

SELECTION PROCESS OF CONSTRUCTION MANAGEMENT SERVICE PROVIDER

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ABSTRACT

Construction management (CM) contracts are often used in large building projects in Finland. Contracts for various bid packages can be awarded while design documents for later packages may be under revision, all according to a design and procurement schedules. Overlapping of design and construction is mainly due to the owner's desire to delay final decisions of space usage for as long as possible. This overlapping in CM projects has also proved to offer many other advantages. This form of implementation compels parties to increase coordination and facilitate a cooperative planning decision process between the owner, CM-contractor, the designer, and the subcontractors.

For the parties concerned, the demands to be met for successful CM implementation differ markedly from those of more traditional delivery methods. At the contractor selection stage it is simply not yet possible to specify all the project requirements. Design solutions and details evolve and develop when the project progresses. That is why it is essential in CM projects to get high performing CM contractor and work environment in which he will ensure that project meet all targets and quality requirements.

The paper will introduce some parts of the new Finnish design management system (FinSUKU) and Performance Information Procurement System (PIPS). The purpose of this writing is to explain how CM service providers should be selected. A case-study incorporating a model partially tested in Finland will also be presented. The authors are of

the opinion that in situations where CM is the chosen contract form, the selection should under no circumstances be solely on the basis of the lowest bid.

Keywords: Construction management, Finland, selection process, CM@risk

Introduction

The Finnish forms of CM consist of two models as is the case in the USA and the UK, namely, CM consulting (Agency CM or CM for fee) and CM contracting (CM at risk) (Haltenhoff 1999). Construction management is characterized as a form where a professional CM organization leads a project in close cooperation with an owner (client). A construction manager suggests schedules for design and procurement packages as well as those of the related contracts. The relationship between an owner and a construction manager is based on **true cooperation** including open cost information. A construction manager acts as an owner’s right hand, i.e. their representative who sits on the same side of the table. An owner has the final decision-making power during the course of a project concerning design solutions, trades or works contracts, and suppliers. An owner may make decisions later at more suitable points in time (Kiiras et al. 2002).

In the late 1990s, CM contracts became common in large and significant building projects in Finland. In the year 2000, **the total value of CM contracts** was equal to that of traditional general (main) contracts in the private building sector. This differs markedly from the situation in the US and the UK. (Kiiras et al. 2002). Numerically however, traditional contracts rank highest among all forms of contracts.

Also in the USA the CM at risk delivery system has increased in popularity over the last 15 years. As both private and public owners seek more predictability and a less adversarial environment, CM at-Risk provides a good solution when high performing contractors are used (Associated General Contractors of America, 2004).

A recent study by the Construction Institute at the University of Texas (CII, 1997) states that the most important efficiency gains in the construction industry will be in the better use of non-adversarial **team building**. CM at risk is one of the best ways available to achieve these gains.

Often a project schedule favors use of the CM form. Total project time may be so short that the **design and construction phases** are inherently **overlapped**.

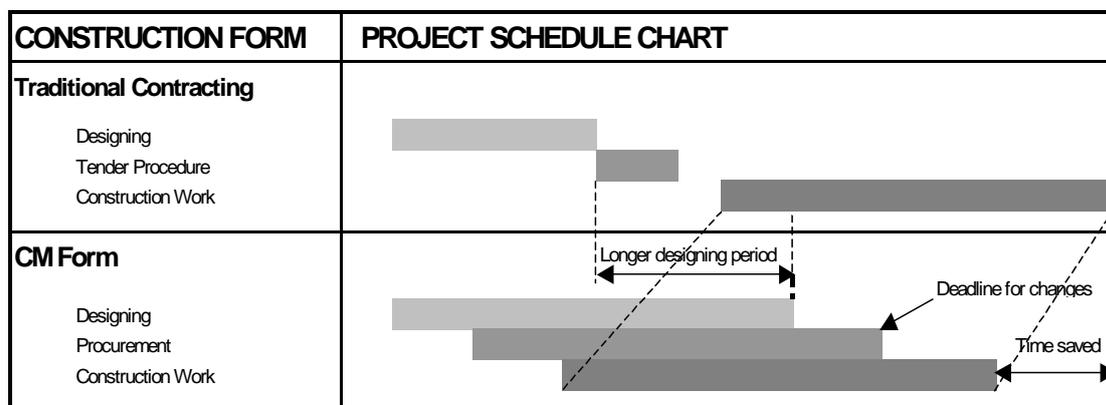


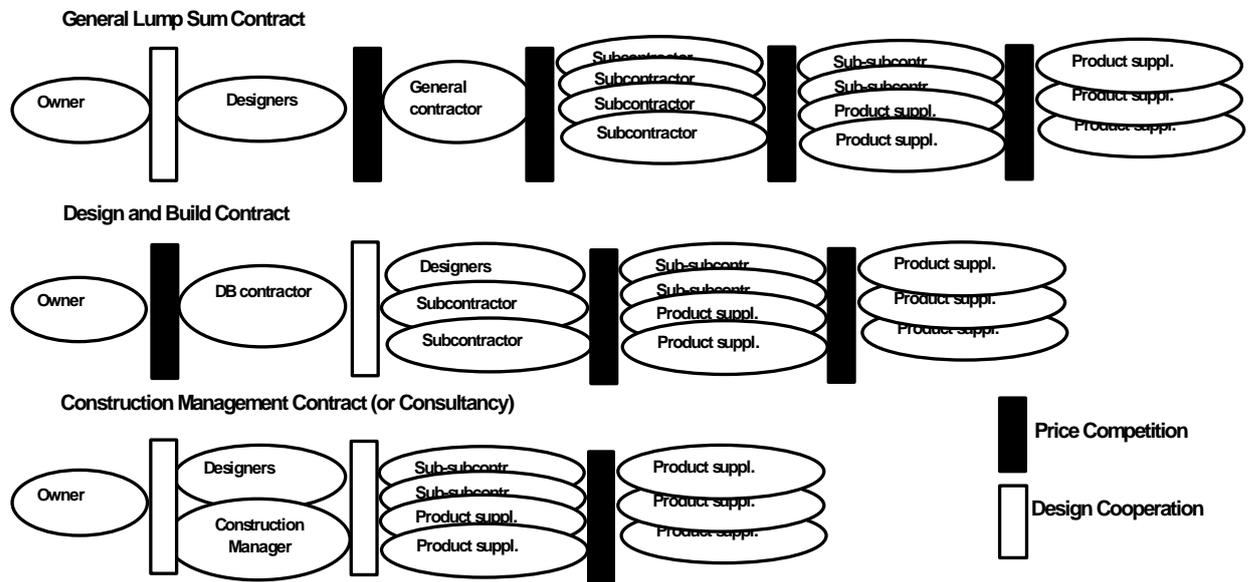
Figure 1: The influence of the CM form on project schedule.

The CII research proposes that Design-Build projects incorporating planning and construction overlap are more efficient than the CM form with respect to total project time. A

significant difference between the Design-Build and the CM form is that in the CM project the owner approves design solutions, therefore eliminating the need for final decisions on every aspect prior to the beginning of the construction phase. At present, projects are often begun before **information concerning end user's** needs become available. In such situations the CM form offers clear advantages.

In refurbishment projects it is impossible to know prior to the construction phase what exactly needs to be done. The CM form allows for flexible management of unforeseen problems in such projects. The vendor selection process should **foster the creation of alternative solutions** and **favor innovation**. Such competition provides owners with more opportunities to increase their equity. Ideally owners can focus on defining their requirements, while designers, contractors, and suppliers concentrate on the development and implementations of solutions that meet these requirements. Traditional contract bidding tends to favor the limited solutions of individual designers and competitiveness is defined solely on the basis production capacity (Pekkanen 1998).

Chains of competition can be compared in the various forms of contracts as illustrated in Figure 2. In lump sum general contracts, chains of competition are very long. Each building-product purchase must pass 3-4 price competitions. It is very difficult to produce high quality through these kinds of elimination processes. The owner has his designers finalize the plans, drawings, and specifications, on the basis of which competitive bidding is arranged for general contractors. In turn, the general contractor arranges competitive bidding among second-tier subcontractors, and so on. All these competition stages are based on the cheapest products that meet the owner's requirements. The designers try to avoid a decrease in quality in these competition chains by specifying ever increasing detailed product requirements.



Source: adapted form Oyegoke 2001

Figure 2: Chains of competition. A comparison of cooperation and price competition in general, design & build, and CM forms of contracts.

Thus, the number of eligible products is reduced and price/quality competition is restricted. All available suitable products and good operational performance cannot be obtained through this low bid chain. Instead, the owners are left with all the low bid problems such as low

quality, chained price competition, decisions made prematurely, and low flexibility for possible design changes (Kiiras et al. 2002). When CM forms of contracts are adopted, improved performance can become part of the selection process. Additionally, the freedom of suppliers to offer their solutions and assume responsibility for same can be incorporated into contracts.

The separation of design and construction has long been presented as the root problem of construction (Ballard and Koskela 1998, Egan 1998,). CM forms allows the owner to benefit from all of the expertise the CM service provider, designers, material providers, and subcontractors have to offer. Final designs can be developed cooperatively among the CM manager, the designers, and the suppliers before the awarding of subcontract agreements (Kruus et al 2005).

Under the general lump sum contract form, the owner's designers produce near final construction documents before general contractor selection. Quality control is achieved through the owner's right to demand results in accordance with specifications in the contract. In CM contracts there is not needed final design solutions and details when selecting CM contractor. They evolve and are developed as the project progresses. For this reason it is absolutely essential in CM projects to create a work environment in which the contractor is sufficiently motivated to ensure that each project meets the quality specifications assigned to it. Only by adhering to this protocol will the contractor receive new contracts in the future. The creation of the above mentioned work environment is facilitated using the **PIPS process**. (Kashiwagi 2005).

High performance using the PIPS process

Selection of any service, especially service provider selection, is best achieved in an environment that forces high competition and high performance. The vendor has to meet the performance requirements of the contract: cost, schedule, and client expectations/requirements.

The Performance Information Procurement System (PIPS) was designed in 1991 to outsource facility and construction services (Kashiwagi 2005). It has since been tested, modified, and retested 409 times over the past twelve years. It was developed using the Six Sigma process of defining the process, measuring critical elements, analyzing the differential,

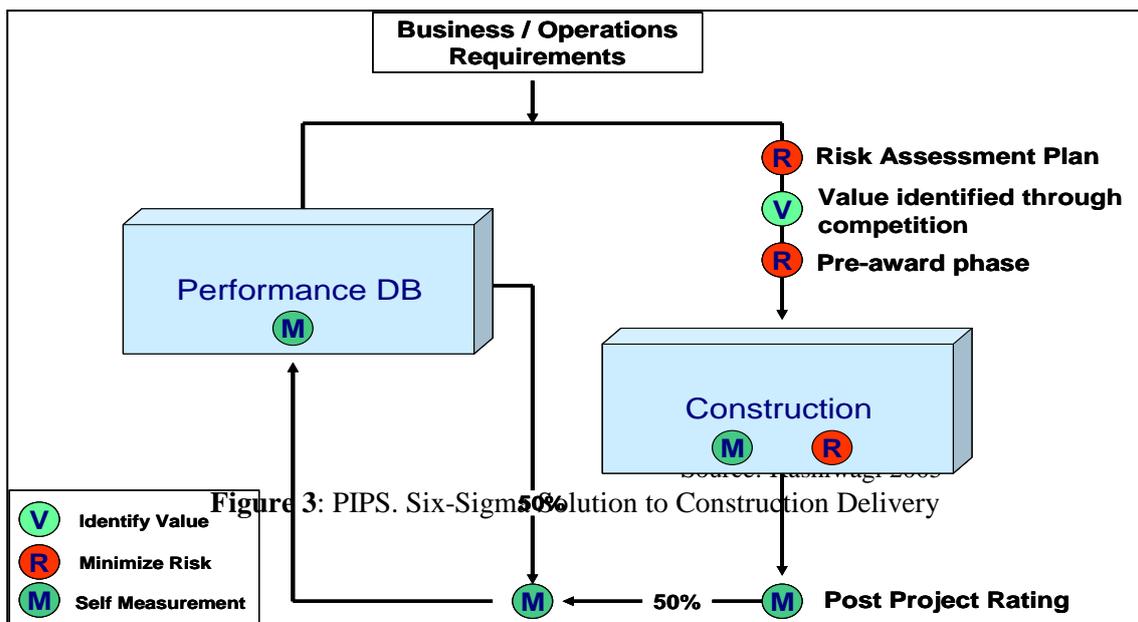
and setting up a structure that forced improvement and controlled deviation through process control.

Service provider selection with PIPS:

1. *Identification of past performance.* Past performance includes frequency of on time completion, minimal change orders, and high customer satisfaction of critical project performance elements (CM/general contractor, site superintendent, project manager, and mechanical, electrical, waterproofing and critical subcontractors).
2. *Project specific capability.* This is defined as the capability to identify, prioritize, and minimize the risk of the project in the non-technical terms of cost, time, and quality expectation before the award as a part of the competitive procedure.
3. *Competition based on performance (past performance and ability to minimize risk) and price.* The prioritization is done using a multi-criteria decision making model, which minimizes risk of nonperformance by giving credit to the identified critical past performance elements (recorded values of filters one and two). This model does not penalize values which are near the mode, but penalizes values that are below the mode.

- The processing of values forces contractors to provide their best value, and compete with every other best value, resulting in a two step best value process.
4. *Pre-award phase.* The best value contractor (as identified by the multi-criteria decision making model) must minimize the risks identified by all competitors. They must coordinate the requirements between critical elements, clarify or seek clarification on the project. The contractor will then sign a contract that includes their risk minimization plan, the intent of the owner, and all clarifications.
 5. *Construction.* The contractor is forced to manage the project in terms of risk minimization. The contractor passes risk information (affecting cost, time, and quality expectation) to the client's representative along with their method of minimizing the risk.
 6. *Measurement of performance.* The project will be rated after completion. All critical elements of the general contractor's team will receive the same performance rating. The rating becomes up to 50% of the critical element's future performance rating.

Figure 3 shows the PIPS process as the user moves through each of the filters. When a client requires a service, past performance information of interested vendors is collected and entered into a performance database (DB). The requirements of client are then given to the vendors, at which point the vendors develop a risk assessment plan that identifies, prioritizes, and minimizes the project risks in terms of cost, time, and expectation. The vendors are further competed through an interview process that forces key project personnel (e.g. site superintendent and project manager) to demonstrate their ability to add value to the job. The past performance information, risk assessment rating, interview ratings, and price are entered into the decision making model. The identified best value vendor then enters the pre-award period. Once the best value vendor has minimized all risks according to the client's satisfaction, the contract is awarded and construction commences. During construction the project is managed in terms of risk through a weekly risk reporting tool. Once construction is complete the client rates the vendor based on the ability to control cost, time, and meet expectations. This rating becomes 50% of that vendor's past performance rating in the performance DB for the next time the vendor competes in the PIPS cycle.



3. Case Study

Description of Project

This case study involves a 21000 m² office building constructed in the 1950's in the center of Helsinki. The building had not been refurbished previously. The building services (M&E) installations were outdated. Due to historical value, the building facade and interior were protected by zoning laws.

Contract Form Selection

The owner had considerable experience with the refurbishment of high value properties. The owner did not however have the staff resources to complete the project independently and decided to hire a construction project management consultant to work as an owner representative in the project as normal in Finland. At the commencement of the general planning stage it was decided to not initially specify which contract form was to be adopted with the selection of the principal contractors. With construction and building services (M&E) work, both lump sum contracting and CM forms were considered.

There was ample time allotted for design phase. For the design and construction phases there were no foreseeable changes concerning end user requirements and therefore no obvious advantage in selecting CM agency or CM at risk delivery method.

As the project was a refurbishment, it was not possible to produce an exact design documents before the demolition phase was complete. Unexpected problems are commonplace in refurbishment projects and it is often necessary to perform test repairs before final design documents can be drawn up. The need to maintain on site control in a refurbishment project favored the use of the CM form.

The building represented modern architecture. For this reason the designers concurred that the proper selection of utility hardware was exceptionally important. On the other hand, they did not want to limit their selection to the wares of only one supplier. The owner's desire to have several price/quality alternatives favored CM form selection.

The owner had numerous experiences with various remodeling and refurbishment projects using different contract forms. The owner had positive experiences with earlier CM form projects. The owner's previous experiences favored the selection of the CM form. A CM at risk form was selected in favor of an agency CM, as the owner's previous experiences favored the separation of owner's representative service from the construction services.

The need to maintain onsite control, the potential for price/quality alternatives, and the owner's previous experiences with various contract forms led to the selection of the CM form. Contracting was handled in such a way that the owner awarded open contracts with target costs for construction and house services (M&E) work separately. Elevator and building automation work was lump sum contracted in the owner's name.

CM contractor selection

Ample time was allotted for the design phase of the project. Changes due to end user needs were not on the horizon. Construction began soon after the conclusion of the demolition phase. On this protected site there were numerous spots requiring extra protection and many valuable

structures that had to be removed and stored for the construction phase. Due to the factors mentioned above it was decided to complete the working drawing (excluding the final furnishings) up to the point where a traditional lump sum contract could be offered before the beginning of the construction phase.

The owner had previous experience in supervising the preparation of working drawings and felt there was no need for the CM contractor to participate in the planning phase prior to the commencement of test repairs and procurement of subcontractors.

In order to maintain control over costs the owners wanted to get both a target and a guaranteed maximum price in advance.

Due to the factors mentioned above the owner's representative chose to complete the working drawings to the same level as in traditional design-bid-build contracts prior to the selection of the CM contractor. In order to become sufficiently familiar with the project, the CM contractor was selected three months before the beginning of the construction phase. The

owner's representative absolutely rejected the choosing a contractor based on the lowest bid principle. In Finland quality factors require consideration as well as price when selecting a CM contractor. In order to facilitate the selection of the contractor, some selection tools have been developed (RAKLI 2003). Novel in this project was the application of the PIPS method in such a way that candidate contractors were requested to provide a risk analyses along with their bids. In addition to cost information, bidders were required to provide a profile of key staff members, including references (project manager, site supervisor, procurement engineer) and a short two-page risk analysis from the owner's perspective.

It was the goal of the owner's representative to find the most suitable CM contractor with respect to the financial considerations of the entire project. Another significant goal was to facilitate the creation of a functional work environment for the construction phase. Important characteristics of a functional work environment are:

- An open cooperative atmosphere amongst the planners, contractors, and the owner's representative.
- The CM contractor's adoption of an active roll in the advancement of the project as opposed to a passive one where the contractor simply waits for fully prepared design documents and solutions to be provided by the owner's designers.

The bidding process

The owner's representative requested and received bids from five contractors. Four of the five provided the requested risk analysis. The owner's representative evaluated and graded the risk analysis using the answers to the following questions as criteria.

- What risks presented were already known to the owner or evident from the invitation to bid?
- What new risks did the contractor present?
- What gains did the contractor promise assuming the suggestions for avoiding risk were acted upon?

The risk analyses were useful as the bidders did indeed find ways to reduce risk and increase equity for the owner. After evaluation of the risk analyses and staff information, envelopes containing the contractors' bids were opened and the contractors were again graded.

After this, the two highest ranking bidders were asked to attend contract negotiations, on the basis of which one was invited to participate in further negotiations in which project risk avoidance and other matters were discussed in detail.

The CM contractor's actions on site

At the time of this writing, 75% of the project's construction time has been used. The project is proceeding in accordance with schedule, quality, and cost targets. Through active involvement and exploitation of its subcontractor networks, the CM contractor has succeeded in developing plans cooperatively with the project designers. Occasionally CM contractor found new design or procurement solutions which facilitated the preservation of the building even more extensively than originally planned. Additionally some cost reduction was achieved in some new building elements.

The owner's representative is of the opinion that the improvement of the design documents was not due to inadequate or inferior initial design but rather due to the fact that design documents simply cannot be finalized until the demolition phase is complete and the efficacy of test repair methods are known. Likewise it is not sensible to completely finalize design documents of new elements until it known what markets have to offer at the time of actual construction.

The contractor has voluntarily initiated on site process improvement schemes, e.g. the introduction of regular weekly architect inspections where unclear matters are dealt with. Additionally the contractor has created an on site data bank where the most current design and construction plans are always available for every subcontractor. In recognition of outstanding performance the CM company received the Finnish Worksite of the Year Award for 2005. This is the first time a refurbishment site has been recognized for this award.

Conclusions

With respect to the stability of the design process, the full exploitation of the CM form is challenging. In Finland the greatest problems in CM projects are associated with the delivery and content of the design documents for the construction process. The FinSUKE research

project was conceived to specifically address and solve these problems. Research articles from FinSUKE have already been published (Kruus and Kiiras 2005, Kruus, Sullivan, Kashiwagi, Kiiras 2005, Salmikivi 2005).

This writing does not propose that CM form is the method of choice for every construction project, although the CM form is certainly advantageous in projects where the owner is either not able to or simply not willing to commit to the finalization of design documents before the beginning of the construction phase. In such situations the exact details of the services the CM contractor will provide are not initially known. They become tangible and develop as the project advances. For this reason the lowest bidder principle alone is non-applicable in connection with the selection of a CM service provider.

PIPS is a tool to promote the success of any construction project regardless of which contract form is selected. The advantages of PIPS are not limited to CM service provider selection, but can be extended to designers and subcontractors alike. An integral component of the PIPS process is the recognition of the vendors success in previous projects. The goal of PIPS is to create an environment in which the vendor concludes that the prerequisite for

winning any contracts in the future is success with present contracts. In smaller markets, such as in Finland, this mindset has evolved somewhat spontaneously. When contracts for larger projects are awarded, owners are often already either directly or indirectly familiar with the selected key personnel. Vendor screening is also practiced in Finland. Only vendors with previous experience in significant projects are invited to bid on large and important projects.

The FinSUKÉ project strives to emphasize the importance of the CM form related advantage of price/quality alternatives for the owner. This advantage has been brought to light in other Finnish research projects as well (Pekkanen 1998 and Pekkanen 2005).

The PIPS process was tested in this case study. The case project could have been realized using an agency CM or a CM at risk for where the building service (M&E) work could have been included in the latter's contract. Even a slightly modified design-bid-build contract could have been used effectively. An important goal for the owner was the selection of a contractor requiring neither detailed guidance nor meticulous supervision. The selected contractor succeeded in adopting the independent, progressive work methodology essential for success.

The experiences of the FinSUKÉ and PBRSG researchers, as well as the case study's owner's representative's experiences are in accord with the lowest bid descending and performance based method ascending quality curves seen in Figure 4.

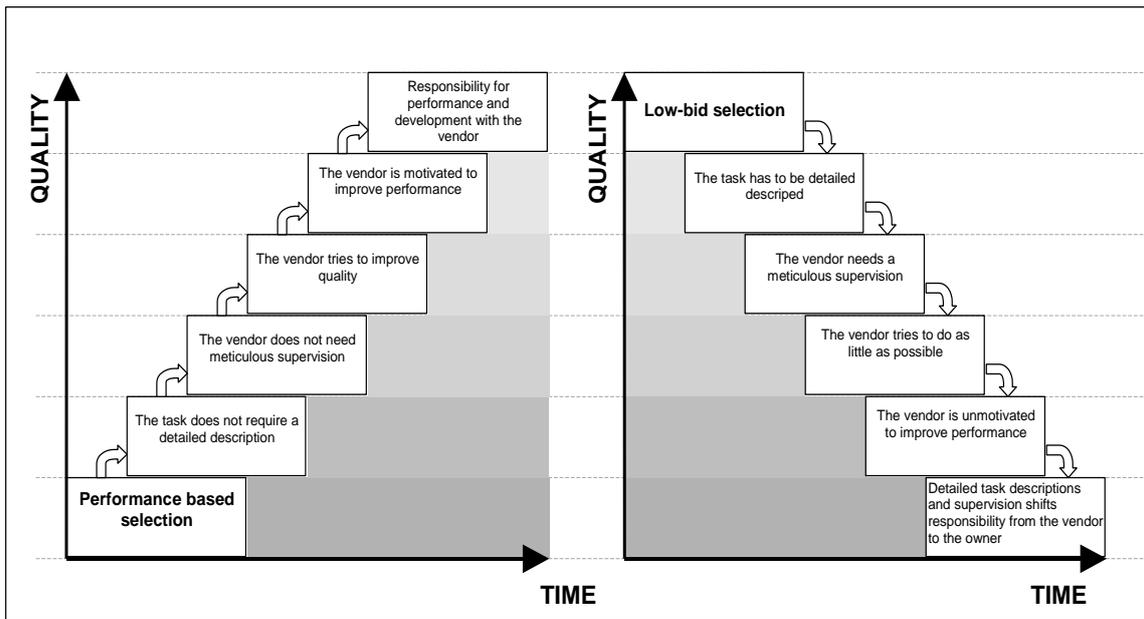


Figure 4: Performance based and low-bid selection process influence on quality

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