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How to achieve success in iconic construction projects: the iron triangle hegemony challenged

Master of Science Thesis in the Master's Programme Design and Construction Project Management

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Department of Civil and Environmental Engineering
Division of Construction Management
CHALMERS UNIVERSITY OF TECHNOLOGY
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ABSTRACT

Although success in construction projects is most of the time read through the lenses of the iron triangle, stressing the importance of money, time and quality, this paper will question such hegemony introducing less countable notions such as the Bilbao effect as other success criteria bringing uncertainty. First of all based on a theoretical study, the notion of success will be deeply studied, putting forward a twofold role of the client to achieve it. As a customer, he sets the success criteria. Then as buildings are bespoke objects, its contribution during the preliminary phases is crucial to the project. Secondly the notion of uncertainty, inherent to these specific projects, will be highlighted, and way to manage it will be exposed.

Finally two case studies of preliminary studies for iconic buildings will stress the influence of the client in such projects and lower the importance of the iron triangle. Lim and Ling's equation of client's contribution will be used to analyze both case studies. It is argued that the client involvement during the preliminary phases of a project is crucial and is exacerbated in iconic projects, where the client's will to have a complex project overcomes any other client's attributes. Such contribution should not be focused on time, money and quality during the early phases of iconic projects as uncertainty prevailed.

Key words: success, iron triangle, Bilbao effect, client, preliminary studies, iconic architecture, uncertainty management

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Foreword

In this report two case studies are used. Data were collected during an internship, from January 2011 to July 2011, made in the company Lordculture in Paris, a consultancy firm specialised in design of museums. The cases presented are real projects in which the consultancy company worked as an expert in facility planning for museums, in both cases hired by the client and future owner of the building. As an intern I worked on both projects presented, directly under the supervision of project managers.

More than just a tool to collect data to write this thesis, this internship was a real chance to get a strong professional experience in a consultancy firm. Thus I would like to thank all the staff from Lordculture and especially my tutor in the company, Pauline Thierry, who supervised me all along this internship. I would like to thank as well my supervisor at Chalmers, Göran Lindahl, for his precious help.

Paris, October 2011

Edouard Proust

Introduction

Usual Design Bid and Build procurement routes are divided into 5 steps: briefing, procurement, design, construction and use (Kadefors, 2009), lasting from couple of years for simple projects, to decade for very complicated ones. During these steps many different actors take part to the process. Client, client representatives, technical experts, architects, consultants, contractors, sub-contractors, users are just so many people involved in it. Despite all these stakeholders engaged in the process, gathering so many knowledge and practices, Fox, Marsh and Cockerham (2002) noticed that “since the 1960s, the construction industry has been continually criticized for its low productivity and poor quality”.

In addition Fox Marsh and Cockerham (2002) claimed that the design authority in a construction process is “customer led”, in opposition to “producer led” as in any other industry. For instance when a single person buys a car, such person does not have any influence in the design process of this car. He just buys the finished product. At the opposite buildings are all bespoke objects, which by nature are defined and designed according to the client’s expectations. Such expectations might be hard to understand for iconic projects, such as the Guggenheim Museum in Bilbao or Sydney Opera House, where their uniqueness brings a high degree of uncertainty.

Starting from these assumptions this paper will try to give a definition of success on a construction project, highlighting the preliminary steps of the projects (briefing and procurement) and the client involvement as key factors for success. The usual notion of success will then be questioned for iconic projects.

To achieve this goal a first theoretical part will focus on the notion of success, highlighting the twofold importance of the client, and uncertainty. First of all as a customer, the client sets the definition of success. Then its implication on the project and especially during the design phase will be exposed as a key requirement to achieve success.

A second part, based on two case studies, will question the usual iron triangle used to manage project as key criteria to define success. Less countable and Cartesian notions, such as the Bilbao effect will be highlighted. The study will be based on two iconic projects developed at a different stage of completion.

1 Theoretical background

1.1 Success as the client satisfaction

As in any other business, construction projects are aiming to achieve success. As such, according to the Cambridge online dictionary, success has two dimensions:

- “the achieving of the results wanted or hoped for”,
- “Something that achieves positive results”

(Cambridge University Press, 2011).

Both definitions then agree on the fact that success is linked with the achievement of something. Something that seems to be planned according to the first definition with the notion of “results wanted”. One can see in it the setting up of criteria, highlighting or proving the success of a project.

McCabe (2007) went further into the definition of success introducing the notion of client satisfaction. According to him “one of the main determinants of success in business is the ability to know how satisfied your customers are with what you provide” (McCabe, 2007). Success is then deeply linked with the understanding of client’s wishes. Therefore one could expect these wishes, or expectations, to be different for an iconic €500 million Renzo Piano Building and for a €8 million standard housing operation.

These client’s wishes in construction were studied by Davenport and Smith. They sent a questionnaire to 100 private and public clients in the UK (32 returned) to know what their priorities in projects were. During this survey around 88% of public and private clients consulted were considered as expert or quasi experts. They ranked the priorities from not important to most important. The results of their studies are expressed in the following tables:

Table 1 : Private client's wishes (Davenport & Smith, 1995)

Private	Not important %(x1)	Moderately important %(x2)	Important %(x3)	Very important %(x4)	Most important %(x5)
Cost	0	0	5	29	66
Quality of the finished building	0	0	24	27	49
Quality of design	0	0	15	52	33
Time	0	0	25	41	34
Client participation	0	4	6	54	34
Legal safeguards	0	20	63	17	0
Insurances/ guarantess	0	12	24	56	8
Life-cycle/ maintenance	0	8	42	40	10
Environment/ energy saving	0	8	36	56	0
Claims/ dispute free	0	8	49	23	20
Buildability	0	17	31	41	11

Table 2 : Public client's wishes (Davenport & Smith, 1995)

Public	Not important %(x1)	Moderately important %(x2)	Important %(x3)	Very important %(x4)	Most important %(x5)
Cost	0	0	8	26	66
Client participation	0	3	8	62	27
Quality of design	0	0	4	67	29
Quality of finished building	0	3	4	63	30
Time	0	6	9	48	37
Buildability	0	7	20	65	8
Life-cycle/ maintenance	0	7	25	61	7
Environment/ energy saving	0	7	37	56	0
Claims/ dispute free	0	16	52	22	10
Legal safeguards	0	20	63	17	0
Insurances/ guarantee	0	21	70	9	0

Whether the client is a public or a private body, money, time and quality are the main priorities that came up. But some other factors, such as the buildability, vary from public to private clients. Therefore going back to McCabe, success for these two kinds of client might result in different aspects.

1.1.1 The obvious iron triangle

As the success of a project remains in the completion of the client's objectives, as in any other business, a clear understanding of who the client is is of first importance. According to Bertelsen and Emmitt (2005) he is first of all a customer, and as such is looking for the best value in the product he is buying. It could be one person, but on the majority of projects it is a group of people guided by "often conflicting values, interests and time perspectives" (Bertelsen & Emmitt, 2005), rather than acting in a single direction. He could be experienced or inexperienced and therefore is expected to have 'irrational behavior' that you have to cope with during the design phase.

This level of experience has been studied by Davenport and Smith (2005). They gathered construction clients into 4 categories: "secondary experienced, secondary inexperienced, primary experienced and primary inexperienced" (Davenport & Smith, 1995). A client categorized as secondary build occasionally, whereas a primary client makes his living with construction projects. According to their study the more experience the client is, the more he wants to be involved in the process. Using a study made by Gunning and Courtney's in 1994, on the influence of client from the private sector during the process in Northern Ireland, they concluded that "If private clients take fuller control either directly or indirectly of their projects, they will be assured of improved satisfaction at the completion stages" (Davenport & Smith, 1995). Nevertheless this notion of experience might be biased for iconic project. Indeed what experience might be considered when facing an uncertain process for a unique operation? This notion of uncertainty and the way to manage it will be developed in the section 1.3.

Whether the client is experienced or not Morledge (2010), Davenport and Smith (1995), clearly showed that the main client's preoccupation is the iron triangle: time, money and quality. As an example in the study led by Davenport and Smith cost was seen as the most important factor for most of the clients questioned. But these three countable and reliable factors are not the only success criteria. Based on Vitruvian perspectives, Bertelsen and Emmitt (2005) identified three values corresponding to three different perspectives: the owner, the users and society. It is then up to the client to select which perspective he would like to foster.

Table 3: Examples of value perspective in construction (Bertelsen & Emmitt, 2005)

	Owner	User	Society
Primary Vitruvian perspective	<i>Firmitas</i> (durability)	<i>Utilitas</i> (Usefulness)	<i>Venustas</i> (beauty)
During construction	Respect for cost and time Errors and accidents	User involvement Schedule	Noise Dust Traffic hindrance
When completed	Capital value Cost of operation and maintenance Durability	Flexibility for initial use Indoor climate, lighting Looks, landscaping Safety	Architecture Compliance with surroundings Environmental aspects
In the future	Long time investment	Flexibility for future use	Landmark Aging in beauty

Coming from this study one cannot but notice that the three focus of the iron triangle are in fact split into different perspectives, corresponding to different actors and period of time. As expected the owner will focus more on the material considerations, such as time and money, all along the lifecycle of the building. In that sense Lim and Egbu (2006) wrote that to be successful a project has to meet two objectives:

- “The translation of client needs into a design
- The completion of the project within a specified time and in the most cost effective manner”

On another perspective, users will focus on the quality and the usability of the facility. Therefore one can say that even if the success of a project remains in the client satisfaction, it is up to him to choose which criteria he considers as priorities. These criteria picked by the client will then define the success of the project.

But once again, regarding this study, the iron triangle is not the only thing that could matter in a construction project. The idea of “landmark” refers to something less tangible. According to Thomson (2010) “Clients may still consider a project that fails to meet formalized time, cost and performance goals successful if it satisfies emergent requirements not understood during initial briefing”. These other aspects will be studied in the coming part.

1.1.2 The meaning of a building

Beside the vision of success embodied in the iron triangle some authors developed notion of success related to less tangible or less countable notions, such as the meaning of the building. These thoughts were introduced sooner with perspective on society developed by Bertelson and Emmitt (2005), where the concepts of “landmarks and aging in beauty” were mentioned. In accordance with these thoughts and based on Lim and Mohammed’s work, Thomson (2011) claimed that construction success is met at two levels. The first one, very close to the iron triangle, focuses on “functional, physical and financial objectives”. The second level is met when “the building is socially accepted and is performant”. Such a notion could not be explained with pure managerial theories and asks for a sociological interpretation.

To free our mind from functional, material and economical perspectives, needed to grasp what the meaning of a building might be, we will focus our thoughts on the book “*Les objets singuliers, architecture et philosophie*” (2000) (translated as: unusual objects, architecture and philosophy) from Jean Baudrillard and Jean Nouvel. Jean Baudrillard was a famous French philosopher, mainly known for his job on consumer society, and on the meaning of a purchase. According to him when a customer buy a product, he buys with it “the meaning that surrounds the object and which is connected to other signifiers” (Law, 2010). Jean Nouvel is a world widely known architect, famous among other for the Cartier foundation building in Paris or the Louvres Abu Dhabi.

From their meetings, we can come up with 3 notions characterizing an architectural object: “the singularity, the testimony and the left unsaid (non-dit in French)”.

First of all the notion of singularity ties up with Baudrillard’s perspective on consumer society. A building as an object is “something else than what it seems to be in any sociological, political, spatial and aesthetic interpretations” (Baudrillard & Nouvel, 2000). In that sense even if a building answer to the functional, economical and technical perspectives, it will be unique as an object revealing the surrounding it is spread in.

Secondly, a building could be the representation of an era and could be kept for this reason as a testimony. As an example the Eiffel tower built in 1889 for the international exhibition in France, was meant to be demolished after the exhibition. What makes it still present nowadays is the fact that it represents and embodies a past period of our time.

Thirdly, according to them every construction project is characterized by a “left unsaid area” between the client and the architect. This area encompasses notions that cannot be formalized or conceptualized but goes along with the project. It completes the economical and functional formalizations of the building to give him a sense. This left unsaid is guided by the choice of the architect.

Although these three dimensions seem abstract, they are clearly identifiable in iconic projects. Politics and/or clients aware of these dimensions, give sense to the building by choosing to foster or not the singularity of a building. According to Baudrillard and Nouvel (2010) “each iconic piece of architecture is build on complicity between the client and the architect”.

Moving on from this purely philosophical interpretation of buildings, some iconic projects were used as a flagship to regenerate a place. This practice is widely known under the name “Bilbao effect” coming from the Guggenheim museum built in Bilbao in 1997 by Frank O Gehry. In the 90s Bilbao was suffering from an economic recession and identity crisis, due to the deindustrialization of the city. The answer of the Basque Government to tackle these issues was the construction of a “major international culture initiative to revive the city” (Dexter Lord, 2007). The Bilbao effect could be defined as “the transformation of a city by a museum or cultural facility into a vibrant and attractive place for residents, visitors and inward investment” (Dexter Lord, 2007). According to Sudjic (2005), iconic projects such as the Guggenheim in Bilbao crystallize the redevelopment policy of a city and therefore encourage investors to come. The Museum in itself does not create the money regenerating the area, it is an icon revealing the wealth of an area.

In order to achieve a successful Bilbao effect, Gail Dexter Lord (2007) identified 7 steps :”vision, leadership, content, outstanding architecture, planning, global impact, civil society institutions”. The “vision” represents a strong political will of a social transformation. “Leadership and civil society institutions” foster on the importance of a strong and qualified client determined to run the project during the decade it takes to build such a project. Planning refers to the highly needed feasibility studies (financial, strategic, visitors’ projections, buildability, architecture competition...) that have to be led before the building is build.

1.2 The role of the client during the preliminary steps

1.2.1 The importance of the preliminary steps

As seen in the first section (1.1.1) the success of a project remains in the client's satisfaction. But its implication in the process is as important. Based on a study led by The Major Project Association in 2003, Potts (2008) identified key reasons of failures. Later on Morledge led the same kind of studies in 2010. The deffects pointed out by both authors are gathered in the following table:

Table 4: Reasons of failure in a construction project (based on (Potts, 2008), (Morledge, 2010))

Reasons of failures according to the Major Project Association	Poor project definition
	Unclear objectives
	Unclear targets
	Inadequate risk evaluation
	Client inexperience
	Poor forecasting on demand
	Lack of effective sponsor and strong leadership
	Poor communication and lack of openness
	Inadequate stakeholder management
	Management focus wrongly targeted at the back end rather than at the front end of the project
Additional reasons of failure identified by Morledge	Pressure from the client for project to go ahead
	An incomplete business case
	Unusual or complex project
	Inexperienced design team

 Reasons of failures located at the onset of a project

 Reasons of failures due to the client

One cannot but notice that among the 14 causes of failures expressed in the table 5, 5 are directly linked to the client implication in the project. In that sense Koskela, Huovila and Leinonen wrote “one third of the external deviations during the design were caused by the client or project management”. The influence of the client will be developed in the following part (1.2.2).

This thought highlights as well the importance of early phases for the success of a project. Indeed in the same table 5, 7 out of the 14 reasons of failures pointed out by the authors are linked to the onset of the process, mainly dealing with planning and the management of knowledge available at that time: “poor project definition, unclear objectives, and incomplete business case”. These failures clearly refer to the briefing, procurement and design phases of a project. In order to highlight the predominance of

such phases Morledge wrote “the performance and value of the completed project will result from the design process” (Morledge, 2010).

These preliminary phases are so important because they set the requirements and tasks for the future phases. They are the input of the project. Based on the case study for the construction of an office building Koskela, Huovila, and Leinonen identified three major defects during the design phase

- “a lack of systematic planning, and a deficient specification of tasks and responsibilities
- “a lack of input information due to poor ordering tasks
- The five most important problems during the design phase are all related to the client decision making.

(Koskela, Huovila, & Leinonen, 2002).

These three major defects stress the role of preliminary phases to set objectives, guidelines, planning and task ordering. But what might happened in a project where it is not possible to set such criteria, where uncertainty prevailed?

1.2.2 The importance of the client

To fully grasp the influence of the client during the early phases, a clear understanding of the design process is needed. This phase was studied by MacMillan, Steele, Kirby, Spence and Austin (2002) (see figure 1 below). They divided it into 12 steps, from the specification of the business needs to the final cost evaluation.

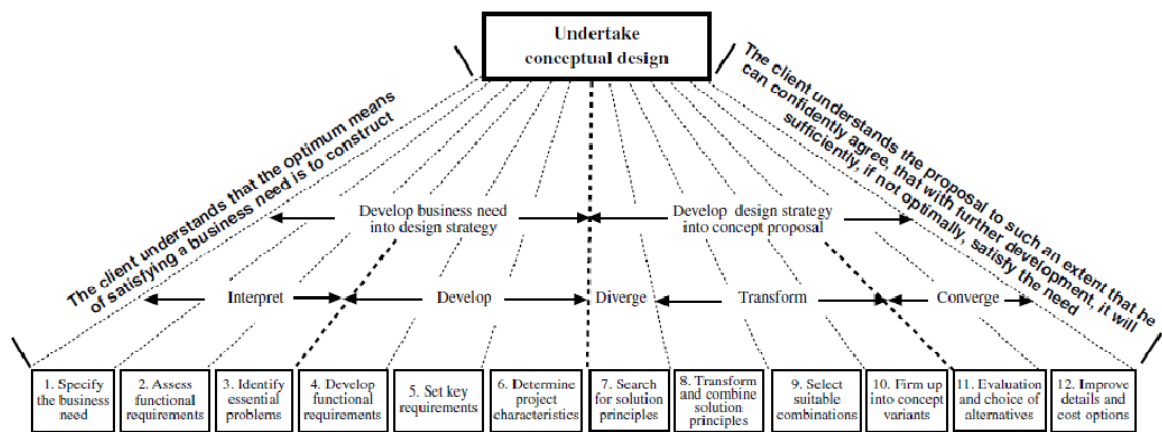


Figure 1: The conceptual design framework model (MacMillan, Steele, Kirby, Spence, & Austin, 2002)

Although the client is not explicitly mentioned in all the 12 stages, he clearly influences all of them. For instance during the interpretation (phases 1, 2 and 3) designers have to define the client’s expectation. In the developing stage (phases 4, 5 and 6) they set key requirements in accordance with the client. The solution principles developed in stage 7 are still in accordance with the key requirements and therefore with the client. During the transform stage (phases 8, 9 and 10), designers select the “suitable combinations” regarding the key requirements approved earlier by the client.

And finally in the last two steps designers choose the right design satisfying the client's need.

Thus during the early phases designers and the client are constantly exchanging, reinforcing the influence of the client. Therefore the client qualifications are a key component for the success of this critical step of a construction project.

Lim and Ling (2002) led a survey upon 33 consultants and contractors in the construction industry to understand what might be expected from the client to get a successful project. The firms questioned were asked to say what the client responsibilities are and to grade their relative importance. The result of the study is reported in the following table and ranked into 4 groups characterizing the client: client's financial status, client's characteristics, client's management competency, client's construction experience.

Table 5 : Client related attributes (Hwee Lim & Yean Yng Ling, 2002)

Client related attributes	Overall mean and (consultant and contractor) 'grade from 1 to 5)
Client's financial status	
Client's creditworthiness	4.09
Client's current assets	3.64
Client's current liabilities	3.67
Client's characteristics	
Client's organizational structure	4
Client litigation tendency	3.61
Client's degree of trust in project team members	4.36
Client's management competency	
Qualification of client's staff	3.94
Client's project management practice	4
Client's construction experience	
Number of years client is in the construction industry	3.64
Client's project portfolio	3.55
Client's past performance in projects	3.76
Experience of client's staff	3.97
Client's fulfillment of his responsibilities	
Client's responsibility in providing project finance	4.21
Client's responsibility in providing project brief	4.15
Client's contribution to project realization	4.03
Client's responsibility in setting down project objective	4.27
Client's responsibility in setting down project priorities	4.18
Client's contribution to feasibility	3.67
Client's contribution to site investigation	3.42
Client's contribution to project complexity	4.09

Regarding this study 7 competencies get a grade higher than 4, pointing out their importance. These are:

- client's creditworthiness,
- client's degree of trust in the project team members,
- client's responsibility in providing project finance,
- client's responsibility in providing project brief,
- client's responsibility in setting down project objective
- client's responsibilities in setting down project priorities
- client's contribution to project complexity”

Among these attributes the authors pointed out 5 factors, and used them to grade the client contribution to the project

A: client’s responsibility in setting down project objectives

B: Client’s creditworthiness

C: Client’s contribution to project complexity (this factor increase if the client is asking for a complicated project, ex: “aesthetical pleasing and unique projects that are buildable at the same time”

D: Client’s litigation tendency

E: Client’s degree of trust in project team members.

The client contribution to the project (Y) is then calculated regarding these factors.

$$Y = 1,10 + 1,10A + 0,78B - 0,84C - 0,63D + 0,76E \quad (1)$$

(The best score will be 12,83).

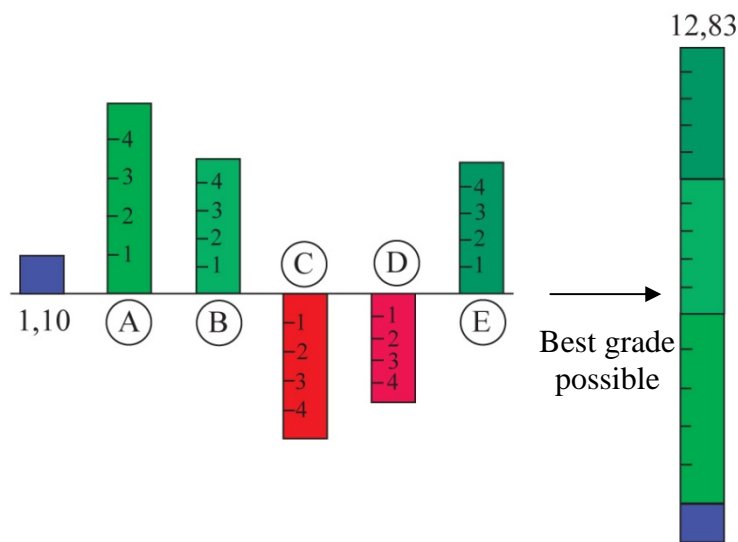


Figure 2 : Representation of Lim and Ling's analysis

Regarding this analysis one can interpret that the “client’s responsibly in setting down objectives” (A) is the main client’s responsibility influencing the project. The relative importance of this factor, once again proves the importance of the preliminary studies in the construction process. The “client’s contribution to project complexity” (C) is as well an important factor influencing negatively the client contribution. Indeed the more complex the project is, the more complicated the construction process will be.

1.3 How to manage uncertainty

As developed in the first two sections of the theoretical background, the influence of the client is of great importance during the preliminary steps of a project, to achieve success. Its contribution in these early phases mainly aims at setting practical objectives and tasks, embodied in the iron triangle. But what if such expectation cannot be achieved? This part will briefly show in a first part that such pragmatic practice is hard to conceive in iconic projects where uncertainty is high, and then highlight some way of managing uncertainty.

1.3.1 Are iconic buildings dealing with a higher uncertainty?

The notion of iconic architecture is most of the time synonym of technical complexity and unique process. As a first example, Ludwig II's Neuschwanstein Castle, now one of the most visited castles in the world, built in the 1870, required the latest technology to satisfy the king's design desire (Bayerische Schlösserverwaltung). A second interesting example is the Sydney Opera House delivered in 1973. It took 16 years to build it, among them 8 years were used to develop the concept and the construction structure for the shell. Though the design brief "did not specify design parameters or set a cost limit" (UNESCO, 2011), the Opera is seen nowadays as "a great architectural work of the 20th century" despite the 6 years delay and the initial budget multiplied by 10. Thirdly in his study of the Lillehammer Olympic Games, Bente R Løwendahl (1995), showed that the final cost was four time bigger than the initial one.



Figure 3 : Neuschwanstein Castle,
© Bayerische Schlösserverwaltung



Figure 4: Sydney Opera House © Tourism
Australia / Jonathono Marks

Although Sydney Opera House and Neuschwanstein Castle are nowadays part of World Heritage, and are in that sense shown in example all around the world, isn't the initial inspiration to build them part of an "irrational behaviour" (Bertelsen & Emmitt, 2005)? In fact this irrationality might be completely normal for such project, and it

might be then rather hard to set practical and measurable objectives during the early phases. This is especially true for the Sydney Opera House project where no design and cost specifications were set.

1.3.2 How to manage uncertainty

Though uncertainty is ontologically unforeseeable and therefore hard to manage, some modes of governance and management succeed in dealing with it. According to Mintzberg, “for every situation and task an organization is facing, there is a specific structure that fits best” (Clegg, Kornberger, & Pitsis, 2007). He identified 5 forms of organizations shaped by the 3 contingencies: environment, technology and size. These are “simple structure, machine bureaucracy, professional bureaucracy, divisionalised form and adhocracy” (Clegg, Kornberger, & Pitsis, 2007). According to Franciscus, Koppenjan and Klijn (2004) dealing with uncertainty is mainly a “matter of mutual adjustment and cooperation”. The organization has to be flexible and enhancing an easy communication between the actors involved. Indeed, as the level of uncertainty is high, stakeholders need to communicate to build the most appropriate solution (Franciscus, Koppenjan, & Klijn, 2004). Such parameters correspond to the “divisionalised form” (Clegg, Kornberger, & Pitsis, 2007). It is composed of independent divisions, highly specialized for the “particular market”.

This kind of organization has clearly been highlighted by Bente R Løwendahl (1995) in his study of the Olympic Winter Games project in Lillehammer. He concluded that such iconic projects are characterized by a high uncertainty and a temporary organization separated from any parent organization. This temporary organization corresponds to the Mintzberg’s specialized and independent divisions. Thanks to them “project management techniques and planning tools are continually modified to accommodate tasks and structures as they emerge” (Løwendahl, 1995).

To deal with this uncertainty, Hillier developed a “multi-planar approach”, based on the practice of city planning. The process used to develop city plans and iconic buildings are quite similar. Indeed in both cases the will or objectives come from a high authority, the State or a City Hall, and uncertainty and uniqueness define both. Coming back to Hillier she proposed a vision of planning focusing on ‘trajectories rather than specified end-points’ (Hillier, 2010). Trajectories enable flexibility. Everything is not frozen and determined by precise goal to achieve. She developed the concept of “spatial navigation” in accordance with the focus on trajectories where the multi planar approach enables to move forward. Multi planar because based on two plans acting at different scale: “plane of immanence” and “plane of organization”. The plane of immanence is long term oriented, flexible and “unstructured”. It echoes the uncertainty with undefined trajectories. On the other hand the plane of organization is short term related, “structured” and “regulated” (Hillier, 2010). These two plans are complementary to deal with uncertainty. A practical translation of this multi planar approach could be seen in the European agreement on the reduction of carbon dioxide emission and use of fossil energy. European Union members have to reduce to 20% their emission of CO₂ and use 20% of renewable energy by 2020. This could be seen as the plan of immanence. Practically it is translated at national and regional levels into regulations, such as energetic consumption restrictions that have to be reached to get a building permission. This is the plan of organization.

Such parallel might be possible for iconic projects as well. The plane of immanence will be the strong political will to build an iconic building, and the plane of organization will be used by the temporary organization dealing with the daily uncertainties, such as the one pointed out by Løwendahl (1995) in his study of the Olympic Winter Games project in Lillehammer.

2 Method

Two case studies will be used in this paper. Both of them were projects I had the opportunity to work in during my internship. In order to gather information for this paper, two principles were used. Firstly a gathering of documentation, often confidential, collected in the company. As a part of the project team I wrote some of these reports.

Secondly semi directive interviews were led with the project manager of the cultural consultancy firm, in charge of each project. As I was working with these project managers on a daily basis, these interviews were rather free and non-formal, enabling to reach the project manager's real thoughts.

As all the data collected came from the consultancy firm, the results highlight the overall feeling of consultants on the role of the client.

These two case studies will firstly highlight the influence of the client using Lim and Ling's equation. For both project presented it was hard to define the client's litigation tendency and the client's degree of trust in project members. Therefore both of these factors will be neglected in the equation. Thus the expression used to grade the client contribution is :

$$Y = 1,10 + 1,10A + 0,78B - 0,84C \quad (2)$$

With :

A: client's responsibility in setting down project objectives

B: Client's creditworthiness

C: Client's contribution to project complexity

The maximum score will then be 10,5.

Secondly the organization developed to manage these projects will be studied to see how uncertainty was managed.

3 Results

3.1 An architectural competition for a museum in the south of France

Presentation

The owner and client for this project is the municipality. An association, mainly composed of technical services from the municipality and consultants, was created to lead all the process, from the preliminary studies to the delivery of the building. As the client is a public body, the project has to follow the official French and European legislation aiming at preserving free access to market and transparency all over the design and construction process. All the rules are gathered in the Public Market Code (Code des marchés publics), and in the Law for Public Client (Loi MOP: Loi pour la Maitrise d’Ouvrage Public). These two texts will not be discussed in this report.

The company I did my internship in was commissioned for the setting up of the program for the scenography and architectural competition, the analysis of the 5 projects selected in the competition and the follow up of the design phases of the winning architect.

Stage in the design process

As the future building is founded by a public body, an architectural and scenography competition was launched. 5 major architects from France and abroad were selected and judged at a scheme level.

In order to judge the projects a technical commission was created. Based on these technical analyses a juror gathering the mayor, architects, city planners and other officials from the city or the area selected a winner. The technical analysis aimed at presenting objectively every project according to key criteria. These were:

- Compliance with the rules of the competition
- Functional and architectural quality
- Quality of the scenography
- Technical quality
- Compliance with regulations
- Operational characteristics (overall surface, cost schedule)
- Respect of the environmental prescriptions

Seeing this analysis it was then up to the juror to select a winner, in accordance or not with the objective analysis led based on these criteria.

Results from the objective analysis

This case study is quite talkative to understand the choice of the client and therefore its influence on a project. Though the technical commission did not grade the projects, in order to stay objective, it is possible to count the number of weaknesses and negative remarks highlighted in each project. In order to have a proper appreciation of the analysis we will grade a weakness with 1 point and a negative remark with 2 points. Therefore the project with the biggest number of points could be objectively

judged as the worst proposition according to the commission. The following table sums up these comments.

Table 6 : Project propositions assessment

	Project 1	Project 2	Project 3	Project 4	Project 5
Compliance with the rules of the competition	0	0	0	0	0
Functional and architectural quality	2	2	10	16	2
Quality of the scenography	18	8	30	24	1
Technical quality	0	0	3	2	1
Compliance with the regulations	2	2	5	7	2
Operational characteristics	9	12	6	16	0
Respect of the environmental prescriptions	4	2	4	6	1
TOTAL	35	26	58	71	7

	Project 1	Project 2	Project 3	Project 4	Project 5
Difference with the predicted budget	+ 14,5%	+ 6,6%	+ 16,5%	+ 8,9%	+22%

Comments

The conclusion of the analysis clearly identified the project number 5 as the best in quality and the most expensive. This project proposed as well the most iconic architecture with the use of new elements and complicated shapes adding a big range of complexity to the project. It was in that sense the most technically complicated project and therefore the one offering the biggest risk. This point has slightly been appreciated by the technical commission.

Finally the juror picked the project number 5, and followed in that sense the advice of the technical commission. But it has to be said that despite the overall good appreciation of this project given by the commission, this project was not presented by the media and officials as the most qualitative, but as the new Guggenheim of the city. Any other project with a more usual design was seen as a “non event” by the juror. Indeed the new facility will be located in a new area of the city just in front of a

bridge connecting the city. This building will embody the regeneration of the area and will be a real flagship of the city.

Evaluation of the client contribution

The grade of 4 is allocated to the client’s responsibility in setting down project objectives (A). This grade translates all the investigations and efforts led by the client to get a program as complete as possible. Moreover by following the French legislation the client has to define precisely what he wants in this program, base of the consultation.

The grade of 3 is given to the client’s creditworthiness (B). Indeed as the client is a public body its credit are limited. Nevertheless by picking up the most expensive project, the municipality clearly showed that resources could be found.

The grade of 4 is given to the client’s contribution to project complexity (C). This grade translates the strong will of the client to have an iconic and complex building.

FINAL GRADE:4,48

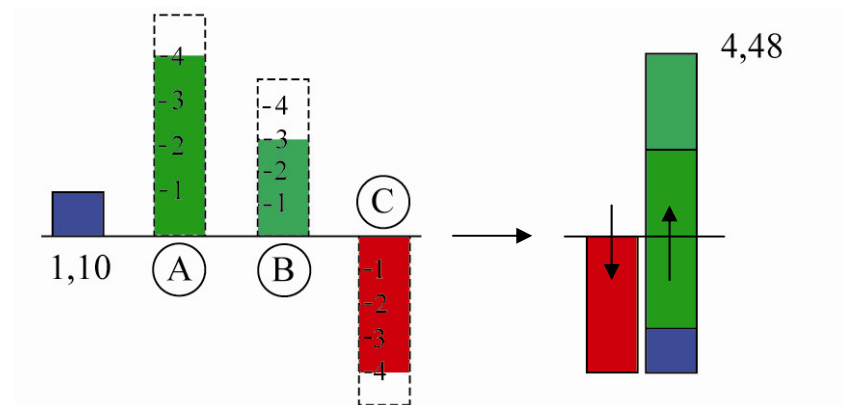


Figure 5 : Representation of the client's contribution, case study 1

Organization used to deal with uncertainty

As mentioned in the presentation, an association was created to manage the project from the preliminary studies to the delivery of the building. This latter was mainly composed of technical services from the municipality and technical knowledge needed was outsourced to consultants. Clearly this body was a temporary structure set up for this unique project. Precise objectives for the consultation were set by this body, through the program, reflecting the political outlines of the public council. The following figure represents the organization used.

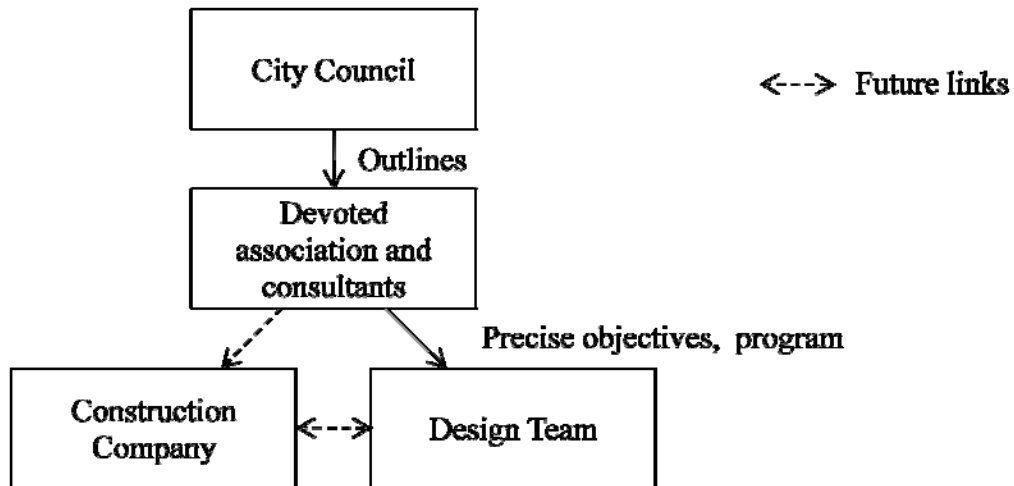


Figure 6 : Client organization used in the Case study 1

As the project was not yet at a construction stage, the links between the construction company and the other actors are not set.

3.2 A museum under construction in the Middle East

Presentation

The owner and payer for this building is the State of a country in the Middle East. It is a former soviet State that can be characterised by a kind of dictatorship. International observers, such as the European Council, the European Parliament and the Office for Human Rights and Democratic Institutions from the Organization for safety and cooperation in Europe, judged that the election led in 2009 were not democratic. During this election the current president was elected with 90% of the polls (Ministère des affaires étrangères et européennes, 2011).

To manage the project, the State commissioned a private company responsible for the construction and the overall management of the project. Though this firm did the daily management of the project, all the important decisions were directly taken by the president himself.

The company I did my internship in was commissioned by the main contractor, as a reference for museums, and cultural matters and to see how it influences the design of the building. Indeed during the design phases the architect did not hire any specialist in museums, so that the building presents major defects to host exhibitions.

Stage in the design process

The project is a major cultural center of 50 000 m², developed on 8 floors, which is currently under construction. It is a very iconic building from a world widely known architect. It is expected to open in May 2012, and already has a 2 years delay.

Thus the management of the project was very reactive, and any defects seen in the design were directly passed on the real construction.

Works that have been redone

The original expected cost for the construction of the building was approximately of 500 million euro. According to the investigations led by the cultural consultancy firm many defects prevented the good use of the building to host exhibitions. The most important defects pointed out are gathered in the following table with the repercussion it had on the building under construction:

Table 7 : Defects pointed out by the museum consultancy firm

Defects	Consequences on the building under construction
No elevator big enough to host a piece of art	Demolition of 3 slabs on 3 floors to host the future elevator. Construction of a new bespoke elevator.
No art treatment area, needed to prepare pieces of art.	Demolition of dividing walls on a quarter of the overall area of the basement
No room to host the administration needed to rule the building	Construction of a new building of 1 850 m ² .

Unfortunately no financial assessments of such defects were available during the time of the study. In addition to these costs, the cost of the cultural consultancy firm, estimated to €1.3 million, should be added.

Besides these defects pointed out by the cultural consultancy firm the decision was taken in May 2011, to take off all the escalators and to replace them by stairs. This decision taken by the State committee, occurred 10 months after the beginning of the study led by the cultural company and 4 years after the beginning of the construction. At this stage of the study no clear explanation on this astonishing decision, reconsidering all the spatial studies made before, was given.

Comments

All over the city in which the future building will take place, iconic buildings arise. As in Barcelona in the 1990s or in Liverpool and Manchester in the end of the 1990s, beginning of the 2000s, architecture is used to express the economical strength. In addition to the project we studied, more than 5 other iconic projects of skyscrapers, leisure centers and theatre, are currently under construction in the city.

In order to develop the project, the State committee clearly did not have any financial limit. Indeed, according to the project manager of the cultural consultancy firm, for every proposition made to improve the building, the State committee clearly answered: "money is not an issue". Though this answer enabled to go on quickly in the process, it did not set any clear boundaries needed to work effectively. There were no constraints for the consultancy firm, creating unease for the project team. This case study highlighted two major points. First of all how weak design studies have dramatic consequences on site. Secondly how an inexperienced client and decision maker, setting no boundaries (financial, technical or programmatic) greatly limits the effectiveness of the project management.

Evaluation of the client contribution

The grade of 1 is allocated to the client's responsibility in setting down project objectives (A). This grade translates the lack of studies led during the early phases and the dramatic consequences it has nowadays on site. It translates as well the strange and authoritarian decisions taken directly from the State committee.

The grade of 5 is given to the client's creditworthiness (B). Indeed as expressed by the project manager money is clearly not an issue for this project.

The grade of 4 is given to the client's contribution to project complexity (C). This grade translates the strong will of the client to have an iconic and complex building.

FINAL GRADE: 2,74

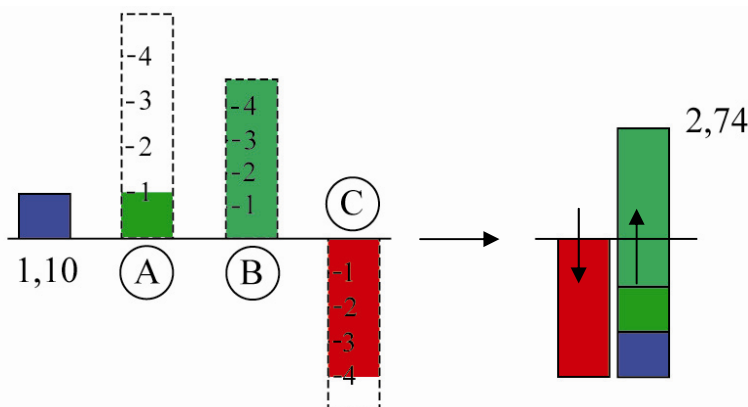


Figure 7 : Representation of the client's contribution, case study 2

Organization used to deal with uncertainty

The client and owner of the project was directly the State of the country through a State committee chaired by the president and his wife. No specific public body was set up to manage the project. Instead all the managing tasks were given to the main contractor and constructor, gathering all the knowledge needed. In a way the temporary structure was developed within the main contractor. The planning and tasks were set up by this body. Nevertheless as there was no devoted public entity managing the project even the client's outlines were not easy to understand.

Moreover the company I did my internship in, was hired directly by the State committee to help the architect doing some change on the building. Therefore three different entities were asked to work together without a precise hierarchy. This organization presented in the figure 8 clearly generated conflicts.

Finally, although the overall management of the project was made by the main contractors, all the decisions were taken by the State Committee. Therefore every month a report had to be presented officially to the state committee to assent to all the decisions.

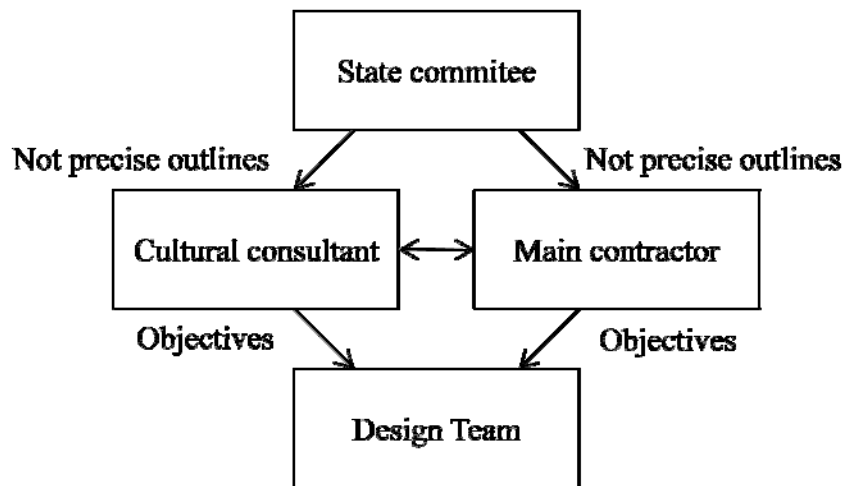


Figure 8 : Project organization used in the case study 2

4 Discussion

Success

First of all the notion of success was deeply studied in this paper. For usual projects success is achieved through a twofold client implication. Firstly as a customer, according to McCabe (2007) its satisfaction is synonym of success. Then its implication in the early phases, to set objectives and tasks is crucial. This second aspect differs from any other businesses where the client does not directly influence the design phase. For instance when a customer buys a car, he does not speak to the designers. This is the bespoke dimension of buildings. The client implication to set objectives stresses the importance of the preliminary stages of the construction process. It has clearly been highlighted in the second case study where huge over costs and rework appeared. Clearly not enough feasibility and programming studies were lead during the preliminary steps. The consequences of such omissions are dramatic and might be exacerbated in these kinds of iconic and complex buildings. Once again the theories from Potts (2008), Morledge (2010), Koskela, Huovila and Leinonen (2002) emphasizing the preliminary studies are confirmed.

The need to set objectives in preliminary steps stresses forward the importance of the iron triangle. Indeed money, time and quality are reliable, countable and controllable notions that managers and practitioners are used to using. Therefore these three factors are predominant in the management of usual projects.

The client

The influences of the client's will to have a complex project upon the client's contribution to the project was measured with the Lim and Ling equation. Regarding the weak grades that both projects get 4,48 and 2,74 out of 10,5, one can say that the influence of such client's will is quite important. For instance in the first case study, although the client's responsibility to set objective was strong, and get a grade of 4, the overall mean of 4,48 revealed a low client contribution. Thus according to Lim and Ling the client's contribution to project complexity, which was equivalent to the client's will for an iconic architecture in this analysis, is a key characteristic of a client that could greatly influence a project more than any other aspects. This finding confirms the theories developed sooner and especially Koskela, Huovila and Leinonen thoughts saying that "one third of the external deviations during the design were caused by the client or project management".

Uncertainty

Both case studies clearly showed that the iron triangle is not self-sufficient to gather all the success criteria of a construction project. Indeed in both cases the building had a strong meaning that overcomes the other cost, quality and time dimension of the operation. The first case study, where the most expensive and riskiest project was picked, was very talkative in that sense. It confirms Bertelsen, Emmitt (2005), Thomson (2011) and Baudrillard, Nouvel (2000) theories on success, highlighting notions such as landmark, social acceptance, singularity and testimony. Clearly an iconic architecture is something else than a qualitative architecture.

In both projects, the building was a real flagship used to express the wealth of the area. A Bilbao effect was clearly sought by both clients. Nevertheless among the 7 characteristics explained by Gail Dexter Lord (2007) and needed to get a Bilbao effect: "vision, leadership, content, outstanding architecture, planning, global impact, civil society institutions", some seem to have been neglected. Thus although the outstanding architecture, vision and civil society institution were clearly taken into consideration for the second case study, the content, planning and leadership were clearly missing. These missing factors might explain the low client's contribution and therefore why high over costs appeared.

This shift in focus from the iron triangle to singularity, Bilbao effect and other, brings uncertainty. In fact as shown in the section 1.3, iconic projects often have significant over costs and delay. Therefore why should managers focus on the usual iron triangle in iconic projects? Such focus is according to this study fruitless, especially during the preliminary steps where objectives need to be set. Uncertainty becomes the norm in these projects and what appeared to be "irrational behaviors" (Bertelsen & Emmitt, 2005) in usual projects are just commonplace here. The brief for the Sydney Opera House, where no cost limit was set, was very relevant to highlight the low credit awarded to the iron triangle in the preliminary steps.

Managing uncertainty in iconic project

Finally these two case studies revealed how the client organization and way of management act upon the management of the project in an uncertain environment. One could consider that the two cases were radically opposed to each other. The first one followed strict regulations, enhanced transparency and reflection, while the second one highlighted how authoritarian decisions could have tragic repercussions.

In the second case study the influence of the client was exacerbated by its authoritarian and centralized decisions not always in accordance with the technical studies. In addition to that no specific project unit was created within the client organization. Everything was externalized to the main contractor even if the final decisions were taken by the State committee. The organization of the client in the first case study was different with the setting up of a special unit uniquely devoted to the project. This unit managed the project all along the process and was very reactive. It translated the outlines of the politics. Coming back to the theory, it follows Hillier's multi planar navigation theory. The long term plane of immanence is the political outlines, and the short term planes of organization are tools and tasks developed by

the specific project unit. There is no real shift from one plane to another during the process, but as the plane of organization is the translation of the plane of immanence its influence is gradually evolving as the project goes ahead. Using Macmillan et al. (2002) design framework, the plane of immanence might be predominant during the development of the business need into design strategy, and the plane of organization takes the lead in the development of design strategy into concept proposal.

Table 8 : Hillier's multi planar approach applied to the management of iconic projects

	Time perspective	Stage in the Macmillan et al design framework	Leading authority	Focus
Plane of Immanence	Long term	Interpretation Development	High authority (State, Mayor...)	Outlines
Plane of Organization	Short term	Diverge Transform Converge	Specific dedicated unit	Iron triangle

This organization in two levels enables the client to manage properly a project when it is not possible to set objectives, guidelines, planning and task ordering during the preliminary steps.

5 Conclusion

Starting from a research on the definition of success in usual construction projects, this paper has highlighted a twofold role of the client to achieve it. First of all as a customer, the success of the project depends on its expectations and how they are fulfilled. Then due to the bespoke nature of buildings, the involvement and contribution of the client during the design phase, to set objectives, is necessary to achieve success.

This client implication is crucial when the client's will to get an iconic architecture is strong. According to the case study led this might overcome any other client's attributes. During these preliminary steps usual focus on time money and quality are fruitless, as iconic projects brings a high degree of uncertainty. To succeed in managing such projects, the client should navigate between long term and short term perspectives. Long term perspectives at the beginning of the project should not be precise and short term objectives constantly evolves with the project, to tackle uncertainty.

Finally the analysis of the two case studies, using Lim and Ling equation (2002), neglected two attributes out of the five pointed out by the authors: "client's litigation tendency and client's degree of trust in project team members". At this stage of the construction process, information needed to grade these attributes was not available and might be accessible at the end of the construction process. Further studies will then be needed.

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