5m-SHEL Model from Perspective of Lifeline Construction Complaints

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Qualitative research of sample (number=352) and quantitative research of sample (number=382) were conducted regarding complaints on lifeline construction based on national data. Qualitative research investigated complaints to corporation A during 2007 - 2008, and quantitative research investigated complaints reported in Tokyo 23 districts, Nagoya, Sendai and Kanazawa of sample (number=382). Qualitative research results shows 60% of complaints are related to "Setsugu (Motivation, Manner, Morality, Mercy) and subsequently 25% are related to construction works. Relationships between "Setsugu", mutual agreement and security management are studied according to covariance analysis. Results indicate that "Positive Setsugu" in customer- relations helps dissolve stakeholder's complaints. Contrary, "negative Setsugu" directly affects stakeholders' decisions whether or not they are satisfied. Mutual agreement is significant in construction work procedure and moreover "Setsugu" related to the subject would reinforce the mutual relationship. Idea of "Setsugu" is pertaining to Japanese culture, and "5m-SHEL model" to incorporate "Motivation", "Manner", "Morality", "Mercy" is a human factor analysis model to accommodate psychological analysis of Japanese stakeholders, purchasers, contractors of lifeline construction enterprises today, providing an insight to understanding complicated modern society.

Key Words: *Setsugu, Conference, Positive, Negative, General decision, Risk communication*

1. FOREWORD

There are many studies on complaint characteristics in marketing and consumer goods field. Past studies related to lifeline construction complaints examine vibration and noise caused by road construction as a part of environmental problem. This research is the first attempt to analyze complaints from a perspective of entire lifeline construction and production goods. According to Jurgen Habermas' logical theory, only an inter-subjective process of understanding can produce an agreement that is reflexive. In other words, mutual agreement can only be achieved by consent among people who are capable of understanding each other. In his numerous writings, Lawrence Kohlberg declares that "Justice is the most virtuous goal for an individual as well as society" however, this statement implies that not only "justice" is the goal of the individual or society, but what is important is to regulate different interests and perceptions.[1)] Thus it can be said that agreement with stakeholders who are not beneficiaries of public construction work is important. Furthermore, if it is considered whether or not mutual agreement may dissolve complaints, the confidence research revealed that people cared much about "Setsugu" in their decision makings.[2)] Hence in this thesis, stakeholders（n=382）who expressed complaints in the past were selected from 4 areas (Tokyo 23 district, Nagoya city, Sendai city and Kanazawa city) to conduct a survey. Primary objective of this research was intended to see how mutual agreements and "Setsugu" may affect lifeline construction results and how it may convert complaints to satisfaction. Second objective was to evaluate the necessity of 5m-SHEL model, incorporating 4Ms（4M is defined as "Sestugu". 4M are Motivation, Manner, Morality, Mercy.）that exist as internal qualities in each agent of the existing m-SHEL model, for the reason that existing SHEL model lacks perception of "task role" and "psychological analysis of human relationships"

2 . CONSIDERRATION OF ANALYSIS MODEL

2.1 Definition

（1）Setsugu

"Setsugu" in this paper, means 1) motivation, 2) courtesy or manners, 3) morality and 4) generosity or mercy. It is not equal to an English word "hospitality", which presumes that there is a host and a guest who receives such welcomes. However, according to Japanese perception, every task or work should be carried out with a feeling of hospitality. In practical work experience, hospitality should be expressed in order to satisfy customers and members of different departments and during different work processes. Survey on Japanese mentality regarding how Japanese think of "motivation", "manner", "morality", "mercy", showed that the order of importance is motivation ‹ manner ‹ moral ‹ mercy .（National Web survey sample n=2,187）[3)]. Setsugu can be categorized into 9 types of requirements, and classified according to level of ability, and awareness level.（4M is defined as "Sestugu".）（Table-1）

Table-1 Setsugu requirements and Awareness level [3), 4)]

Conditions	Level of ability	Awareness level
Necessary requirements	1. Bright and honest personality 2. Capable of making appropriate judgment and representation. 3. Properly dressed	Motivation Manner
Worker requirements	1. Possesses common sense and acts honestly. 2. Capable of taking appropriate actions and work in cooperation with others. 3. Understands cleanness. 4. Capable of enduring and paying efforts.	Motivation Manner Morality Mercy
Service knowledge	1. Understand the importance of servicing others 2. Understands the effect of servicing others 3. Capable of utilizing servicing techniques.	Motivation
Worker knowledge	1. Understands the term of the Chamber of Commerce and Industry.	Motivation
Social knowledge	1. Possesses social common sense and capable of understanding current topics.	Motivation Manner
Human relationships	1. Capable of corresponding in human relationships.	Manner Morality Mercy
Knowledge on customer service	1. Understands customer psychology and express Intelligence. 2. Understands and show ordinary manners 3. Capable of expressing appropriate manners in front of customers.	Manner Morality Mercy
Conversation	1. Speaks polite and welcoming words. 2. Speaks intelligently in front of customers. 3. Able to present, explain and convince customers.	Manner Morality Mercy
Attire	1. Dresses appropriately in front of customers.	Motivation Manner

(2) Mercy

The word "Mercy" used in this paper does not mean "tolerance" in English. Tolerance in technical terms means "allowance" or "general variance", but in primary definition it is "to tolerate". Secondary meaning is "generosity". In this paper, "Mercy" means "mercy or generosity" as primary definition. Thus, "Mercy" in this sense refers to individual sense of morality subordinate to social ethics.

2.2 Complaint Pyramid

Types of response can be divided into either legislative response or cordial response. Although complaint is dealt as "expressed feelings", there always exist underlying feelings of dissatisfaction which may lead to complaint. [5)] There is a possibility that not every complaint is being reported. Therefore, complaint pyramid is completed by gathering and organizing information from stake holders' perspective. Sympathetic consumers are inclined to change their level to active interest and passive interest depending on their time and situation. Keio University professors emeritus and Graduate School of Economics and Management professor, Dr. Masaki Shimaguchi described in his lecture on "Modern Marketing and Customer Creation" on November 7, 2007, "It is only 4% of customers who makes a complaint to express their dissatisfaction, according to the investigation conducted in the United States. The rest stays silent feels the situation hopeless. This problem should be handled as a management problem to be solved as promptly as possible, since if there is one complaint it would mean that are many customers lost under the surface of the water. (Figure-1)

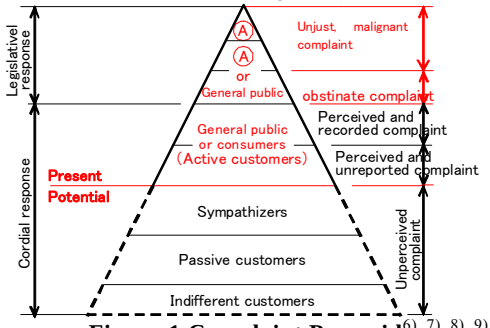


Figure-1 Complaint Pyramid [6), 7), 8), 9)]

Note) A is indicative of "AGGRESSIVE".

2.3 Analysis Model for Causes of Complaints

(1) Expectation-Confirmation Model

Oliver explains that stakeholders have some level of expectations for consumer goods that complaint expectations may become a standard for stakeholders in evaluating response to their claims. If response exceeds their expectations, requests made through complaints will be satisfied. If the response is at expected level, indifference will result. If response is below the level, complaint will remain unsolved. [10), 11), 12)] This would be a helpful perception for stakeholders who are using lifeline every day. Hence, indifference is a result of an effort to maintain service at expecting level so that lifeline can be used regularly. If lifeline is temporarily obstructed due to construction work or accidents, complaints would rise.

(2) Human Factor Analysis Model

Human factor analysis should provide safety, economy and enhancement of welfare for the employees. [13)] These human factors are illustrated in F. H. Hawkins' SHEL model [14)] where "L" in the middle, represents worker himself and "S" is software such as work procedure, documents with instruction, instruction measures, education and training, "H "is hardware such as work tools, machine and facility, "E" is work environment such as temperature, humidity, sound, vibration, light, and space, and "L" is human factor such as surrounding people, supervisors to give instructions and colleagues to surround this L. Here, m-SHEL model [14)] is proposed in the context of management application. (Figure-2)

a) F.H.Hawkins' SHEL model

b) m-SHEL model

Figure-2 SHEL model [14)]

These models explain that motivation of a worker, who is the main person at work, himself and management is essential, but if pervasive supervision and leadership exist within an organization where an individual is highly motivated, the model is appropriate, but where stakeholders in general is concerned, it is necessary to think of a model which incorporates individual difference to satisfy stakeholders.

(3) Analysis of "Setsugu" in Complaint Response

When a stakeholder makes a complaint, relevance between how much Setsugu may affect his judgment and the complaint response can be analyzed using Setsugu Analysis model. Perceptional variance is added to the model to look into the qualities of Setsugu.

(4) Difference in Stakeholders' Perception

In an information processing procedure, a stakeholder who makes a complaint confronts unpleasant situation, becomes attentive to the situation, then tries to interpret the information to grasp the situation. "Perception difference" is defined as the difference in interpretation of complaint response during this process.

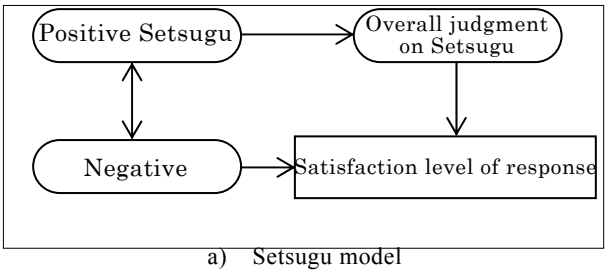
(5) Analysis model

Setsugu analysis model is designed in considering the following points 2.3(1)～(3).

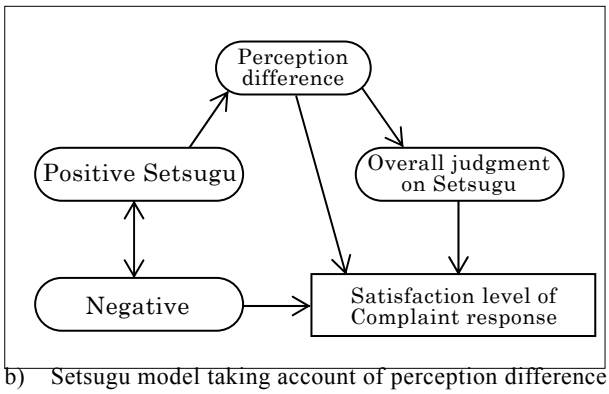
①Causes of Setsugu related complaints were selected. Each cause was determined whether it is positive or negative, and analyzed if either had influence on overall judgment through Setsugu.

②Similarly to above, details to consider difference of perception were added to analyze how Setsugu interfered in positive cases and negative cases.

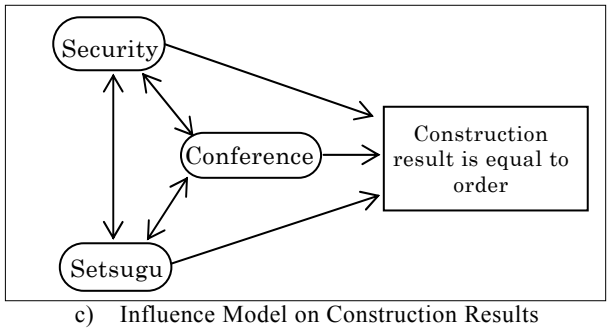
③If complaint (n=382) is made by the contractor of construction, he was asked how much Setsugu was involved in the mutual agreement (or asked of the interest level in the subject) (Figure-3)



a) Setsugu model



b) Setsugu model taking account of perception difference



c) Influence Model on Construction Results

Figure-3 Examination model of Setsugu

3. MEASURES

3.1 Qualitative Research

A survey was conducted on stakeholder complaints by phone calls to lifeline company A of sample (number=352) in 2007 and 2008.

3.1 Quantitative Research

(1) Sample Collection Method and Ideas on Research Area

Where privately and publicly owned sectors are concerned, it was necessary to select Nagoya in Chubu (mid-Japan) area to establish large city standards along with the Tokyo 23 districts, since it was selected in the confidence research[2]. In large cities, lifelines except water pipeline and highways are privately owned. Especially 96% of national gas enterprise is privately owned and 4% is publicly owned. On one hand, some lifelines other than water pipeline and highway in local cities are still managed by government owned companies. Furthermore, LP gas (Liquefied Petroleum gas) is still more common in local areas compared to large cities and central area of local city that lifeline should be organized as network and areas with more than 50 thousand households was selected. This is because it is likely that there would be less number of stakeholder complaints if there are less household demands for pipeline. Considering above conditions, total of 4 areas including Sendai city which is managed by Sendai city Gas Bureau in Tohoku (362,000 household demands) and Kanazawa city managed by Kanazawa Corporate Bureau (77,000 household demands) which is one of the local district in standard area of Chubu were selected to administer an adequate survey. (Table-2)

Table-2 Lifeline operation and management in the research area

District	Name of the city	Lifeline operation category			
		Electricity	Gas	Upper / lower water line	Road
Large district	Tokyo 23district	B Electric Power	F Gas	Tokyo metropolitan	National and local public organization
	Nagoya city	C Electric Power	G Gas	Nagoya city	
Local cities	Sendai city	D Electric Power	H city gas bureau	Sendai city	
	Kanazawa city	E Electric Power	I city corporate bureau	Kanazawa city	

Questionnaire was distributed through web research conducted in 4 areas of above Table-2. Sampling answers are given only by those who are registered to Cross Marketing Corporation. Therefore, respondent are stakeholders who are capable of using PC and are able to answer using e-mail. In order to avoid concentration of response coming from one area, sample answers were collected until the number of response reached 500. Thus, number of sample is number=500 for each areas and number of sample totals number=2,000. Out of which stakeholders n=382 who had experience of making complaints in the past were selected. In order to use covariance analysis model to formulate a hypothesis from the given model, more than sample number=200 samples were necessary to set a parameter for the covariance analysis model since for liable results. To meet the requirements sufficient number of samples (n=382) were collected as parameter for statistics results. Covariance data analysis according to AMOS[15] was conducted on data obtained from questionnaire administered to those who were given the role as stakeholders (n=382) , purchasers and complainers.

(2) Period of survey

Period of survey and sample attributes are as follows:

①Period of survey: December 15th ~20th , 2009

②Age/ Gender: age 20 ~69, male/female

③Research area : Tokyo 23districts（number=500）
Nagoya city（n=500）
Sendai city（n=500）
Kanazawa city（n=500）

④Evaluation measures : 5 grade evaluation method

A respondent was asked to choose answers from "applies" "somewhat applies" "cannot say" "somewhat does not apply", "does not apply" to allocate (distinguish) according to 5 levels in the 5 grade evaluation method.

（3）Questionnaire

Questions are based on the content of mode regarding security, mutual agreement, overall evaluation on Setsugu (positive or negative) to see how Setsugu is influencing the other factors. Questions were asked regarding Causes of complaint and what would be of importance for the purchaser if he had made a complaint in the past, in relation to security, Setsugu and mutual agreement. The question was intended to see if the results of confidence research[2] on how security and setsugu could Influence the mutual agreement would be supported. （Table-3）

Table-3 Questionnaire

category		No	Questions
A	security	1	Do not allow stones or concrete to fly and hurt the pedestrians and vehicles
		2	Do not allow the water or fowl smell to leak
		3	Do not allow gas failure, electricity failure, telecommunication failures and road subsidence to happen.
	Mutual agreement	4	To hold a discussion before starting construction work
		5	Should be able to discuss immediately if there are any changes in plans during the middle of construction.
		6	To be able to understand your point of view.
	Setsugu	7	To promote and gain understanding of the neighbor residents before construction start.
		8	That the construction worker does not behave in a rude manner to the neighbor residents
		9	That the construction worker do not use arrogant and rude words.
		10	In adequate explanations regarding the supervision of construction works.
		11	In adequate guidance for pedestrians and vehicles during construction.
	Construction results	12	That the completion of construction works fulfills the expectations held upon placing an order.
B	Perception varience	31	Listened to what you have to say before deciding upon how to respond to complaints.
	Positive Setsugu	32	Courteous response by customer relations.
		33	Prompt response by customer relations
		34	Polite and appropriate words used by customer relations.
		35	Customer relations tried to fulfill your requests to solve problems.
	Negative Setsugu	36	Issues of complaint were determined one-sidedly by the customer relations respondent.
		37	Customer relations respondent's attitude was unfavorable.
		38	Customer relations respondent did not try to solve the issues you are confronting.
		39	Customer relations response from the company and the workers were ultimately justified regarding the loss and inconvenience you experienced.
		40	Customer relations' explanation was understandable.
		41	Customer relations response was appropriate.
		42	Customer relations respondent acted according to his role appropriate stance (position).
	ResponseResults	43	Customer relations response was satisfactory, agreeable.

note）A is "Question asked if the stakeholder gains the role as purchaser".
B is "Question regarding stakeholder complaints".

4. RESULTS

4.1 Realities of Complaints in Lifeline Construction

（1）Realities of Complaints 2007

Complaints by telephone calls（sample number=212）from stakeholders to Corporation A in 2007 was investigated. As a result, 60％ of complaints were related to Setsugu and 25% of complaints were related to construction works, and percent total of the two factors accounted for 85% of the complaints category. （Figure-4）

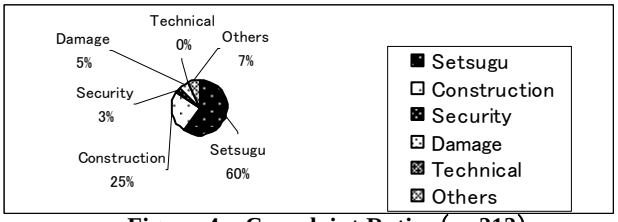


Figure-4 Complaint Ratio（n=212）

（2）Realities of Complaints 2008

Complaints by telephone calls of sample （number=140）from stakeholders to Corporation A in 2008 was investigated. As a result, 61％ of complaints were related to Setsugu and 28% of complaints were related to construction works, and percent total of the two factors accounted as much as 89% of the complaints category. Two dominant factors accounting for considerable percentage in complaint factor ratio, and their growing trend were seen both 2007 and in 2008. （Figure-5）

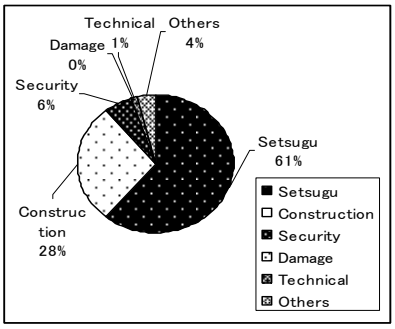


Figure-5 Complaint Ratio（n=140）

4.2 Influence Analysis on Positive Setsugu and Negative Setsugu

Questions No.32～43 in Table -3 were incorporated in to Setsugu model to analyze Causes of complaint in the covariance model. Results showed GFI(Goodness of Fit Index)=0.904, AGFI(Adjusted Goodness of Fit Index)=0.854, CFI (Comparative of Fit Index)=0.931, χ^2=196.871 and RMSEA(Root Mean Square Error of Approximation)=0.088. GFI, CFI marked above 0.9 and AGFI marked above 0.83 that it can be said that there is a high possibility of relevance. This is led from real experiences related to complaints. Considering the fact that complaints by telephone calls asserted complaints' relevance with Setsugu, this model should be reliable. There is relevance between the positive Setsugu and negative Setsugu factors. Positive Setsugu contribute to adding satisfaction through overall evaluation on Setsugu. Negative Setsugu directly becomes dissatisfaction toward customer relations respondent's manner. In general, if GFI, AGFI and CFI values are more than 0.9, then it is safe to say that the influencing coefficient is liable. If RMSEA is below 0.05, then it can be said that the

model is suitable and if it is more than 0.1 then it is unsuitable.（Figure-6）

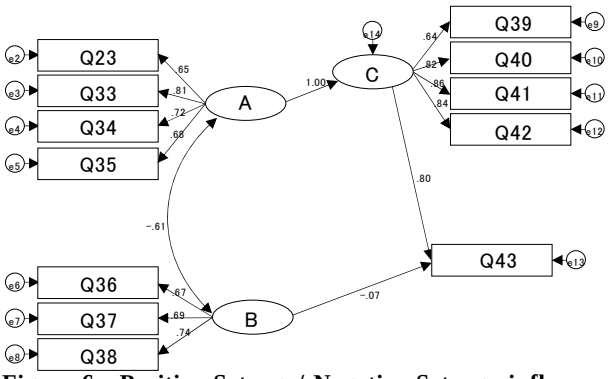


Figure-6 Positive Setsugu/ Negative Setsugu influence analysis（Sample number=382）

note）Q32~Q43 relate to questions in Table-3. A shows security positive Setsugu. B is negative Setsugu. C is Setsugu based on overall evaluation.

4.3 Setsugu Influence analysis considering perceptional variance

Causes of complaint are expressed in Setsugu model and questions No.31～43 in Table-3 were applied in the covariance structure analysis model. Results showed GFI=0.894, AGFI=0.850, CFI=0.920, χ^2=287.299 and RMSEA=0.098. Although CFI was 0.92, since it was above 0.83 it can be said that there is a high possibility of relevance. Although the model may not apply completely, the fact that the model is led from real experiences related to complaints suggests limitation of the model itself. However, considering the fact that complaints by telephone calls asserted complaints' relevance with Setsugu. Positive Setsugu is absolutely necessary condition but would not satisfy stakeholders just by having complaints to listen to his statement. Moreover, Positive Setsugu would trigger satisfaction toward complaint respondent's action through overall judgment of Setsugu as shown in Figure-5.（Figure-7）

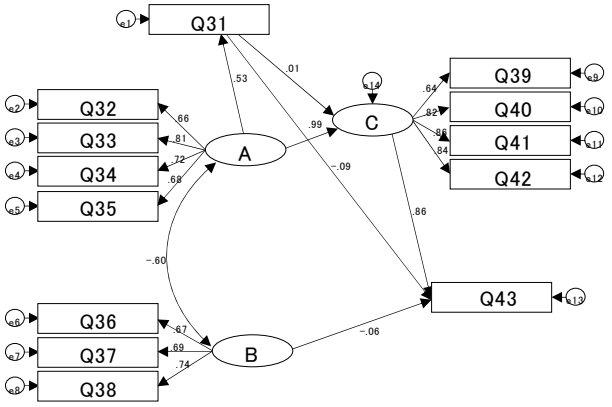


Figure-7 Perceptional variance considering Setsugu influence analysis（n=382）

note）Q31~Q43 relate to questions in Table-3. A shows positive Setsugu. B is negative Setsugu. C is Setsugu based on overall evaluation

4.4 Setsugu Influence Analysis Considering Construction Results

From the role obtaining model, where purchaser is also the stakeholder with complaints covariance analysis was conducted based on questions in Table-3. Results showed GFI=0.915, AGFI=0.865, CFI=0.926, χ^2=206.941 and RMSEA=0.092. GFI, CFI were above 0.9 and AGFI had also been above 0.83 that the relevance would be accountable. Although the model may not apply completely, the fact that the model is led from real experiences related to complaints. Considering the fact that complaints by telephone calls asserted complaints' relevance with Setsugu, this model would be sufficiently adequate. From this analysis it can be drawn that Kohlberg's concern regarding adjustment by mutual agreement is important. Mutual agreement had a strong relevance of 0.77 to construction results and maintenance of security and Setsugu were the important relating factors in achieving mutual agreement, both marking above 0.7 to show strong relevance. Hence lifeline construction is closely related with security maintenance, mutual agreement, Setsugu. Especially with regard to what the stakeholders think as Setsugu, there is a strong relevance with mutual agreement and maintenance of security to mark 0.8.（Figure-8）

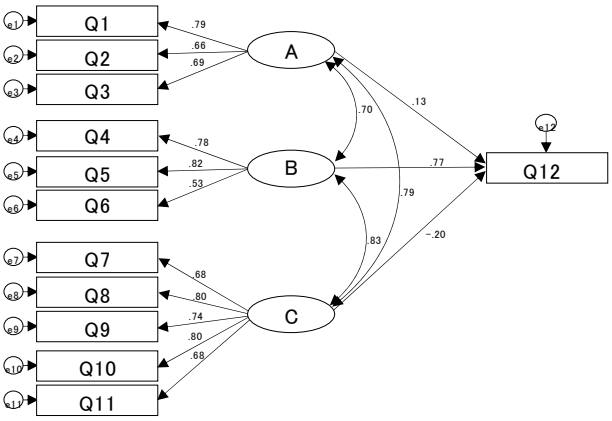


Figure-8 Setsugu influence analysis（Sample number=382）in consideration of Construction Results

note）Q1~Q12 relate to questions in Table-2. A shows security maintenance. B is mutual agreement. C is Setsugu.

A survey was conducted to see if enforcement of Setsugu by workers and supervising staffs would reduce the number of incidents and accidents. As a result, 63% of the workers and supervising staffs who think that number of accidents can be reduced by strengthening of Setsugu. 53% of workers and supervising staffs considered "chill and gasp" incidents would be reduced. From this Setsugu is important at lifeline construction.[3)] (Figure-9)

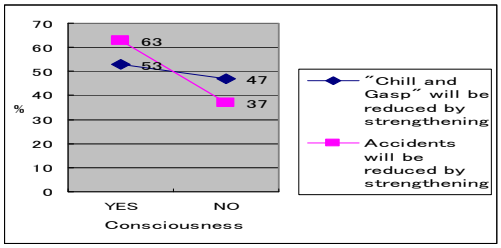


Figure-9 Consciousness of Worker's and Supervisor's to Setsugu (37companies as sample n=623) [3)]

5. CONSIDERATION

5.1 Relevance between Setsugu and Satisfaction

Covariance structure analysis （Figure-6）on positive Setsugu and negative Setsugu which investigate causes of complaint reveals that both positive factors and negative factors are relevant to each other and that positive factor affects Setsugu through general evaluation of customer

satisfaction. On the other hand, negative factor without going through general evaluation of Setsugu, directly results to appear as strong feeling of dissatisfaction. Qualitative analysis results （Figure-4, 5）where complaint (discontent) percentage high, also proves that negative Setsugu directly appears as stakeholder's strong antipathy.

Further, Figure-7, in the Setsugu model with perceptional variance added, comments given as "Listened to what you have to say before deciding upon how to respond to complaints" did not signify that the stakeholder was directly satisfied by customer relations respondent's response to the issue. This does not mean that the stakeholder just wants to be heard but is judging according to customer relations response. Since lifeline construction is often moving. Construction is carried out to the end unless there is suspension by order especially during the busy period. In such cases, when complaints arise, construction work is near the end. Since construction work is finished by the time the actual measures are decided, hearing complaints would not directly lead to improving stakeholders' level of satisfaction. Above facts suggest the importance of related supervisors as well as workers to acknowledge that promoting positive Setsugu would be essential to encouraging the stakeholders to deepen understanding of actual construction work. In order to do so, it is necessary to motivate the supervisors and workers to improve their manners, to act promptly and appropriately and be able to coordinate the surroundings.

5.2 5m-SHEL from Setsugu & Construction results perspective

If a purchaser was a claimer of complaints in the past, the covariance structure analysis (Figure-8) result asserts that effort to establish mutual understanding is substantial in achieving construction results equivalent to purchase order of construction. On the other hand, stakeholders may be interested to hold meetings with residents prior to and during construction. Existing SHEL model lacks perception of "task role" and "human relationships". By complementing the model, SHEL model will become more suitable for human (social) relationships today. In practical terms complaints that were sent to lifeline companies can be categorized into Motivation, Manners, Morality and Mercy. In order to reduce the number of human factor errors, it is important to administer management on Motivation, Manner, Morality and Mercy which are present in any human being although the level may differ according to an individual. In such cases, Setsugu would be essential, since passion and sincerity expressed at meetings could lead to establishing trust relationship with the stakeholders. When I was representing a construction site in Wakaba district of Sendai city, a chairman of a neighborhood self-governing body said, "there are so many who do nothing but speak or listen but respond differently to what he had said. If he visits frequently and explains, his passion and honesty would have been understood and there will be fruitful discussions at the town meetings." What is important between the stakeholders and purchaser and constructors are, "motivation" to express necessity to carry out the task of construction works, "manners" to show sincerity in the conduct of construction works, "morality" to respond to stakeholders with justice and "mercy" to express generosity towards stakeholder complaints. These four factors would become increasingly indispensable to promote real trust relationship. Consequently, 5m-SHEL to incorporate above four M factors is an ideal model to reflect on modern construction work sites, and human factor analysis model should be seriously considered. （Figure-10）

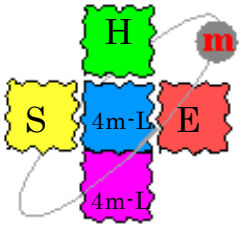


Figure-10 5m-SHEL model

6. CONCLUSION

Psychological reaction of the claimers of complaints obviously showed the importance of Setsugu and demonstrated how Setsugu is positioned in a communication. Therefore, 5m-SHEL incorporating four Ms helps us to understand the complexity of modern society using human factor analysis model for lifeline construction. This also applies to perception of workers and supervisors.

7. SUMMARY

During the recent years, morally questionable business activities are justified as long as they do not violate the law. The author feels there is a need for reform in the society so that honest people would be able to benefit. Also psychological analysis of silent stakeholders should be conducted to establish pyramid of complaints for further studies. Lastly, I would like to express my sincere appreciation to Social Technology System Professor, Mr. Toshio Wakabayashi at Tohoku University Engineering Research Department who has provided me guidance in writing this paper.

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