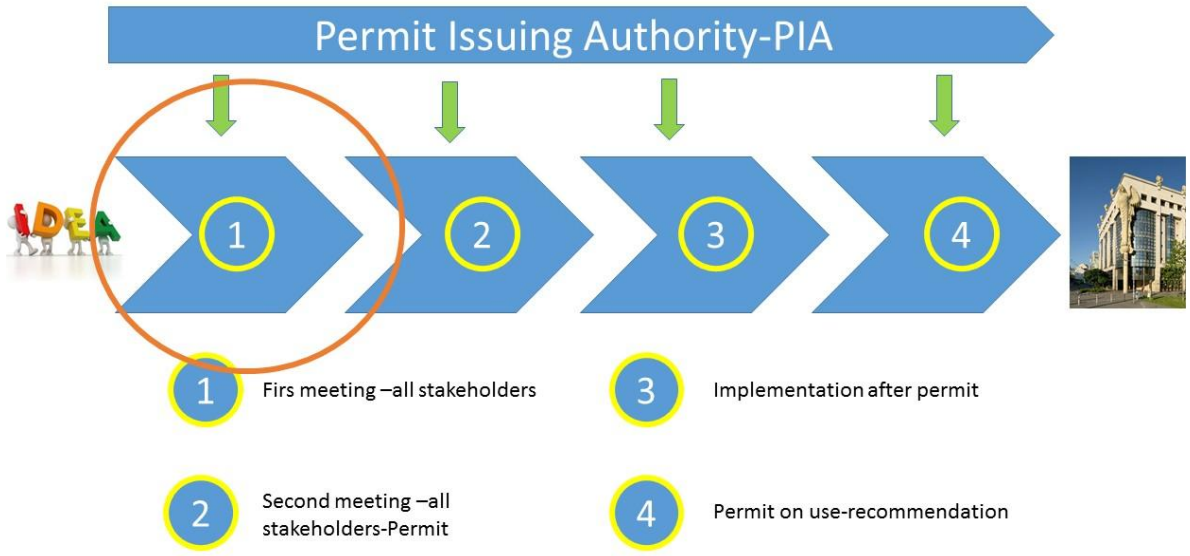


Figure 13 - Step 1 first meeting with all stakeholders

3.7.4 Project completing phase

The stakeholder will agree for necessary time to complete the final design based on PIA requirement and as well will take in consideration requirements from other stakeholders that are part of the process. Meeting with owner and designer will happen in several occasion based on requested by the owner but this process will not be described as those meeting will not postpone the scheduling for second meeting.

3.7.5 Second meeting – that may end up with permit of recommendation for small changes

In this meeting, presented in as step 2 in the figure 14, the interested parties will come with final version of the project that is drafted with the involvement of all stakeholders in every stage of design and implementation. The second meeting is mainly presentation for PIA of the final design works and as conclusion or check time if all standards, requirements and proposals were adapted and applied in the final project. PIA in the main time will present their survey for that case and any complain if they receive in between two meetings. Part of the meeting are all stakeholders and parties that will be involved, or pretended to be involve, in the implementation of the final building structure. The PIA will evaluate presentation and all submitted documents and will take a decision within a week.

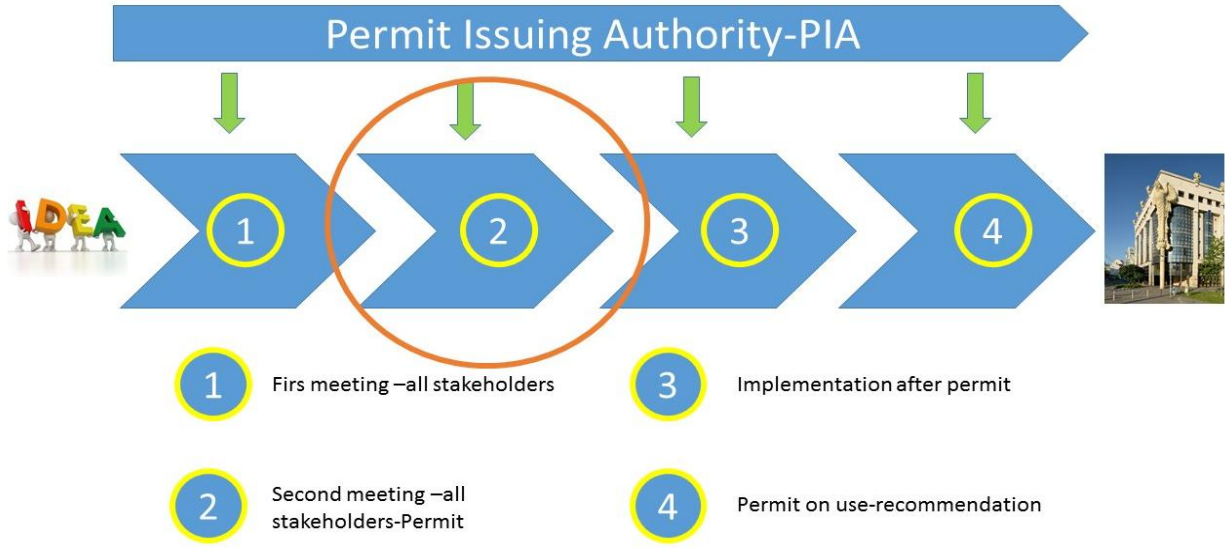


Figure 14 - Step 2 Second meeting with all stakeholders- Permit from PIA

3.7.6 Permit issued by PIA

PIA, after second meeting and submission of all necessary documents by the investor, and responding to any minor complain, will issue a building permit for construction a new building structure requested by the investor as presented in figure 15 as a step 3. PIA will make sure that permit is issues after all standards are applied and the design (detailed design) is completed by design office. PIA will inform and deliver the permit to the main stakeholder-owner and the permit will be published as well in the web page of the PIA for all interested parties.

3.7.8 Implementation – building structure

The implementation of the new building structure will begin after PIA issues a permit. The entire process is monitored by PIA as key factor in this process. The PIA will monitor implementation of the project as well after issuing the permit. The implementation, as usually, is monitored because of responsibility that PIA has for permit issued and because of authority that PIA has to make sure that building structure is completed in accordance standards and regulation in place, based on standards that permit is issued. As normal procedure up to now, PIA, after building structure is ready for use, does the final check and issue the permit for use.

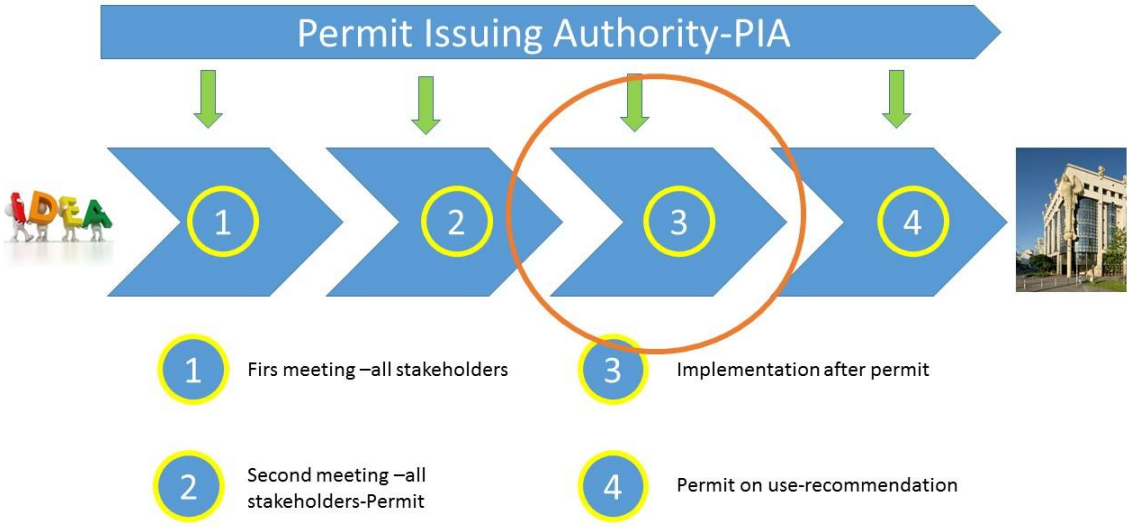


Figure 15 - Step 3 Construction phase

After entire process is completed, PIA will collect reports from all stakeholders involved in the process for the sake of process improvement. In the reports all stakeholders will present, share their experiences in this case and give recommendation to PIA. All recommendation will be taken in consideration to be forwarded to the local, and country level, with intension to create a global approach in the permit procedures.

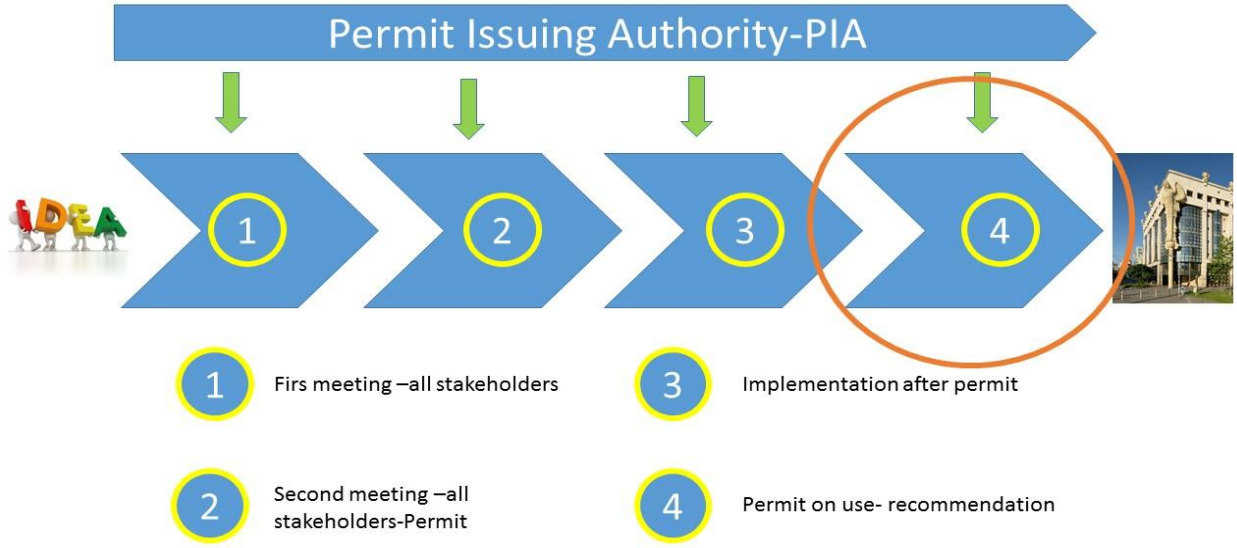


Figure 16 - Step 4 Permit on use-Construction completed

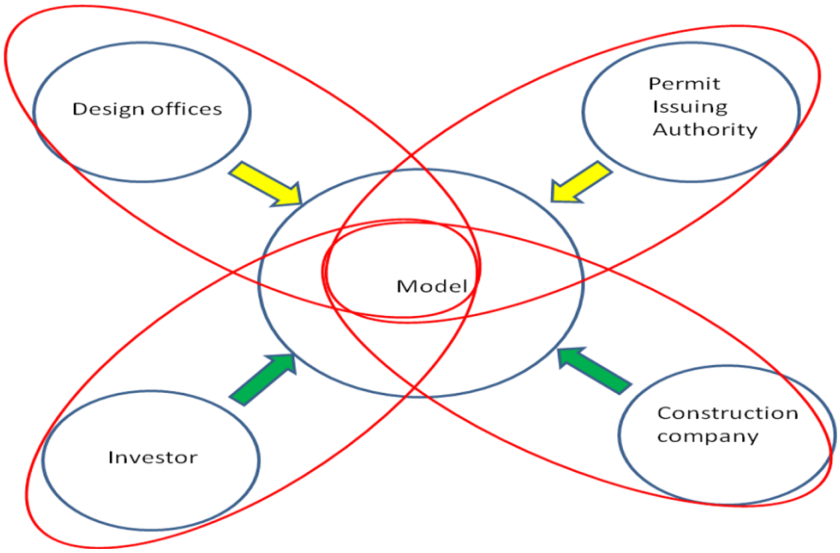


Figure 17 - Application of Sys. Eng model for successful P.M and better relation between stakeholders

4.0 JUSTIFICATION AND LIKELY BENEFITS

As every research objective is to contribute on science and human development, this research as well aims to clarify the importance of:

- Systems engineering in design and construction.
- Application of international project management standards at post conflict project management and implementation.
- Communication importance on implementation of international project donated to post conflict countries.

In the case study presented below will be analyzed entire process from the design until final building structure and will be compared with introduced model in order to identify all gaps and problems. Furthermore, through the case study analyses will be possible to identify benefits of transforming the current procedure based on introduced model.

The case study identifies problems, gaps and threats that can be present without applying systems management and international project management standards as general basement in which are built a local standards for emergency time during implementation of the project and possibility to be converted in accordance with local, regional and international standards in later phases.

5.0 CASE STUDY-CENTER FOR ARTIFICIAL INSEMINATIONIN PEJA; RKS

Folowing case is analyzed in order to present the delays, problems and obstacles in the construction industry, as the project was implemented with existing procedure, and try to compare this projects with introduced model in order to see benefits of using a model on reducing delays, cost and project implementation

Genetic Center of Kosova

Figure 18 - Genetic Center of Kosova; Peja; R. of Kosova

5.1 Introduction

Kosovo Genetic Center is a project that is realized as a donation from the Italian Government, respectively the Ministry of Foreign Affairs of Italy through the Italian NGO PRO.DO.CS headquartered in Rome, Italy through its subsidiary in Peja and representatives- President of PRO DO.CS in Rome - Ana Maria Donnarumma and representatives Peja Z. Marco Piccolo - Project Manager. The project is implemented in the Agriculture Institute in Peja lands designated by the Ministry of Agriculture for the construction of the center (respectively Arberesh - Vitomiricë) which is located in the Western part of Kosovo. Project, until the implementation phase, has passed through various stages of consultation that has leaded Mr.Marco Picolo project Manager with the Ministry of Agriculture of Kosova in Pristina, Peja Municipal institutions, external consultant (Professor Dr.sci Xhavit Bytyçi Professor in the Faculty Veterinary University of Prishtina, myself-architect; genetic centers Expert Mr. Ugo Cavallini from Italy; Mr. Ymer Fetaj-manager of logistics in NGO PRO.DO.CS). To design this project was selected The design House "archART" based on a selection process that is done by NGOs PRO.DO.CS in Peja and the same design house will also monitor the implementation works as the donation to the Center for Genetic Artificial Insemination.

Below will be explored some aspects that have contributed to concept of the project as:

- Mission
- Vision
- Location
- Architectural Concept
- Construction
- Function
- Implementation

5.1.1 Mission

The mission is in fact a response to the reason of existence of genetic center. Kosovo before was part of Yugoslavia and as such all its needs in terms of genetic material for artificial insemination has met the Yugoslav federation in which existed several genetic centers. With the dissolution of

Yugoslavia and the creation of a new independent country-Kosovo leaded to a need for building genetic center for Artificial Insemination, as Kosova has big number of the cows. The center's mission is to produce enough quality genetic material of world's most popular breeds of livestock in order to enable local farmers to cultivate race very well studied to increase the quantity and quality of milk and its products, and also to increase the quality and quantity of meat. Genetic center's mission in the future will be to make continuous studies of breeds that are adapted to our climatic conditions and genetic improvements in favor of increasing the above mentioned qualities.

5.1.2 Vision

What will be the genetic center of Kosovo in the future?
Kosovo utilizing its intellectual and international experience aims to have a very well-known genetic center in the region and beyond, because the center concept in such a way as to produce enough genetic material for artificial insemination for local farmers and as well for farmers in the region. Considering Kosovo's European perspective supply radius of this center will grow and it will be a regional center for genetic studies and production of quality genetic material.

5.1.3 Location

The location was chosen to be the Western part of Kosovo, namely Peja because in this city is located the agricultural research institute that has sufficient area for the construction of genetic center for the artificial insemination of cattle. Based on the memorandum of cooperation from the Ministry of Agriculture, from the Agricultural Institute were given land of 10 hectares where will be constructed center (in the area of approximately 1 hectare) and the rest will serve nutritious plant cultivation center for bulls and calves. The location of the center is very close to the main road between Peja and Mitrovica that enables customers to have easy access to the center, and because of the fact that center is located in the Agricultural Institute land, means that research level in this center will be more professional and academic because the Institute has a very good access to the center. Based on fact that the location of the center is in suburban area of the city of Peja, away from Peja Indistrial area, mean that the center is well insulated and

protected from infections that can be transmitted through air. The research and manufacturing activity of the center and isolated conditions that provides location, makes this center to be considered as very well incorporated in the given location and its destination. Locating the center in the western part of Kosovo - specifically in Peja is not a central position in Kosovo, but taking into account that the center will have a capacity that exceeds the needs of Kosovo is predicted to be a regional center for the states around Kosova.

5.1.4 Architectural concept

Agricultural facilities, because of the cost and their function, there is no necessity to apply a shaping architectural concept of the building as another destination facilities (eg, hotels, apartments, schools, hospitals, etc.). Therefore the architectural concept is a function of the functionality of this center, having as well an impact on the cost for implementation. However, the location of buildings, shapes and their internal function is carefully designed ant therefore have made this center to be very functional and apply all required standards for Kosovo conditions.

5.1.5 Construction

For this Genetic Center is used skeletal construction system (columns and beams). This system enables the center to later have different modifications depending on technological developments and equipment that will be used in this center. This system of construction enables the center to have extensions depending on the need and requirements. Construct system details are specified in the technical description of each building in particular. Function-Composing the building location is made in accordance with their function. Entries are also located in such a way in order to avoid cross communication of the supply part of the distribution of the product. Buildings-Facilities between them are functionally very well connected that helps cutting a communication distance between buildings in favor of increasing the functionality. The whole center is fenced 2.5 m high, and besides this division that separates administration from the internal part of the center to prevent the transfer of personnel and infections from one side to the other.

5.1.6 Implementation

The project can be implemented in two phases. In the first phase can be built laboratory stables for bulls, warehouse for concentrate, hay and dump storage while in the second phase can be built stable for calves, stables for calf testing -quarantine, garages and paving roads in phase previously worked with grit.

5.2 Project analysis

Project was initiated from the NGO Prodox from Italy that implemented several projects of this field all over the world. The initial idea was to fulfill Kosovo needs for the artificial insemination material and in the near future to create an institute for research in this field and expand the activities in the region by producing more than 1 million units of genetic material. All construction activities have been foreseen to happen in Kosova, starting from design, construction, and start up of the production activities with the import of equipments and bulls from abroad. Land of 10 ha for this project was given from the Institute for the agriculture in Peja (socially owned Institute).

5.2.1 Idea

The idea for this project was analyzed for a long time between project manager from NGO Prodox, local expert and a design office representative. The communication between Prodox project manager (Italian), local expert (Albanian) and architect from local design house (Albanian) were realized in English. The idea and drawings several time were send to Rome – Italy for approval regarding building surface, building design and center capacity and in this case Prodox from Rome requested several changes. They send one external expert that in that time was engaged in Serbia, as expert for this field from Italy. The external expert visited Kosova and provided his expertise on center design. The Prodox project manager from Kosova as well visited Serbia respectively center for artificial insemination in Temerin. The initial idea wa to design the center that can work without being dependent from outside resources by having all necessary resources for normal function. From the design house, respectively from the architect, Prodox requested to design center for artificial insemination with following caracteristics:

- Administrative building (management, office for celling genetic material) with laboratory and other units necessary for production and storage of genetic material in one building.
- Stable for 8 bulls according to international design standards
- Stable for calves with veterinary center for animal health and research purposes.
- Quarantine for sick animals
- Storage for concentrate and hay
- Storage for silage
- Garage for storage of working and transport equipment
- Dung storage

5.2.2 Design

Design process has several steps and it is difficult process even if it is performed by investors and designers-architects of same nationality, but it becomes even difficulties when it has to happen through communication of above mentioned factors of different nationalities, as it is subject of this case study. During the design process architect was following instruction and requirements given from Project manager, local expert and international expert and tried to fit all those requirements in his design, following always design and building standards for this kind of building. Design was several times presented to Prodox and as well send to Rome for approval. Director of Prodox did not communicated in English. All suggestions were sent through Project manager in Italian Language and then interpreted through project manager of Prodox to architect and other engineers of design house in Kosova.

5.2.3 Communication

Considering very necessary, communication between all factors listed below was not performed on time and in professional level:

- Prodox-Investors
- Design house-Architect and other engineers
- Construction company

- Supply companies
- Ministry of Agriculture of Kosova
- Italian Ministry of Foreign Affairs

The Project manager failed to involve all above mentioned factors on time to this project at every phase, starting from the design and continuing with other steps until final handover.
All communication is done through:

- Face to face meetings
- Telephone conversation
- E-mail

Communication become even more difficulties in this project at it has to be done in following languages:

- Albanian
- Italian
- English

5.2.4 Construction permit and construction process

Taking a construction permit was not that difficult as this permit was issued from Municipal department of urbanism in Peja and therefore the Ministry of Agriculture of Kosova influenced that municipality simplify procedures in minimum in order to get building license in very short period. The design house did completed project based on Prodox requirements and always following local standards and procedures. The project was hand over to Prodox on time and that Prodox applied for construction permit. Prodox was asked from Peja municipality to provide several additional documents that design house provided additionaly and in a very short time the construction permit was issued. After getting construction permit Prodox organized the public bid for selecting the construction company. For this purpose Prodox engaged a local expert for completing the procurement procedures without having information for any possible connection that this expert may have with local construction companies. The company that was selected was not the company that offered the low construction price but it was a company with experience in

construction, with appropriate potential to construct this center. The main architect of the design office was engaged from prodox to follow up the construction of the center although the construction of the centers was followed from inspectors of department of Urbanism in Peja Municipality and as well from engineers of construction company. Prodox decided to construct this center partially starting from the center for bulls and administration with laboratory as initial phase se and then to continue with other buildings designed from the design office based on standard requirements for building a genetic center for artificial insemination. The reason for this partial construction was budget limitation from Rome for that year and therefore the rest of the center will be constructed next year. As construction company did not participated during the design process, they usually requested additional information from the design house. The construction company realized that it was several gaps during design process that were as result of limitation from the Project Manager-Prodox because of limited project finance. Design office did provide all information requested from the construction company but every request was time consuming as delayed activities of construction company.

5.2.5 Startup and handover

With some delay, construction company managed to complete administration building with laboratory and stable for bulls. Completed buildings were not enough for normal function of the center as there is still necessary to complete the storage building for concentrate and hay as minimum requirement for somehow function of the center.

5.3 Analysis of the case study model

The model presented above and the case study taken to be analyzed will best present the strengths and weakness of using/not using the model during entire process. The description of the case shows that the process was very long and difficult starting from idea to he final building structure, furthermore this process was even more difficult as the investment was from outside country (NGO from Italy) and the country still was in transition period after last conflict (1999) in Republic of Kosova. While analyzing entire process it is visible that several processes were

not that much related and communication was always process that somehow can be considered as obstacle in this process. Not only communication was the only thing to be considered as process "slow down", but as well lack of meeting between stakeholders and building temporary relation between them was one of the factors that had impact on entire process from the idea to the final building structure. The coordination and project management of entire process can be considered as "lack of experience" as the management performance during this process was very low. It was not only coordination, management that can be considered as factor that delayed the entire process, but as well all stakeholders contributed on process delay. Taking in consideration the processes designed and presented through model and comparing with processes that are performed in this case study can be concluded that every process was developed independent as:

- Idea and financial decision (Italy)
- Design –Design office and NGO (Kosova)
- Permit-PIA and NGO (Kosova)
- Building- Construction company and NGO (Kosova)

The idea was initiated without knowing and involving all stakeholders and as well the budget was dedicated to the idea without any design and calculation.
The failure to involve all stakeholders had impact on design, capacity and quality of project implementation based on resources limit (especially financial limit).

5.3.1 Analyzing the investor

Investor, as main and very important stakeholder in this process, did not establish any relation with local authorities and local stakeholders in a professional level. Analyzing investor's performance in this project easily can be identified lack of establishment of communication between all parties to be involved in several project steps. Furthermore the parameters of foreign countries may not fulfil requirements of another country, especially countries in transition as they are in development process and changes often happen for better improvement of entire process.
The investor (NGO Prodox) established several relation and communication individually was

good. The relation established with Ministry, PIA, architect, local consultant, construction company were developed individually and in a very few cases the investor managed to have two of the stakeholders in the same meeting. The system of individual meeting generated cost and it was time consuming as instead of meeting all stakeholders at once, NGO organized separate meetings with stakeholders that were local and as well reporting meeting to Italy. The main loss can be considered time lost for organizing meetings and coordination between stakeholders as communication was very difficult and even more difficult because of communication in three languages.

5.3.2 Analysis of design

Process of building design was initiated from the project coordinator and local consultant. The main requirements for design were determined from them and only technical part was left for architect and some minor suggestion. The design house did not had any meeting with PIA and construction company to avoid any obstacle that can occurred during permit procedure and building process. The design was several times presented to the project coordinator and local expert, and furthermore the coordinator managed to bring as well international expert as added value. The main part of the process where is presented importance of model application presented above is that in this case, after presenting the final project to the donor(Italy), the design was not approved and the design process should be revised. This miscommunication leaded to the delays presented in the model design, and delays were reflected to the following steps as permit and building construction.

5.3.3 Analysis of permit process

Permit process, as important part before construction starts, as well did not contributed to facilitate the entire process and reduce time and cost for this project. PIA after receiving final design, had several requests and therefore additional documents were submitted. We can easily understand that in the permit issuing process was as well missing communication between stakeholders as result the permit process produced delay that had impact as well on time and cost increase, and delay to start building the final building structure was increasing. PIA without having communication with design office, and with the rest of stakeholders, did not had

opportunity to present any specific requirements, a part from general requirements that did presented to the project coordinator. In this context, delay were not project ignorance, but normal requirements that PIA will ask before issuing permit for construction. Model application will make possible that PIA present their specific requirements to the project coordinator and design office (architect) and manage to avoid delays on issuing permit as on time will present all requirements that all stakeholders needs to respect and fulfill. Important is as well, according to model, that construction company takes part in the meeting before permit is issued as they can well contribute to the entire process by presenting their requirements and experience that will avoid delays in the next steps during project implementation. At this steps of the project as well we can conclude that communication was not established. Due to a failure to establish good communication between stakeholders leads to delay and increase of cost and time for project implementation. Model application in this case, at the permit issuing process, is on big interest for all stakeholders.

5.3.4 Analyses of construction

Construction, as final step to final building structure, is the process that realize the investors' idea, architects design, and respects the PIA permit and set up standards for that buildings. As the construction need to fulfill in fact the rest of stakeholders in this process, their involvement since the beginning of the project is very important. I this case study the construction company was not involved since the beginning and during implementation several delays occurred as the construction company requested several changes to be done by the investor and through him to the design office. By requesting additional changes because of implementation capacity of the selected company, additional cost was generated to the design office, project coordinator and project itself, as those changes will take some time and are related to further steps of building construction. He delay generated while waiting for redesign of some parts of the design had a negative impact on construction and those delays are reflected and associated with additional cost time energy. Construction as very important step to final implementation of the building, model dedication attention and involved them since the beginning to be close related and have communicated their experience and any special requirement that will contribute to avoid delays. By avoiding delays reflect to cost and time reduction. If construction process is organized based

on model the case scenario will be that office for design will present design before final approval and the construction company will have opportunity to present their requirements that may accelerate project implementation that, if are reasonable for investor, and according to PIA requirements, can be approved and taken in consideration and added to final design that will be handover for permit. In this case, there is no need for revising of any part of project and will be possible to avoid delays during construction process. Avoiding delays, as mention, will lead to successful project implementation and entire process acceleration, and what is mostly of benefit, will reduce cost and time for implementation.

5.3.5 Analyses of final handover after construction

In this step delay had its impact as the function of the building was closely related to the final handover and permit on use from PIA. The implementing company did not managed to handover building on time, because of issues presented above, and therefore delay on handover was reflected to the function that building was dedicated. The process of equipment and staff recruitment did started with delay, as result of the delays happen during the construction process. Model application will involve, at least inform, the project implementer, and suppliers for the dynamic of implementation for better planning of the resources for building function.

5.3.6 Application of the new model

Analyzing case study in comparison with new model there are several issues that can be identified that needs improvement and based on analyses it cost to a project additional time, budget and other resources that have been involved.

The additional cost were created because of investor relation and communication with other stakeholders and this communication was separately done to individual stakeholder. The model introduced manages relation very well as on time establish relation with all stakeholders.

Cases study shows that relation and communication was performed individually to every stakeholder and decision process was very long as all stakeholders have to agree on final design and project structure. The introduced model gives a solution to make long procedure as short as possible as save time and other resources by getting together all stakeholders in the same time and same place (although may not be physically in the same office). As during implementation

of the project-construction of the building structure some additional changes were requested, the investor did a long way to finalize requested changes, by contacting architect, PIA and construction company. All those procedures postponed the entire process and occurred delays that generated additional cost and need for additional resources. The model avoids all above mentioned delays by improving communication and relation of the stakeholders and whatever need to be changed will be done in the very beginning. Model gives a great solution of time, cost and resources reduction. For example in the case study, instead of completing paperwork for three months, the entire process was about 9 months that generated 6 moths extra payment for services. Construction as well did generated additional cost because of lack of communication and relation of construction company and designer. The construction was postponed due to some changes requested by construction company. The model avoid having request for changes in the construction phase as model involves the construction company at the design phase.

As a conclusion, model introduced in this research provides an integrated approach of all stakeholders, avoid miscommunications and improve relation of all stakeholders for the construction process initiated by investor, designed by architect-designer, constructed by constructor, but all the time approved and monitored by PIA based on approved regulation and standards.

6.0 CONCLUSIONS, RECOMMENDATIONS

It is difficult to decide for the best model that brings positive changes and improvement in the process from idea to the final building structure through application of the systems engineering with main focus to reduce delays and through delays reduction to have direct impact on time and cost reduction. Evolution and further development of the construction industry reflect needs for exclamation of the entire processes that have impact in its rapid development and application of "state of the art" models to improve construction industry performance, with less time to be implemented and with less cost involved.

This research shows that application of systems engineering at the construction industry as process from the idea to the final building structure needs more attention to adjust the whole system, based on industry needs and development of this field. Increasing the level of systems engineering application at the construction industry will facilitate the entire process from the idea to the final building structure and accelerate this process that is very important for industry development.

As the entire process contains of three main steps that are closely related to each other as: Idea-design; permit; and construction of final building structure, the model defined from this research aims to more develop relation between three steps and facilitate process through systems engineering application that will have direct impact on entire process and influence reduction, or effective usage of time and cost that are crucial issues of entire process.

Model will as well influence development of a new approach of PIA toward interested parties for building industry and through systems engineering application will be possible to initiate "state of the art" communication always being in disposal to contribute on better performance of all stakeholders. This communication, as presented in the model, leads to time and cost reduction and process performance as well.

The most important issue that model brings and promote is reduction, with intention to totally eliminate, of the delay. Integrating delays management through model application influences cost, time reduction. Model is designed not to fit and solve single case but be applicable as process that facilitate the entire construction process from the idea, design to the final building structure. This model promises to solve issue of delay, time and cost through the process optimizing that every industry aim to apply. Every step in the process is optimized through

systems approach and communication relation establishment that facilitate entire process.

Further development

Model has to be developed more through “state of the art” technology application that different countries are applying and be adapted to local requirements based on local law and standards. More important is that model influences the initiation of its application through by adapting the local procedure in order to best fit to the model and reflect positive impact of the model to the entire process. Model has no specific performance and requirements as it is a road map to show the way how is possible to change process with small redesigns of the system and benefits that bring systems engineering application.

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Name: Lulzim Beqiri

Profession: Architect, lecturer at UBT

Date of Birth: 13.01.1973

Nationality: Albanian

Key Qualifications: (for detailed description see Employment Record)

- Leading Project Management role for development of strategic plan for Municipality of Ferizaj 2014 – 2019
- Leading Project Management role for development of strategic plan for Municipality of Vushtrri 2013 – 2019
- Joint Project Management with international team (Czech Invent) feasibility study of new economic development zone for Gjilan / Novoberdo
- Foreign Direct Investment (in partnership with Czech INVENT-Czech Republic)
- Erasmus Mundus-EM2STEM-coordinated by City University of London; UK
- Foreign Direct Investment (in partnership with Czech INVENT-Czech Republic)
- Improvement of investment and entrepreneurial climate in Kosovo

Education:

University (from – to)	*Degree obtained*
PhD- Vienna University of Technology (2011-current)	Ongoing
Vienna / UBT (2007-2008)	Engineering Management (IEM)
University of Prishtina – Faculty of Architecture (1992-1998)	Graduated Engineer of Architecture

Employment Record:

Date	*Place*	*Organization*	*Post*	*Job description*

2010 - current	Kosova	EU	EU Project for management of Residential and Commercial Property in Kosovo	• Skills Audit for Central region of Kosova (EU RED) • TEMPUS • Erasmus Mundus-EM2STEM-coordinated by City University of London; UK • Foreign Direct Investment (in partnership with Czech INVENT-Czech Republic) • The rationale for introducing-applying the brand "Quality Kosova" in domestic products • Monitoring, Supervision, consulting for The University clinic centre of Kosova for capital investment • Management of the Economic Zones in Kosovo • Perception of Foreign Direct Investors for Business environment in Kosova • Improvement of investment and entrepreneurial climate in Kosovo
2006-2010	Kosova	Head of Regional Office	National Professional Officer	• Supervision of 16 staff members at Regional Office in Prizren • Monitoring and ensuring of implementation of KPA program in all Prizren Region (six municipalities: Prizren, Suhareka, Rahovec, Dragash, Malisheva, Mamusha) • Liaison with KFOR, Local government and other bodies involved in Housing property and human rights • Administration of abandoned properties in Prizren Region • Administration of Properties that are under rental scheme of KPA • Managing notification of more that 6000 claims /properties • Coordination of KPA activities with other international organisation operation in Prizren as OSCE, UNHCR etc) • Coordinating a decision delivery to claimants inside and outside Kosovo • Coordination with security structure in Kosovo as Kosovo Police, EULEX police, KFOR to implement / enforce decision • Processing all request related to properties involved in our project

				• Reporting to Kosovo Property Agency high level Management and to Municipalities belong to Prizren Region for level of program development • Performing a Public relation meetings with all institution local and international operating in Prizren
2005-2006	Kosova	Kosova Property Agency	Team Leader	• Coordinating and monitoring the implementation of Project in five HPD Regional Offices in Kosovo. • Enabling the implementation through technical control. • Monitoring the quality of work completed by Regional Offices (RO) through daily reports and frequent visits. • Distributing and monitoring copies of the claim files to ROs for updates regarding respective properties. • Managing the accurate updates of Inventory, Survey, Claim (DS) files with respective property data and finalizing the file handover as per Right Holder requirements. • Organizing the training packages, drafting forms and assisting in production of adequate short-term strategies that will support and accelerate the implementation of Property Administration Project.
2004-2005	Kosova	United Nation	Team Leader	• Supervision of the 15 member team • Coordination of all daily tasks • Responsible for coordinating, managing and supervising the human rights activities of the UN Housing and Property Directorate (UNHPD) Regional Offices in Peja/Pec and Prizren. • Liaison with all regional actors involved in data collection on housing issues in order to ensure an efficient flow of information on human rights issues involving housing and to ensure good cooperation between these organizations and the UN Housing and Property

				Directorate. • Liaising with UNMIK Municipal Administrators, producing reports concerning the general housing situation and keeping records of all available housing that is either vacant or abandoned in the 10 municipalities of the Peja & Prizren regions. • Matching available vacant housing with humanitarian needs, facilitating the identification of suitable temporary accommodation for homeless persons and maintaining the allocation of housing on humanitarian grounds organized and supervised the regional team in performing and fulfilling the tasks required by HQ-Prishtina. • Supervised the notification on HPCC decisions. • Ensuring the implementation of UNHPD and UNHPCC decisions, including liaison with UNMIK Police, Kosovo Police Service and KFOR. • Organized continuous training of municipal staff in order to build capacities to administer abandoned properties within the region.
2001-2004	Kosova	UNMIK	Regional Officer	• Interviewing individual claimants/requesters and filling HPD forms and supervising the Assistant Regional Officers that claims/requests are filled out accurately and completely and making sure that the claimant/requestor submits available evidence relevant to the claim. • Supervised and joined one of the teams for the claim intake and requests for administration of residential properties and provide assistance the Team Leader in his duties. • Organized notification on HPCC decisions. • Performed duties with mobile teams as and when required and informing the

				interested parties about the role of HPD and how it can assist them
2000-2001	Kosova	Caritas – Austria	Construction Supervisor	• Designing of projects for the houses, reconstructed by Caritas Austria • Implementing of reconstruction-field operation • Representing Caritas Austria in the Municipal Housing Committee in municipal level • Coordination of field operation with other NGOs • Coordination with a Social Centre for reconstruction of 40 houses

Languages: (1: fluent – 5: poor)

Language	*Reading*	*Speaking*	*Writing*
Albanian	Mother tongue	Mother tongue	Mother tongue
English	1	1	1
Serbian	1	2	1