

# INNOVATION IN JAPAN'S CONSTRUCTION INDUSTRY – PERCEPTIONS OF CLIENTS AND CONTRACTORS

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**ABSTRACT :** This paper represents a partial outcome of a doctoral research undertaken at the University of Tokyo, Japan. The doctoral research looked on the phenomenology of innovation and its implications for the construction industry in Japan. This paper focuses on the perception of innovation by major Japanese construction clients and major Japanese construction firms. Among construction researchers innovation is a popular topic and no conference will miss covering the issue. After a period of very critical judgment on the ability of the construction sector to innovate and partially even frustration on the inflexibility of the sector, a much more positive attitude was taken. At present, most construction researchers would agree that the construction sector clearly is very innovative. That stands in contrast with how construction practitioners perceive their own sector. This paper presents the results of an empirical research in how construction clients and contractors in Japan perceive the issue of innovation. In fact the perceptions differ largely and give interesting insights on particularities of the Japanese construction sector and on the mismatch of clients and contractors perceptions.

*Key words : Japan, Innovation, Perceptions, Clients, Contractors*

## 1. INTRODUCTION

Without doubt innovation is generally understood as a key concept in today's business world and as an indispensable capability of firms to compete in tighter markets and in particular within an international context. The literature on innovation covers a wide area and addresses uncounted aspects of innovation. Despite that abundance innovation as a phenomenon is still diffuse and perceptions of what innovation is, who is innovative and if it is a crucial matter in any business environment vary greatly. Even more unclear become matters within the construction sector. Often, construction is not perceived to be very innovative from an outside perspective. Other industries with shorter product life-cycles and stronger market presence are seen to be more innovative. On the other hand, among construction researchers innovation is a popular topic and no conference will miss covering the issue. After a period of very critical judgment on the ability to innovate of the construction sector and partially even frustration on the sector's inflexibility, a much more positive attitude was taken. At present, most construction researchers would agree that the construction sector clearly is innovative. If we contrast perceptions of construction practitioners on their own work and these of construction clients we have to attest a great mismatch. Three – including the researchers' – differing perceptions become visible.

## 2. SCOPE

The scope of this paper is to investigate the perception of innovation in construction from the point of view of major clients and major construction firms in Japan. It is based on the partial results of a doctoral dissertation undertaken in Japan from 2001 to 2004. The paper will give a short review on the issue of clients and innovation and after that describe some particularities of the Japanese construction market. Following these elucidations the empirical findings will be introduced and discussed.

## 3. BACKGROUND

Since innovation became an area of investigation by the general research establishment some 20 years ago and it became a topic for the majority of management researchers the first aspect under investigation was how relevant it is to innovate for a firm. A decade later it was indubitable that innovation is necessary for any business – innovation became understood as a key competence and core activity of a firm. The macro economic context of innovation became generally understood. Following these insights the next area under investigation was how to innovate: What are the enablers and hinderers of the ability to innovate and what structures might be necessary to foster innovation? To date a third big area of investigation became of interest which leads us back to the beginning of innovation research. Nowadays' questions are when are innovations economically and technically sound? Recent investigations [1] show that many firms have a great stock – a great source of ideas within their corporation that might be turned into innovations. The actual

problem many firms face is to filter ideas based on their potential to become an actual profitable innovation; which means to put it into the market and earn money with it. As resources to fully develop an innovation are limited and any innovation is more costly than a product-evolution, only a fraction of ideas can be turned into innovations. Hence, the question is how to evaluate the potential of innovations and how to link it to the existing or targeted business focus.

A problem of the world's most innovative firms – like BMW, Mercedes Benz or Bosch if we take the car industry as example – is that they experienced an 'over-kill' of innovations. They developed and produced more innovations than the market actually wanted to carry and they over-stretched their technological focus. For these very innovative firms the question comes up, which innovations or possible innovations should better be terminated? Criteria are not to lose business focus, not to endlessly open new technology fields that might become too complex and, finally, the firm's profit targets. Management research consequently focuses on user-involvement and clients' feedback to innovations. Von Hippel [2],[3] added important insights to this discussion.

Construction is a particular difficult industry if innovation is to be managed. Construction innovations are in many cases difficult to mediate to the client as the innovation within a construction product and its performance is only a projection into the future. A proposed to-order customised solution – as most construction projects are – incorporating an innovation can not easily be compared to a planning that does not incorporate the innovation. In-use performance and life-cycle-costs are still not fully predictable. That means construction innovations have to be sold differently compared to other products: A potential camera buyer can compare an innovative with a less innovative model before making a decision which to buy, what is impossible for a construction client. Moreover problematic in construction are the high capital requirements which make innovations – that possibly will not be awarded by clients – very risky.

Based on these factors, the investigation into perceptions and expectations of construction firms and clients of construction innovation becomes highly important. In case a mismatch is the result of such an investigation alternative action recommendations to the current ones must be developed.

#### **4. THE JAPANESE CONSTRUCTION MARKET**

The Japanese construction market is in many respects very unique. For many years in the 20th century it was the biggest construction market in the world. Construction investment was remarkably higher compared to other highly developed countries. Besides its actual size, it is strongly characterised by the general Japanese business culture. As construction has a strong local dimension and the Japanese construction market is particularly difficult to access for foreign companies the Japanese aspects of business culture are very pure in construction.

Like in most countries the majority of construction businesses are of tiny size and about 97.7% have less than 100 employees (Germany 98.7%). What however is different is that the Japanese construction industry more than others is dominated and shaped by a small number of super-sized general contractors. This fact is result of government policies after World War 2.

Construction firms also have established a very close link to their clients resulting in many repeat orders. That only can be the case if construction firms have established a way to sense into clients' perceptions and wishes.

Moreover, the Japanese construction market is characterised by particular changes within the last decades. As the most basic infrastructure projects are completed and Japan now has a fully developed infrastructure, the scope of work by construction firms has changed. Parallel with this was the development that state run projects are not only subject primarily to economical growth anymore but quality of life and ecology became more important issues. A further aspect is the increasing cost pressure on building projects due to economic slowdown with tighter budgets and a shift in the relation of land prices vs. building costs. Adding to that was the introduction of new technologies like earthquake resistant high-rise buildings – which changed the face of Japanese cities remarkably within the last two decades.

#### **5. EMPIRICAL SURVEY METHODOLOGY**

The survey undertaken in 2003 and 2004 comprises two levels: A softer level of interviews and discussions and one of harder data by questionnaires. The target population of the survey were major Japanese general contractors and major clients.

For the interview level 9 general contractors were visited and with others a discussion by email was established.

Questionnaires were posted to 52 firms (24 client organisations and 28 construction firms) of which 33 were returned, representing 28 firms. The return rate was 54%.

Besides, a number of consulting firms and professional institutions were also included in the interviews. The selection of firms was done based on their size as the Japanese construction market is very much dominated and shaped by its major players. Clients selected were basically real estate developers, power companies, railway companies, car companies and city governments. The choice of clients was done based on their high influence on the construction industry as demanding repeat clients and their power in the land market.

In the literature, innovation is defined in uncounted ways: From the form of 'everything new', which doesn't offer any phenomenological insight, to very detailed ones. The definition chosen and given at hand to the interviewees was that of: "Any change in inputs, methods, or outputs which improves the commercial position of a firm and that is new to the firm's operating market."

## 6. SURVEY RESULTS AND DISCUSSION

### 6.1 Interview outcomes

From the interviews conducted some key findings shall be presented here: From the point of view of major general contractors technological competence is no real competitive advantage. Much more they perceive their competitive advantage to be their national and even worldwide network of subsidiaries and their track record of all types of construction with all types of clients and their relationship network to potential clients. The issue that technological potential is not a very important competitive advantage might be seen similar in other countries, however, the perception of Japanese contractors is also based on the tendering practices. Typically, for major public works a minimum number of bidders of equal technical capabilities (usually around 5 or 6) were required by Japanese public authorities. The equal technological competence was ensured by state coordinated R&D projects and mutual sharing of technologies between the major contractors to ensure the number of bidders required was achieved. This practice was loosened recently.

In general the brand name is seen as crucial competitive advantage for general contractors; and this established brand name is result of its track-record and marketing activities.

The word innovation is not appreciated by the interviewees very much. If the greater context is explained they agree and appreciate it, however, they often seen no way which implications innovation can have within their daily work. Many construction managers interviewed did not perceive that a lot of innovation happens in construction. They acknowledge technological progress, but as the basic work practice is almost unchanged for many decades, they do not perceive many innovations to affect their work. These managers typically would expect the actual assembly process to be the core business of construction were innovations only occasionally occur. One general contractor understood innovation as an approach to better making use of in-house resources.

The general perception is that the initiation for innovation comes from the general contractor's side because they can identify the actual needs / requirements of the project due to their project overview and direct client contacts.

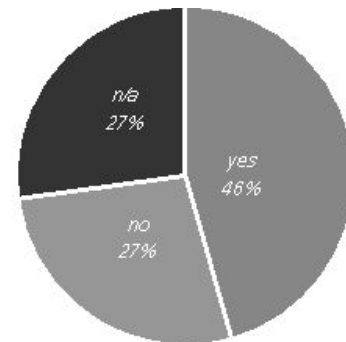
### 6.2 Questionnaire outcomes

Some of the key results of the questionnaire survey are shown in Tables 1 to 8 and the diagrams 1 to 9.

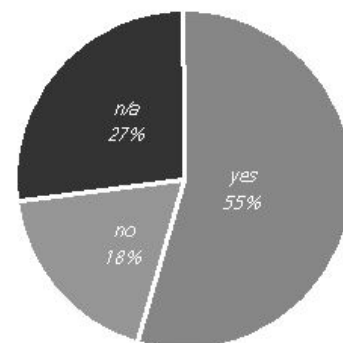
Table 1 shows the clients' priorities how to choose a general contractor. Price ranks first while technological competence is second. Time as one of the three dimensions cost, time, quality ranks only fourth. That time ranks only fourth in Japanese clients' priorities might be caused by the traditionally few time overruns in Japanese building. Usually, all projects are finished on time and it became a matter of course. In an international context one can say that time ranks very high in Japan and clients are not willing to accept time overruns.

**Table 1.** Contractor choice by clients

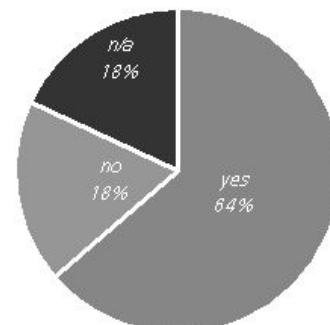
| <i>Question:</i> | <i>How do you choose general contractors? What factors have priority?</i> |
|------------------|---|
| <i>Rank</i>      | <i>Answer</i>   |
| 1                | Price   |
| 2                | Technological competence  |
| 3                | Quality   |
| 4                | Time  |
| 5                | Reputation  |
| 6                | Contractual transparency  |
| 7                | Established business relationship   |



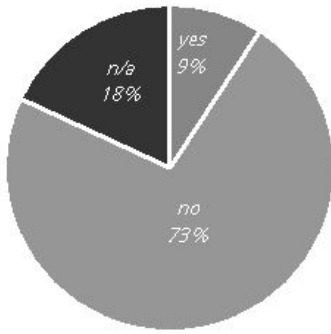
**Figure 1.** Do you require customized solutions in your construction project?



**Figure 2.** Do you expect construction companies to be innovative?



**Figure 3.** Do you think innovation is a competitive advantage for construction companies?



**Figure 4.** Would you award suggested not required innovations by contractors?

**Table 2.** Contractors' innovation objectives

| <b>Question:</b> | <i>What are the main objectives for innovation?</i> |
|------------------|---|
| <b>Rank</b>      | <b>Answer</b>                                       |
| 1                | Improve cost  |
| 2                | Solve interface problems                            |
| 3                | Others: shorten construction period; client demand  |
| 4                | Improve quality                                     |
| 5                | Improve safety                                      |
| 6                | Marketing   |

**Table 3.** Innovation barriers

| <b>Question:</b> | <i>What are the main innovation barriers?</i> |
|------------------|---|
| <b>Rank</b>      | <b>Answer</b>                                 |
| 1                | Lack of capital                               |
| 2                | Lack of technical capabilities                |
| 3                | Lack of client interest                       |
| 4                | Lack of competence                            |
| 5                | Innovation is no competitive advantage        |
| 6                | Too time-consuming                            |
| 7                | Lack of information                           |
| 8                | Problems with property rights                 |
| 9                | Others: no interest in innovation             |

**Table 4.** Type of most construction innovations

| <b>Question:</b> | <i>What type are most construction innovations? (within a project)</i> |
|------------------|--|
| <b>Rank</b>      | <b>Answer</b>  |
| 1                | Technical  |
| 2                | Problem-solving on site  |
| 3                | Process  |
| 4                | Developed during planning stage  |

**Table 5.** Stage where most innovations happen

| <b>Question:</b> | <i>At what stage do most construction innovations happen?</i> |
|------------------|---|
| <b>Rank</b>      | <b>Answer</b>   |
| 1                | Planning stage  |
| 2                | Requirement definition stage                                  |
| 3                | Construction stage  |
| 4                | Construction materials / parts producers' stage               |
| 5                | Usage stage   |

Further questions to clients were if they are familiar with the concept of innovation and if it is a competitive advantage in their original business. Of the respondents 64% agreed to that they are familiar with the concept of innovation in their original business (36% replied with no) while the question if innovation is a competitive advantage was answered with yes by 27% and 55% with no (18% did not answer the question, n/a). Figures 1-4 show more results on clients' perceptions. Figure 1 indicates that a great number of clients require customised solutions – which in many cases might only be satisfied through innovations. Figures 2 and 3 fit into the greater picture by suggesting that the majority of respondents expect construction companies to be innovative and see innovation as competitive advantages for construction firms. However, figure 4 clearly shows that an overwhelming majority of clients is not willing to award innovations that might go beyond the requirements defined in the project brief. This result shows that construction companies have difficulties communication the benefits of innovations that go beyond the initial requirements. Obviously, a competition based on innovativeness is hardly possible for construction firms. The question arises why and how construction should innovate if clients expect innovative construction firms and see it as a competitive advantage, but are not willing to award these activities or to support innovation based competition by contractors.

Tables 2-5 describe the results of the following questions to general contractors:

- What are your main objectives for innovation?
- What are the main innovation barriers?
- What type are most construction innovations?
- At what stage do most construction innovations happen?

What can be seen from these tables is that contractors see most innovations to be connected with internal goals and being linked to internal problems. Innovations should improve cost (basically production costs to improve profit expectations) and solve interface-problems which are implied in the project planning. Moreover do the first two aspects that hinder innovation also refer to internal problems, capital and capabilities, while clients' interest ranks third. The type of most construction innovations is technical or problem-solving on site and occurs in the early stages of a construction project (planning stage & requirements definition stage).

If we look at the industry context, the following results could be collected: The main innovation sources for general contractors are the co-operation with consultants and within joint-ventures. Public research institutions rank third and clients fourth. It can be assumed that public research institutions rank high in Japan and subcontractors low compared to other countries. That could be explained through the before mentioned tendering practices by the public authorities and the coordination of research projects. The low ranking subcontractors might be explained by the close networks between big general contractors and subcontractors in Japan which are dominated by the big lead-contractors. Subcontractors act less independent in

Japan compared to other countries.

Table 7 asking for a rough estimation of the percentage value of external innovation sources, interestingly, sets the highest values with 20% and 50% of external sources of innovations. From the zero value of smaller 10% we can conclude that innovation in construction typically is a collaborative process which requires co-operation. Table 6 shows which by contractors are perceived to be the most innovative member of the construction industry with product deliverers ranking first and general contractors ranking second in Japan. While product deliverers ranking first seems logical, as they produce products that can be compared in performance before purchase, it seems typical for Japan that general contractors rank second while consultants and planners rank lower. That shows the dominance of major general contractors in the Japanese construction market with their strong in-house planning competence. Consultants and planners such as architects are comparatively weak in Japan.

**Table 6.** Innovation sources

| <i>Question:</i> | <i>What is the relevance of particular innovation sources?</i> |
|------------------|--|
| <i>Rank</i>      | <i>Answer</i>  |
| 1                | Consultants  |
| 2                | Joint-ventures   |
| 3                | Public research institutions                                   |
| 4                | Clients  |
| 5                | Technical equipment  |
| 6                | Independent subcontractors                                     |
| 7                | Technical publications   |
| 8                | Corporate subsidies  |
| 9                | Employing new staff  |

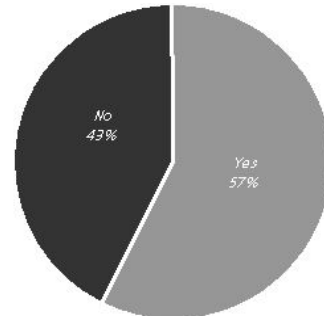
**Table 7.** Rough estimation of percentage value of external innovation sources (n/a: 9%)

| <i>No.</i> | <i>Share of external innovation sources</i> | <i>Respondents' answers in percent</i> |
|------------|---|--|
| 1          | <10%  | 0                                      |
| 2          | ~20%  | 32                                     |
| 3          | ~30%  | 14                                     |
| 4          | ~40%  | 9                                      |
| 5          | ~50%  | 27                                     |
| 6          | >50%  | 9                                      |

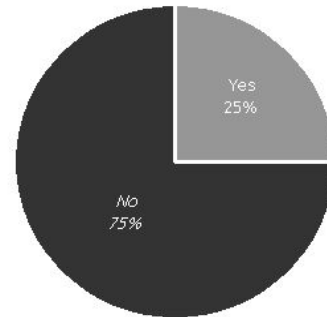
**Table 6.** Contractor perception of most innovative industry members

| <i>Question:</i> | <i>In your perception, which construction firms are the most innovative?</i> |
|------------------|--|
| <i>Rank</i>      | <i>Answer</i>  |
| 1                | Product deliverers   |
| 2                | General contractors  |
| 3                | Consultants  |
| 4                | Subcontractors   |
| 5                | Planners   |

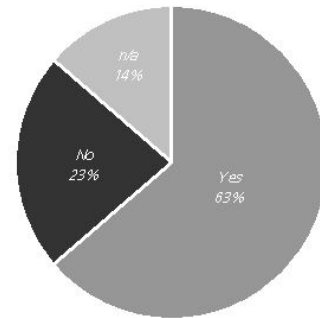
A further question on the contractors' side was if they perceive innovation to be an unclear concept to which 57% agreed. Only for 43% innovation was not an unclear concept. Moreover, 75% of the respondents – which mainly were project managers and senior staff – are not familiar with innovation activities in their daily business. Similar to the clients' answer, 63% agreed that innovation is a competitive advantage in construction (23% answered no, 14% n/a). Some 90% agreed that they would try to suggest innovative solutions to clients even if not requested.



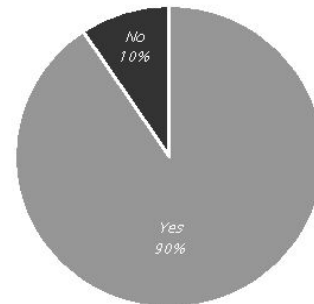
**Figure 5.** Is innovation an unclear concept?



**Figure 6.** Are you familiar with innovation in your every day business?



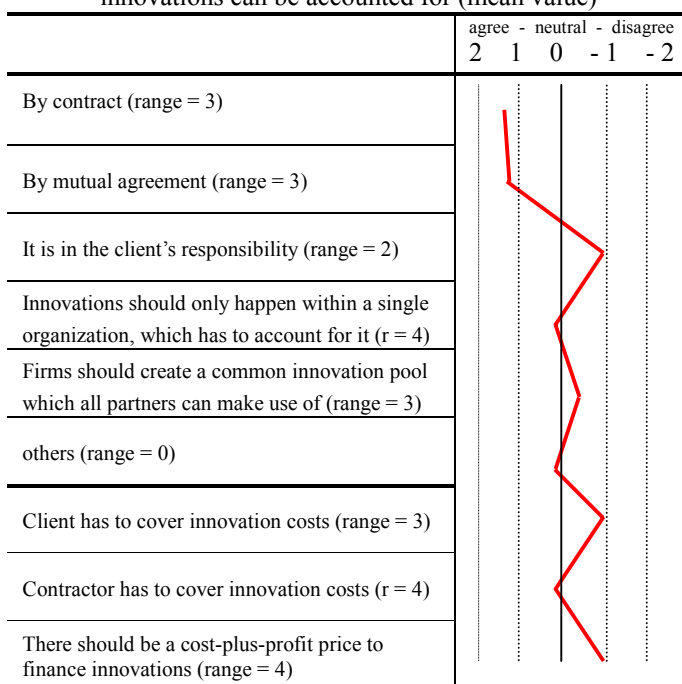
**Figure 7.** Do you think innovation is a competitive advantage in construction?



**Figure 8.** Do you try to suggest innovative solutions even if not required to the client?

The last set of questionnaire answers that shall be presented here is connected to the issues of how risks incorporated in innovation activities and the funding shall be accounted for (Figure 9). The diagram shows preferences by respondents to given answers with high agreement shifting the graph to the left while disagreement moves the graph to the right. The wide ranges (r) of answers indicate no common positions. The first questions show very contradicting answers. It shows that risks, property rights and financing should be accounted for by contracts or mutual agreements but lie not in the clients' responsibility. Very diffuse is the reply to the suggested answer that innovations should happen within a single organisation that carries the responsibility. The interpretation of the contradicting answers is that respondents might be fully aware that the distribution of risks between organisations tends to be very difficult and single responsibility would be desirable but not necessarily realistic. The last three statements, like the others, give also a diffuse reply indicating that the funding of innovations should not be shifted to the client's side but as well no clear assignment to the contractor's side is desired.

**Figure 9.** How risk, property rights and financing of innovations can be accounted for (mean value)



## 7. SUMMARY AND CONCLUSION

If we sum up the results of the surveys which focused on the perception of innovation in construction by clients and by general contractors in Japan it can be said:

- Clients expect construction firms (like firms in any other sector) to be innovative – This position expresses today's understanding of business processes (Figures 1, 2).
- Clients also see innovation as a competitive advantage for construction companies and clients mentioned technological competence – which can be closely linked to innovation-ability – to be the second most important factor

to choose a contractor (Figure 3, Table 1).

- Clients also stated not to be willing to reimburse non demanded innovations by contractors (Figures 4, 9).
- Contractors understand innovation to be necessary (Figure 7) but have difficulties defining innovation and integrate it into their daily activities (Figures 5, 6).
- Contractors use innovations mainly to manage internal issues like to increase profit, solve technical problems etc.

What can be concluded from these and the before mentioned findings is that the ability to innovate is a phenomenon of today's business activities and a compulsory activity of every industry – no matter how innovative an industry actually is. Clients expect firms to be innovative and they perceive it as an 'included service' that in most cases will not be reimbursed additionally. If we also refer to what was mentioned earlier, that the performance of construction innovations are often difficult to communicate or proof, it becomes obvious that there is a great gap between innovations that target construction-internal issues and innovations that directly benefit the client. For the latter, project initiation and project definition together with the client are the key stages. What clients do not agree to in these early definition stages is extremely difficult to sell them in a latter stage of the project.

For the bulk of innovations that might serve internal aspects (within projects or between industry members), co-operation issues between the collaborators might be the key factors. Figures 6, 7 and 8 support this assumption. In this paper it shall be concluded that innovation research that tries to investigate how to realise innovation within construction activities should be well aware of the before mentioned gap and might have to develop completely different mechanisms to serve the two innovation spheres – the client focused in early stages and the internally focused during planning and building. We have too little research that is linking the issues of innovation efforts by construction firms with their marketing; despite this is the key to generate real profit. There is the risk that the bulk of the groundwork on innovation in construction done by researchers remains ineffective. Research has not only to tell construction firms to be innovative but also how to sell these innovations.

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