

Title	Role of the Techno-Producer in the Construction Industry, as a Leader of Innovation
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Citation	Proceedings of PICMET 2010: 838-845
Issue Date	2010-07-19
Type	Conference Paper
Text version	publisher
URL	<a href="http://hdl.handle.net/10119/9535">http://hdl.handle.net/10119/9535</a>
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Description	

## Role of the Techno-Producer in the Construction Industry, as a Leader of Innovation

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**Abstract--**The author has been given the chance to act as the point of contact with various companies for the purpose of inter-industry cooperation. Based on this experience, it became obvious that innovation processes are quite different depending on the type of business.

The author's awareness of this fact became clear regarding innovation in the product creation phase in the construction industry. The ability to give technical suggestions to customers as well as to explain associated technology, along with actually developing such technology, is very important. When different types of businesses and technologies are involved in innovation in this way, the techno-producer plays a major role in making such innovation in various businesses and industries successful.

This paper describes abilities required for techno-producers to effectively act to make innovation happen in the construction industry, by clarifying characteristics and features of the industry. This paper discusses differences in role of techno-producer (1) by difference in production system and (2) by comparison of the construction industry and other industries.

### I. INTRODUCTION

This paper discusses the talented people who realize innovations in the construction industry. The author participated in inter-industry cooperation for five years or more, and has studied the theme of innovation management. The author works in the construction industry. The characteristics of innovation have been considered by comparing the construction industry with other industries. The roles of the talented people who create innovation, called techno-producers, were studied by paying attention to the changes related to differences in business type.

The author is interested in the role of the techno-producer in the construction industry, and differences from that role in other industries. The management subject in the construction industry is engineering and service to improve facilities' value. For that purpose, it is effective to make an attractive technical proposal.

The exact goal in a project must be set in consideration of the situation and the external environment of the market. It is necessary to coordinate with external organizations for goal achievement, and to realize a project. This paper discusses, through a case study, what kind of role a techno-producer plays. "What relation is there between a manufacturing system and the role of a techno-producer?" is the first question of this research. "Is the role of a techno-producer in the construction industry different from their role in other industries?" is the second question.

### II. PREVIOUS WORK

A "techno-producer" is a term coined by the late Professor Kameoka, and there is no formal definition as of January, 2010. The late Professor Kameoka advocated that a "market mechanism" functions based on "a high tech trading market mechanism (techno flow market)", in order that a techno-producer may play an active part. Anyone can become

a techno-producer, if the person makes a concept, and shows leadership. There is no limit on the number of techno-producers.

In sports or the entertainment world, a producer has the leading role. A producer is needed also when technology is commercialized. The necessity of cultivating "a high tech trading market mechanism (techno flow market)" was proposed. It is important to circulate "technical stock" smoothly and economically. For that purpose, activation of a "techno flow market" is important. It is effective to introduce positively the "market mechanism" which evaluates and circulates technical value[4]. The following opinions were expressed in a paper of PICMET about the term "techno-producer" [6].

1. A person who starts radical innovation and makes a new business or new industry
2. A person who sets a strategic goal
3. A person connected with all innovation processes
4. A person who has a joint relationship with external entities at the same time as playing a central role in a company

In order to make new innovations in the social economic environment, where change of technology or the market is rapid and complicated, the leadership of creative, talented people as innovators is required[4]. Like music compositions and conductors, a techno-producer sets a creative new product concept as a strategic target, and creates a new industry. A new strategic concept is organized, a practical strategy is completed, and it is the "technical expert" who provides comprehensive direction (orchestrating). Competitive strength of Japan is heightened by acknowledging and cultivating techno-producers, and by organizing "a BA (shared space)" of the activity. The following three items are mentioned as fundamental abilities of a techno-producer.

- 1) As a concept creator (goal setter), when the environment has been recognized, they have the ability to set a goal.
- 2) They have the ability to design the process in which the given goal is achieved, as a coordinator (goal achievement person).
- 3) As a project leader (process actualization person), when a goal and an achievement process are given, they have the ability to realize the goal.

Especially, creativity is essential to a concept creator.

Fig. 1 shows that business producing consists of three processes, planning, execution, and completion, and the goal image as a vision is created[1]. A plan process is the creation

process of changing 0 into 1. An execution process and a completion process are processes to realize changing 1 into 100.

These processes are realized with the following seven abilities.

- 1) Picking up: Power of discovering the sign of a chance or a hit, and new talented people
- 2) Understanding: Power of understanding movement of the world, and the essence of things
- 3) Imagining the goal: Power which draws a vision and can imagine the goal
- 4) Organizing: Power of organizing and using various business resources effectively
- 5) Empowerment: Power which encourages a "person" and an organization, power of making to reach toward a goal.
- 6) Flexibility: Power of adjusting things flexibly, such as responding to trouble or an environmental change
- 7) Wrapping up: Power which overcomes, performs and achieves various things and is accumulated in the next vision.

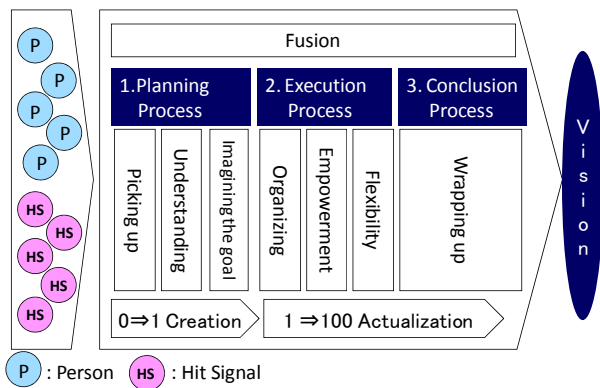


Fig.1 Three processes of business producing, and seven abilities

### III. THE TECHNO-PRODUCER IN THE CONSTRUCTION INDUSTRY

The techno-producer investigative surveys were implemented 7 times from June to October, 2007. Four members of the R&D planning department of a construction firm were discussed in detail. The role of the techno-producer was extracted from the contents of the discussions at a meeting. 15 contents are listed below.

#### A. Talented people's nature

- 1) Coordination with external people is important for a techno-producer.  
It is necessary to coordinate with organizations and individuals in and outside the company, and to form a network of talented people strategically.
- 2) The breadth of viewpoint when dealing with technology is important.  
The ability to manage technology and business is important.
- 3) A subject can be given by a manager's discussion with members of two or more technical fields, and cultivated

and summarized.

- 4) A techno-producer can take up a theme to apply and acquire external resources across the range of an R&D department.

#### B. The existing technology and existing markets

- 1) A techno-producer is required for proposals about large-scale projects.
- 2) The role to expand developed products to an operational division is expected from a techno-producer.
- 3) Needs cannot be understood if the operating division is not known. The training of a techno-producer leads to strengthening relations with the operating division intentionally.

#### C. New technology adoption

- 1) It is important to perform integration, in order to commercialize a product. It is a role of the techno-producer to associate and integrate the R&D department and business.

#### D. New technology and an existing market

- 1) It is important to visualize the developed product.
- 2) A techno-producer proposes not individual component engineering, but an integrated construction system.

#### E. Extension to a new market

- 1) It is important to clarify the gaps of the level of the developed product and the level for which an operating division applies technology. It is a role of the techno-producer to reduce gap.

#### F. New technology and a new market

- 1) It is a big role to take a concept from a different section from the existing area of research, and to commercialize it.
- 2) It is a role of the techno-producer to cultivate new business domains or fields which are not extensions of the present technology.

#### G. The existing technology and a new market

- 1) The ability to search for social needs and make proposals including business models is required.
- 2) It is necessary to develop scenarios according to changes in situations.

Fig. 2 shows outline of 15 contents about a techno-producer by the matrix of technology and a market.

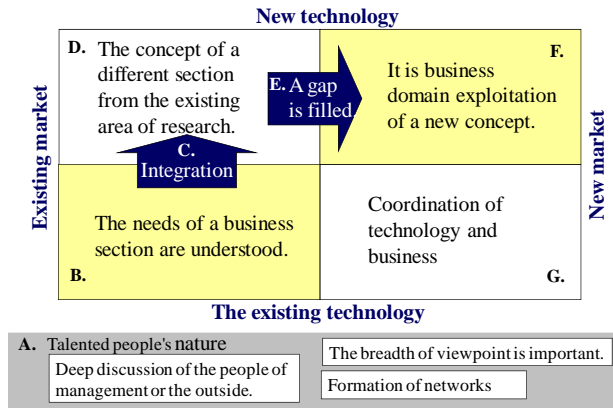


Fig. 2 Role of techno-producer in the construction industry

In the quadrant of an existing market and the existing technology, it is a role of the techno-producer to understand the needs of an operating division, and to expand a developed product in a market.

The quadrant of new technology and an existing market shows what is proposed not as individual component engineering, but as an integrated construction system. "Integration" is a role for which a techno-producer is required. As the result, "the concept of a section which is different from the existing area of research" can be created. It is also an important role of a techno-producer to reduce the gaps between a developed product and the needs of an operating division.

In the quadrant of a new market and the existing, the requirements for a techno-producer are to coordinate technology in business.

In the quadrant of a new market and new technology, the requirement for a techno-producer is to cultivate a business domain using a new concept.

#### IV. CASE STUDIES OF THE TECHNO-PRODUCERS IN THE CONSTRUCTION INDUSTRY

Two cases of techno-producers in the construction industry are introduced.

##### A. Electromagnetic shield building

The circumstances of an electromagnetic shield building in a market, and the role of the techno-producer, are summarized from documents and an interview. Mr. A who engaged in development as a project member from the R&D stage, was interviewed. An interview was held from 13:00 to 14:30 on July 27, 2007. There are the following four phases, from research and development of an electromagnetic shield building to market development. Each phase is described below.

1) *Many electric-wave instruments required for the measures against noise were commercialized.*

Electromagnetic shield technology shuts down the

electromagnetic noise which blocks electronic devices inside a building. At the same time, the external leakage of the electromagnetic noise generated inside a building is prevented. The plan of the 500,000-volt extra-high voltage power transmission of an electric power company became concrete, and the facilities for research on the corona discharge of the extra-high-voltage-power-transmission transformer of an electric power company were successively planned around 1975. These facilities had a huge transformer. In order to measure the electromagnetic waves of 1 MHz band generated from corona discharge, the huge shield building which prevents noise mixing to radios, such as at private houses near the building, was required.

There was a leading client who needed an electromagnetic shield in the 1980s. Electromagnetic technology was helpful in the market which had matured at that time. There was already a basic technique. However, the construction technology to ensure the performance of electromagnetic shielding was not established.

2) *The concept of the electromagnetic shield building was realized at D building.*

Mr. A did engineering development of the electromagnetic shield with the consortium in 1984. The technology of the noise rejection of wireless LAN was applied when rebuilding D building. Then, the concept of the electromagnetic shield building was made. The technique of the electromagnetic shield building of "shielding in the building itself" was developed.

3) *Many sites were managed, the technological level was raised, and the range of products offered was extended.*

After the technique and the concept were completed, Mr. B took charge of the role of management, and Mr. A took charge of the role of engineering development. The technical range of products offered reflected the requests of the design department, which is an in-house client. The ability to consider the designer's details increased the level of performance.

4) *The consistent organization in the company was established.*

The electromagnetic shield building construction special department was organized in a subsidiary company in February, 1989. In order to perform market development of the electromagnetic shield building completely, Mr. A organized the electromagnetic environment market development room in the company in 1995, and he assembled talented people from merchandising, design, estimate, construction, and research and development. The characteristic of this organization is special merchandising. In order to respond to individuals' issues concretely, the technological problem solutions were created together with the client.

Market development evolved into an organization which performed business division initiatives, instead of remaining

within the research and development division. The role of techno-producer in this case is summarized in Fig. 3.

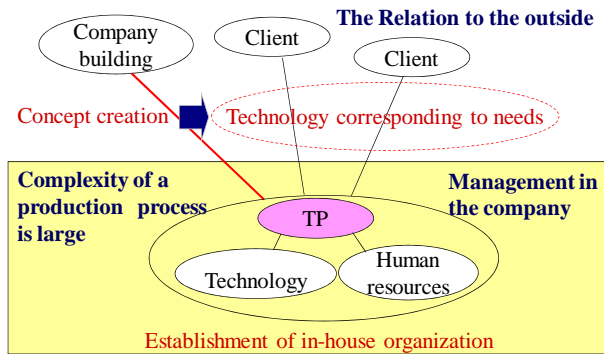


Fig. 3 Role of techno-producer in the case of electromagnetic shielding technology

### B. The case of high-pressure lined rock gas storage technology

Mr. B is a techno-producer of high-pressure lined rock gas storage technology. An interview for about one hour was held from 11:00 on November 27, 2007. Mr. B has stated as follows;

- The passion for making a national project successful was important.
- The result is large if the order of a project can be received in the future.
- The goal was clear although there was a risk to the company.
- Technology was a conclusive factor for an order received.
- The technical subject of high-pressure lined rock gas storage technology was that iron planks are thick.
- In Sweden, there was 20MPa high-pressure lined rock gas storage technology.
- "A base rock achieves the function of stress and steel achieves the function of only confidentiality" was a concept.
- This concept actualization was the driving force of the innovation.
- Humanity and a concept are important.

The following six items were implemented for the development of high-pressure lined rock gas storage technology.

- 1) The foundation was consolidated in order to win with technology.  
First, the technical list of tasks was made.
- 2) The external connections concerning acceptance of an order were formed individually.  
One key person of each organization, such as the Ministry of Economy, Trade and Industry, an industry affiliate, the ordering party, an energy company, an energy system research institute, and a university (a base rock, energy, economics), was selected. These people from each

- 3) With the talented-people network in the company, the techno-producer persuaded the boss of business or an engineering work.  
The dream of winning over other companies in the energy storage field persuaded related people.
- 4) The R&D fund was acquired from the outside.  
Funds were spent on business or research.
- 5) Incentives were given to the members.  
In specifying an incentive, Mr. B's motivation improved.
- 6) The persuasion to a high executive of a company explained that there was a risk.

Objective data showed the actual conditions. Social environmental changes and intensification of energy problems were explained objectively based on the material released. Mr. B thought that the following energy was natural gas.

Mr. B said, "The dream as a technical expert is important", and he rounded off the interview. The role of the techno-producer in this case is summarized in Fig. 4.

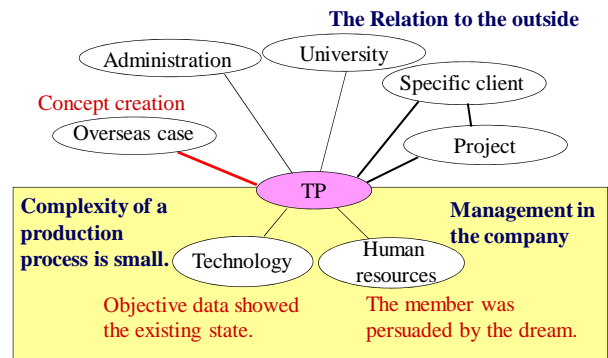


Fig. 4 Role of techno-producer in high-pressure lined rock gas storage technology

## V. THE CASE STUDY OF OTHER BUSINESS TYPE ENTERPRISES

In the case of a techno-producer, the typical enterprises of the electrical machinery industry, the auto industry, and the telecom industry were investigated. Only the case of the telecom industry is introduced here due to space limitations.

### A. Producer system of N company

Mr. C is one of the persons responsible for systematizing the producer system in the R&D department of N company. The following information was acquired at the interview on January 30, 2008.

- 1) Mr. C is summarizing the producer organization of N company as follows :  
In N company, producer organization was established in the R&D department in 2004. About 3000 researchers are at 12 research institutes. There are 60 to 70 producers in

the staff division.

The greatest point of producer organization is having included the producing function in the staff department independently from the research institute. Several teams with producing function in the staff division were organized. Some researchers and some people from operating divisions or associated companies became producers. The role of a producer includes performing merchandise planning, discerning the timing of market introduction, and proposing R&D organization to a research institute. At the research institute, a commercialization development project which was developed across boundaries was composed in response to this proposal. The top of the project is called the director. A producer promotes a project in cooperation with the director. In a project, an alliance with a group company, a business corporation, or another company may be constructed.

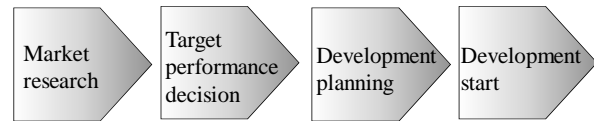
2) Why did N company adopt the producer system

The main point is summarized here about the reason for introducing the producer system which Mr. C pointed out. The purpose of introducing the producer organization is to create new business, to grow up the business continuously, and to commercialize it. A researcher can enter a market himself and expand the developed product. The researchers who do so are very few. Then, the producer system was adopted in order to increase the probability of market development systematically. It is necessary to change from the activity from a technical viewpoint to a market viewpoint. The gap between engineering development and commercialization was filled by the producing function. In order to produce inventions and discoveries, and bring new products to the main stream of a market, it is necessary to overcome many barriers.

The conventional approach gave priority to the performance. There was no opportunity to hear the voices of customers until after the technological results came out. The approach of a producer gives priority to decision of time to market, and sets the target performance which can win at that time. At the same time, by marketing, opportunities to hear the voices of customers are increased and hypothesis testing is adjusted on the way. (Fig. 5)

Fig. 6 shows the model for the producer organization of N company. It is characteristic to consider the environmental changes of a market carefully, to set up a supposition about the investment stage to a market, and to verify the appropriate investment timing in the development stage.

■ The conventional approach



■ Approach of a producer (hypothesis testing type)

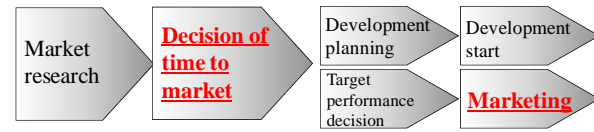


Fig. 5 Characteristics of producer system of N company

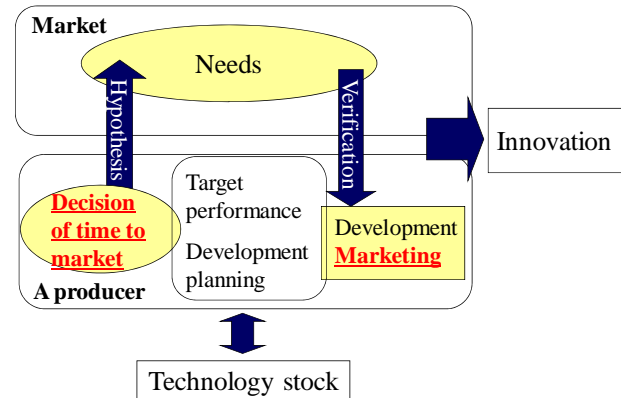


Fig. 6 Producer organization of N company

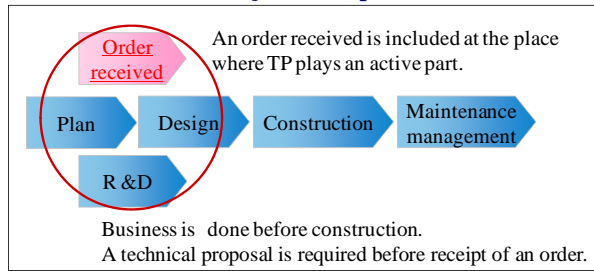
VI. CONCLUSION

A. Question and verification

1) The difference in activities of the techno-producer according to manufacturing system

"What relation is there between a manufacturing system and the role of a techno-producer?" is a question of this research. The business flow of job order production was compared with the business flow of market production, and the corresponding case is shown in Fig. 7. The most characteristic thing is that the techno-producer is related to job order production in the initial stage in this comparison. This shows the role of a techno-producer to make an effective proposal in the ordering phase. The techno-producer of the construction industry is closely concerned with a client, and creates an engineering proposal. The case of the high-pressure lined rock gas storage technology of 4.2 is a representative case. However, in the case of market production, sales are the last process, and marketing is performed in the planning phase, but a sale is not made directly. Sales are not included in the role of the techno-producer.

**The business flow of job order production**



**The business flow of market production**

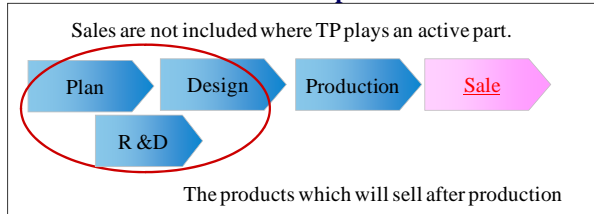


Fig. 7 Difference in role of techno-producer by difference in production system

2) *The role of the techno-producer in the construction industry*

Two cases are classified according to the role of the techno producer in the construction industry, as defined in Section III. Fig. 8 shows the result.

The case of the electromagnetic shield filling the gap in a new market by new technology, corresponds to "E. A gap is filled." The case of base rock storage has expanded a new market with the existing technology, which corresponds to "G. Coordination of technology and business."

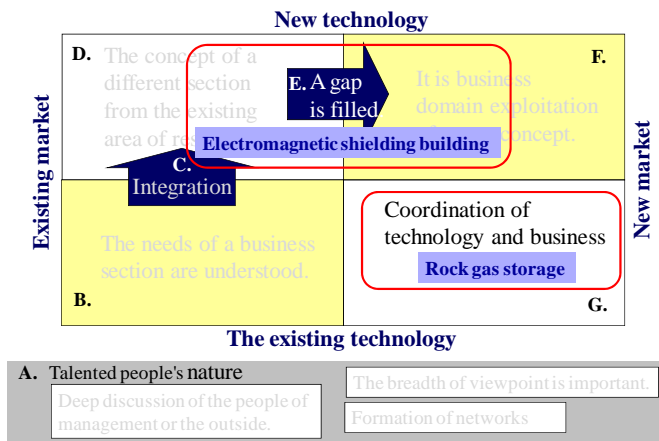


Fig. 8 Roles of techno producers in CASE STUDIES

3) *Difference in role of techno-producer in the construction industry and the other industries*

"What are the differences between the role of the techno-producer in the construction industry, and in other industries?" is the second question. Table.1 summarizes the results of the case studies of Section IV and V. The representative case of the role of a techno-producer as an

organization system is the automobile industry. This shows the base system of new car development.

In N company (communications service business), the authority of a producer is strong as compared with other industries, and it is characteristic to have rights of personnel management and the decisive power of development funding.

TABLE1 INDUSTRIAL CLASSIFICATION AND TECHNO-PRODUCER COMPARISON

Case	The feature System	Authority of TP		A point of contact with the outside	
		Human resour	Funding	Joint research development	Contact point
Chief engineer of new car development (TOYOTA)	Basic system	Weak	Weak		There is no direct point of contact.
Playstation (SONY)	No system				There is no direct point of contact.
Service industry (Case V)	In-house system	Strong.	Strong.	The owning technologies have priority.	Associated companies have priority.
Electromagnetic shielding building (SHIMIZU)	Voluntary activity	Weak	Weak	Compamy implements positively.	Cooperation is valued
Rock gas storage (SHIMIZU)	Voluntary activity	Weak	Weak	Compamy implements positively.	It is closely related to a client.

By job order production, when a production process is complicated, a techno-producer plays a role linking inside and outside. On the other hand, a client is considered important when job order production of a production process is also comparatively simple. In the manufacturing industry which is performing market production, there is no direct point of contact of a techno-producer and a customer. The techno-producer in the construction industry of job order production has many points of contact with a client. Table 1 shows techno-producer comparison by industrial classification.

Fig.9 shows the case of the industrial classification which was the target of investigation, with two axes, showing a manufacturing system and process complexity. Market production shows two companies of the manufacturing industry, and job order production shows a case of civil engineering and building. The complexity of the processes in the auto industry and the building industry were evaluated as "large", and in the electronics industry and civil engineering were evaluated as "small." The techno-producer of an electromagnetic shield building is in a position which manages a point of contact with a cooperating contractor or a client, and has played the role of "the link between the outside and inside." A chief engineer of the auto industry is in the position of cooperating with many departments or contractors. "Making a process with a cooperating company" is their main role. In the case of the Playstation in the electronics industry, the thought of the technical expert with a rich personality is realized. "Asserting technical significance" is a role of the techno-producer. It is a success factor of the techno-producer that high-pressure lined rock gas storage of

civil engineering proposes key technology according to a specific client. The phrase "creating with a client" shows the role of a techno-producer directly.

	Large	
Market production	<u>A process is made with a cooperating company.</u> EX. Chief engineer of new car development (TOYOTA)	<u>The link between inside and outside.</u> Ex. Electromagnetic shielding building (SHIMIZU)
	<u>My way is asserted.</u> Ex. Playstation (SONY)	<u>Creating with a client.</u> Ex. Rock gas storage (SHIMIZU)
	Small	
	Complexity of a production process	
		Job order production

Fig. 9 Difference in role of techno-producer in the construction industry and the other industries

**B. Theoretical implication**

The techno-producer in the construction industry abstracted the process of realizing an innovation, and expressed it as a model, as shown in Fig. 10. A techno-producer performs concept creation for the purpose of changing a client's potential needs into actual needs. Presentation of the concept was performed also in projects, such as base rock storage and a micro grid, in the initial stage of the project. Through cooperation with a specific client, engineering development is promoted based on a concept. In order to realize a concept, trial and error are repeated. Insight and proposal strength serve as conclusive factors. This stock of technical capabilities serves as a source. Accumulated technology is required when performing concept creation by collaboration with a client. A techno-producer takes the lead in a series of processes for innovation creation. In order to create customer value and business value in the construction industry simultaneously, it is important to realize innovation through collaboration with a specific client.

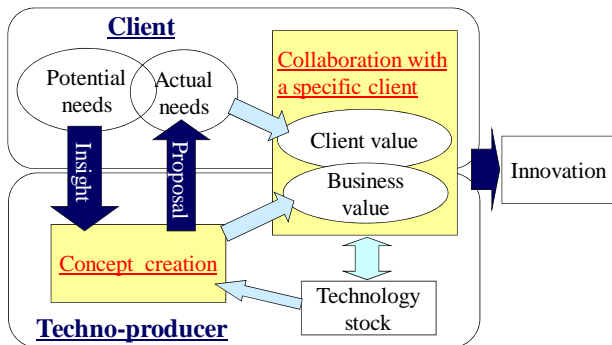


Fig. 10 Innovation model of the construction industry with techno-producer

**C. Suggestions for future research**

The suggestions for future research include the following subjects.

- 1) A clarification of the ability development process of a techno-producer.  
 The ability of a techno-producer to respond to a problem improves by accumulating performance. The role of a techno-producer changes with the various problems generated by environmental changes. It is a future subject to clarify the ability development process relevant to the role of the techno-producer suitable for a project.
- 2) Verification and improvement of the innovation model  
 If the innovation model is not clear, priority is given to the solution currently faced, and there is the possibility of missing the overall picture. With a model to refer to, action can be improved objectively. It is necessary to feed back practical results and to improve the innovation model of the construction industry.
- 3) Research on the concept creation process  
 Concept creation is the most important role of a techno-producer. It was difficult to fully understand the content of the concept creation process in the interviews in this case study. More details about the nature and the role of a techno-producer, in concept creation in the early stage of a project will provide valuable information.

**ACKNOWLEDGEMENT**

The author is thankful from the bottom of his heart to the late Professor Akio Kameoka, who created the term "techno-producer" which shows the essence of MOT.

**REFERENCES**

- [1] Narihiko Yoshida(2010) The work way that makes an idea a form, Toyo Keizai Shinposha
- [2] Satoshi Hino (2002) Research of the Toyota Management System (principle of permanent growth) Diamond Corp.
- [3] Yoshitaka Ichinose (2007) "The latest trend involving the investment for research and development of an enterprise", Bank of Japan Review
- [4] Akio Kameoka (1998) Management of Technology (MOT) Paradigm Shift : A new concept creation type leader's "techno producer" period, the Collection of Japan Society for Science Policy and Research Management Annual Scientific Convention Lecture Gists, Vol.13 (19981024) pp. 357-362
- [5] Akio Kameoka (2005) The latest MOT (Management of Technology) About a trend, Institute of Electrical Engineers of Japan, Vol. 125, No.3, and pp.165-168.
- [6] Akio Kameoka, Syuuji Kondou, and Yasuo Ikawa(2007) Designing a 'Knowledge Science' Based Graduate MOT Education Course and Its Review of Implementation and Practice, Proc. of Portland International Center for Management of Engineering and Technology (PICMET) 07, Portland, USA. CD-ROM
- [7] Osamu Katayama (2002) How did Toyota build "The Strongest Car", Shogakukan library
- [8] Fumihiko Kojima (2001) Order of Producer Work, and How to Advance, JMA Management Center Inc.
- [9] Sadaaki Shinjo (2007) The role - which the top management in the development project of a powerful management innovative processor plays, Japan Advanced Institute of Science and Technology, School of



## PICMET 2010 Proceedings, July 18-22, Phuket, Thailand © 2010 PICMET

Knowledge Science, Master's thesis

- [10] Osamu Takahashi (2006) The research on training of motion picture producer talented people in movie industry, the Collection of Japan Society for Science Policy and Research Management Annual Scientific Convention Lecture Gists, Vol.21, No.2 (20061021) pp. 804-806
- [11] Akira Takeishi (2003) Division of Work and Competition (outsourcing management for a competitive advantage), Yuhikaku Publishing Co., Ltd.
- [12] Yoshitaka Takeuchi, Shu Ishiguro (2004) New Intermediary in Knowledge Society : The function of a network generator, requirements, The Collection of Japan Society for Science Policy and Research Management Annual Scientific Convention Lecture Gists, Vol.19 (20041015) pp. 345-348
- [13] Hideki Yoshida (2006) A case study about the mediation to application / utilization research from the objective basic research towards innovation creation, The Collection of Japan Society for Science Policy and Research Management Annual Scientific Convention Lecture Gists Vol.21, No.1 (20061021) pp. 9-12