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著者	Sunayama Wataru, Yada Katsutoshi
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The River-Rafting System for Knowledge Discovery Related to Persuasion Process Conversation Logs

Wataru Sunayama, and Katsutoshi Yada, *Member, IEEE*

Abstract— The purpose of this research is to develop a framework to represent the content and process of persuasion communications for overdue payment collection, thus making it possible to examine how the skilled operators have used theme related keywords concerning motivations to pay, the payment methods and the payment confirmation in their negotiation to achieve higher collection success. This paper describes a basis for modeling a persuasion process. There has been no research or methods for dealing with large amounts of conversation logs for discovering useful knowledge about persuasion processes. In this paper, we report our successful efforts in discovering a part of the distinctive features of skilled worker techniques as indicated in their conversations related to overdue payment collection and the application of our methods to communication data related to a Japanese telecommunications company.

I. INTRODUCTION

AS part of the process of the recovery of the economy and the expanding business activities of companies in Japan, the growing disparity in income levels in Japan has become a problem. In recent years, the structure of the economy has undergone vast changes and the proportion of direct business transactions with end use consumers, “BtoC (Business to Customer)” business, has been rapidly expanding because of a factor causing serious conditions to arise. For example, depending on the company involved, trouble concerning customer payments has been growing. In the case of BtoC business, the numbers of customers involved are very large so that it has become necessary in many cases for the companies affected to rationalize and improve the efficiency of these business operations.

In the existing research [7], we discussed the problem of collection of overdue payments related to the operations of Japan’s telecommunications companies. In the case of these companies, the company operators called up the overdue payment customers and have been negotiating the payments of these overdue amounts. However, it has been seen that the success of such negotiations depends to a large extent on the levels of the persuasion skills of the individual operators. However, in 2007, because of an organizational problem, over half of the experienced employees will leave the company. Thus, it has become necessary to move quickly to

transfer these special, but tacit, unrecorded skills of the successful operators to other employees. Therefore, we divided the current employees into those with high collection skills and those with lower collection skills and have analyzed the actual verbal content and structure of their negotiations to determine the factors that could account for differences in their levels of success and to discover ways to transfer this newly discovered knowledge.

The persuasion patterns that were created from the data called [2] and this contained such major basic elements as getting the customers to acknowledge the problem, and getting the customer to change his/her attitudes and behavior. One of most critical factors affecting the success, or lack of success, of the persuasion procedures was the actual content of the communication as such, in other words, the actual information that was communicated during the conversations. Yada et al. [7], by combining the use of text mining and statistical methods, discovered groups of special vocabulary items, including words and phrases and by measuring the frequency with which these key terms were used, were able to identify and extract knowledge that underlies superior negotiating skills. In the case of these skills, the quantitative frequencies of use of these words and phrases in the negotiation conversations and underlying structures were clarified. However, although the static characteristics of these conversations and interplay became known, it became clear than there was as yet insufficient understanding of the dynamic aspects these processes and that knowledge gained was not yet readily usable.

Thus, at this point, in the case of this study, labels were created, and are presented below, to identify the various types of words and phrases contained in these conversations and to identify the roles that these terms play in the flow of these conversations. These terms are presented and used as a framework for analyzing the persuasion processes involved. In addition, by analyzing the conversation logs of the actual late payment collection problems of the company, it is demonstrated that by changing over to the knowledge concerning negotiating skills that is clearly indicated, that a useful, effective analytic framework has been established. The main objective of this study was to develop such a framework that would make it possible to create a model of the persuasion process and also to verify the usefulness of this model using actual company data.

W. Sunayama is with the Faculty of Information Sciences, Hiroshima City University, 3-4-1 Ozuka-Higashi, Asa-Minami, 731-3194 Hiroshima, JAPAN (Tel: +81-82-830-1705, e-mail: sunayama@sys.im.hiroshima-cu.ac.jp).

K. Yada is with the Faculty of Commerce, Kansai University, Suita, 564-8680 Osaka, JAPAN (Tel: +81-6-6368-1121, e-mail: yada@ipcku.kansai-u.ac.jp).

II. THE PERSUASION COMMUNICATION PROCESS

Where the creation of a model of the persuasion process is concerned, the development of a framework for expressing the various changes in the conditions that take place during the persuasion communications was the primary focus. We found it necessary to clearly express both the content of the persuasion communication in these encounters and the timing of the changes in the content. At this point, using the principles established in the previous study, [7] we examine here the framework for use in analyzing the content of late payment recovery persuasion communications.

A. *Creation of the Mood to Pay*

When persuading late payers, the emotions and feelings of the party being persuaded are likely to have an effect on success or lack of success [4]. The late payer, with regard to requests to pay, will not necessarily take a positive attitude and may look for opportunities to offer reasons why he/she will not pay and attempt to get away without paying. In order for the operator to be able to get the late payer to change his attitude toward the matter of paying his debt, it is necessary to supply the late-payer with detailed information concerning the situation and to warn him of possible consequences while controlling his/her emotions. In the first place, the late-payer has already been officially notified several times that he is late paying his bill and has chosen to ignore such notifications. It can be seen from this, that the late-payer is likely to have a negative attitude with regard to persuading him to make the required payment [1]. Therefore, it is necessary to change his attitude by using various warnings and communicating the facts.

B. *Conferring on a Payment method*

When these persons are themselves contributing to this process and when they sufficiently understand the content of the persuasion, based on this information, they tend to change their attitudes [5]. In order to get them to follow through with the payment, in the case of such negotiations, the operator must indicate specific and concrete methods of payment several times, in most cases. This type of conversation may get the late-payer to become involved positively and also helps the late-payer to understand accurately the problems involved when paying late and this process has the effect of raising the recovery success ratio significantly.

C. *Final Confirmation of Payment*

In the case of recovery of late payments, since the late-payer will use such excuses as misunderstandings, forgetting the payment and other excuses to deflect the request for payment, in order to keep the late-payer from avoiding payment, the operator will often use the approach of reconfirming the method of payment to which the late-payer has agreed. The repetition has the effect of strengthening the understanding of the content and promotes changes in the attitudes of the late-payer [3]. By repeating the content of the negotiation, the operator has the opportunity to re-stress the content and get the late-payer to take action.

D. *Key Points Concerning Recover of Late Payments*

The basic factor is to get the late-payer “into the mood” to pay by using the payment persuasion process described above. The order here is probably to “confer on the payment method” and then to “reconfirm, for the last time, the payment method”. It is necessary for the operator to carry this process out quickly and effectively to encourage the late-payer to pay. When the operator is responsible for a relatively large number of later-payers, it is necessary handle the matter as simply as possible and not to spend too much time on a given late-payer. This is necessary to keep the conversation moving. The reason is that it is better not to spend a whole hour on one late-payer even if one succeeds, but rather, to spend one hour on six late-payers and collect from two of them. This approach leads to the recovery of much greater total sums.

Using these factors, it was possible to clarify the structure of the persuasion content of the late payment collection procedures. However, it was necessary to use a new framework for expressing the time-flow related changes in the persuasion content in the conversations. In order to acquire knowledge making it possible to carry out the persuasion procedures in a shorter period of time, it was necessary to create a method of analyzing the persuasion content.

III. DISCOVERING NEW KNOWLEDGE CONCERNING THE PERSUASION PROCESS USING BUSINESS DATA

A. *The “River rafting” System and Persuasion Communication*

The term, “river rafting” system [6], refers to perceiving the entire persuasion communication process, from beginning to end as a “river rafting process”. This involves quantifying the vocabulary items used during the flow of the conversation and achieving a grasp of the changes that take place so that the various aspects of the communication process can be analyzed quantitatively. The persuasion communication describes the situation being dealt with, communicates the thinking and intentions of the communication parties and, as an outcome, attempts to get the other party to take the actions that are desired. This “river rafting” process involves several themes and the final destination downstream is to cause changes in the late-payer’s behavior so that he/she takes action. It is necessary for the persuading side to discuss these various key themes with the late-payer and to “descend the river” efficiently. This river rafting system flow communication process must contain several themes that must be efficiently handled and it was necessary to extract knowledge needed to facilitate this process.

The river rafting system flow consists of the following elements for analysis:

- 1) The themes and vocabulary items contained in communication concerning the major important themes (Theme vocabulary).
- 2) Various assigned label terms based on the distances

between the themes (and theme-related vocabulary).

- 3) Frequency of use of the various themes (and theme-related terms) and information concerning the success/lack of success of the persuasion process.

Using knowledge gained concerning the various aspects of the overall persuasion systems, it was possible to identify the critical themes and the related vocabulary items for these themes that were the most important elements for success and how to make use of them.

B. Themes and Theme Vocabulary Items

In the case of the “river rafting flow” of the persuasion process system, the next step was to create labels to identify the various themes and related theme vocabulary items. Concerning themes directly related to collection of overdue payments, it was possible to establish three different category labels: “Mood creation leading to payment,” “Conferring on payment methods” and “Final confirmation of agreed method of payment.” In the case of this paper, with regard to the vocabulary items used in the conversation logs concerning the aim of overdue payment collection, by means of an analysis of the various factors involved, using the results obtained in [7], these factors were divided into groups and these vocabulary items groups were given appropriate key element word labels. However, the data that we used was actual company data and this data contained many forms of noise. Therefore, it contained many vocabulary items that had low relevance to the factor key word categories. Therefore, the vocabulary items in each category with the highest relevance to the critical themes were selected out and are called “factor key words.” Table 1 consists of a list of factor key words and theme key words.

TABLE 1. FACTOR KEY WORDS AND THEME KEW WORDS.

	Factor Key Words	Theme Key Words
Creation of the mood to pay	Letter, money, interest, shop, use, promise, request for payment, lawyer	Request for payment, letter, document, arrears, interest
Conferring on payment method	Confirmation, request, remit, divided payments, remittance, full payment, letter, full amount, arrival, defense, promise	Sum, remittance, full amount, divided payment, complete amount
Final confirmation of payment	Request, divided, court, court house	Can pay, receive, submit, make payment

C. Assignment of Labels

In the case of the river rafting system, in the conversations between the overdue customer and the collector, a number of vocabulary items are used (Includes nouns, verbs and adjectives, etc.). To carry out the analysis, explanatory function labels were used. In other words, for the vocabulary items used in the conversations, the following six function labels were used, as per the accompanying definitions.

- 1) TOPIC: Conversation theme vocabulary item (Theme key word).

- 2) FLOW: Theme-related word (Also, previously used word).
- 3) NEW: Newly introduced word (First use).
- 4) INC: Word incorporated into theme-related vocabulary items, not related at first use.
- 5) BYWAY: Previously used, non-related theme vocabulary item.
- 6) FLOOD: First use vocabulary item not related to a theme.

These labels can be divided into two major categories that include the various label types that have a clear relationship to themes (TOPIC, FLOW, NEW, INC) and the less closely-related/non-related to theme items (BYWAY, FLOOD). This classification by relevance to a given theme is made based upon whether a given item appears within the ten preceding a given theme word or within the ten words following a given theme word. A given item that satisfies this rule at least once is classified as a “theme-related vocabulary item.”

Based on this degree of given theme-relatedness, the item is also given such labels as NEW or FLOOD as suitable. From the second use of given term, and for first use of FLOOD label terms, when such a term is encountered within the theme before or after 10-word location, it is labeled as an INC term. When the term is encountered again, it is labeled as a FLOW term and a NEW term. When subsequent encounters occur, it is labeled as a FLOW term.

D. Overdue Payment Collection Ratio and Changes in Objective

The objective of this paper was to clarify a basis for tracking the frequency of use of theme words and analyzing the relationships of these terms to high ratios of collection of overdue payments. Table 2 shows the collection ratio calculations by operator. First, the term (label) usage ratios for each conversation by each operator were calculated. Then, the collection ratio correlations with each theme label were calculated. From these calculations, the most effective given theme-related terms (labels) were identified and it was possible to interpret the flow of a given conversation and suggest effective collection strategies.

TABLE 2. NUMBER OF CONVERSATIONS BY OPERATORS AND COLLECTION RATIOS

Operator #.	# of conversations	Collection ratios
1	7	0.231
2	8	0.174
3	9	0.171
4	3	0.156
5	5	0.152
6	5	0.152
7	11	0.147
8	7	0.133
9	8	0.132
10	9	0.122
11	9	0.122
12	9	0.116
13	7	0.112
14	8	0.110
15	3	0.105

	Total: 108	Average: 0.142
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IV. EXPERIMENTS

A. Conditions of the Experiments

The data used for this experiment was data provided by a telecommunications company. It included billing for amount of use (Whether overdue reminders were sent out or not was not a condition). This data included records of conversations with late-payers aimed at collecting late payments. The experiment involved 15 operators. These operators carried out a total of 108 conversations with late-payers with the object of collection of the overdue payments. These operators were supplied with the vocabulary items discussed in Section 3 that included key factor key words and theme key words.

Formula 1 was used to calculate the correlation coefficients for conversation i , label j , occurrence rate $rate_i(j)$ by using the number of label j appearance in i , $num_i(j)$. The label j correlation coefficients for conversation i for the operator overdue payment collection, p_i , were calculated using Formula 2 below. The terms in Formula 2, $\overline{rate(j)}$ と \overline{p} , Formula (3) and Formula (4) are the respective average values.

$$rate_i(j) = \frac{num_i(j)}{\sum_j num_i(j)} \quad (1)$$

$$cor(j) = \frac{\sum_i ((rate_i(j) - \overline{rate(j)}) (p_i - \overline{p}))}{\sqrt{\sum_i (rate_i(j) - \overline{rate(j)})^2 \sum_i (p_i - \overline{p})^2}} \quad (2)$$

$$\overline{rate(j)} = \frac{1}{108} \sum_{i=1}^{108} rate_i(j) \quad (3)$$

$$\overline{p} = \frac{1}{108} \sum_{i=1}^{108} p_i \quad (4)$$

B. Results of the Experiments

Table 3 shows the correlation results for each respective theme label. However, the Table results are based on calculations for all vocabulary items for all three of the theme categories. For the various labels, the correlations indicate the relative level successful collection when the given term is used. In addition, where negative correlations are indicated, this means that collection rates are higher when these negative correlation label vocabulary items are not used.

1) Theme-related vocabulary terms and unrelated terms.

Figure 1-a) indicates correlations for collection for theme-related factor key words. The theme-related words include TOPIC, FLOW, DIV and INC. The non-theme related words included BYWAY and FLOOD. When the factor key words were used, as was the case for the complete process correlations, the more closely theme-related words that were used, the higher collection ratios. In addition,

Figure 1-b) shows the correlations when the theme key words are used. Based on these results, collection correlation results tended to be positive like the total process theme calculations. However, it should be noted that the correlations for successful collection were heavily influenced by terms related to conferring concerning method of payment.

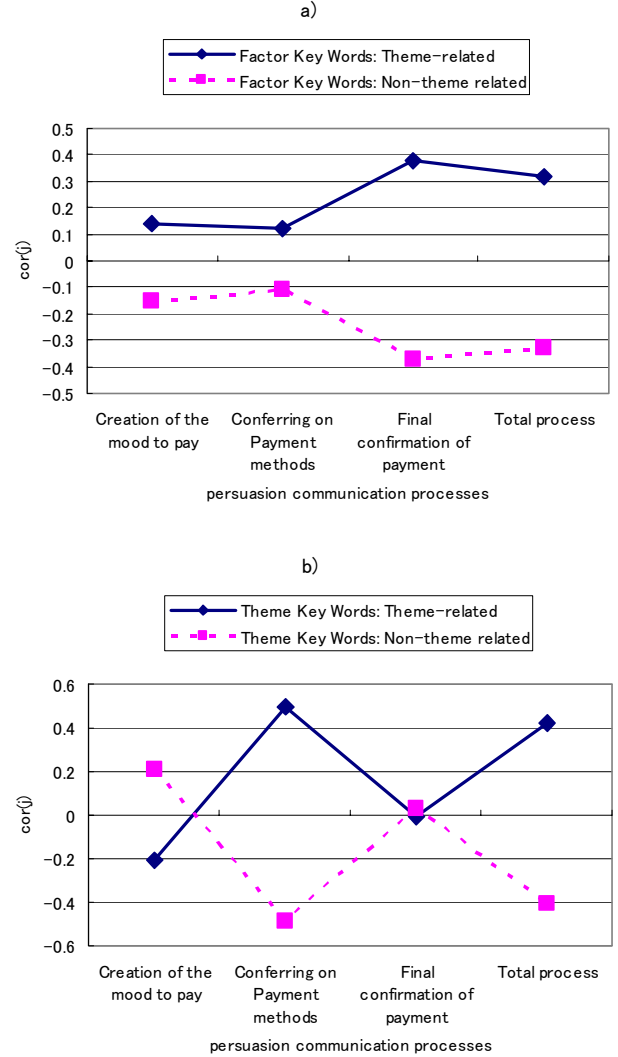


Fig. 1. The correlation coefficients by label and the overdue payment collection ratio.

2) Conversation characteristics related to specific labels.

In Table 3, when the related correlations for the respective labels are examined, the values for factor key words can be seen to be relatively weak in terms of correlation. It is possible to interpret this result as indicating that for each of the respective themes, vocabulary items that have differing meanings have been included. Here, we focus on rechecking the factor analysis that resulted in the groupings of these various vocabulary items.

Table 3: Correlations by label for successful collection

		TOPIC	FLOW	NEW	INC	BYWAY	FLOOD
Creation of the mood to pay	Factor	0.07	0.09	0.14	0.26	-0.17	0.03
	Theme	0.06	-0.35	-0.3	0.28	-0.01	0.13
Conferring on payment methods	Factor	0.23	-0.06	0.11	0.16	-0.11	0.01
	Theme	0.48	0.55	0.48	0.19	-0.32	-0.2
Final confirmation of payment	Factor	0.31	0.44	0.14	0.35	-0.27	0.03
	Theme	0.2	-0.17	-0.06	0.19	-0.08	0.1
Total process	Factor	0.42	0.04	0.18	0.58	-0.32	-0.09
	Theme	0.53	0.12	0.26	0.51	-0.44	-0.11

As can be seen in Table 3, the level of correlation of the factor, “Creation of the mood to pay” (TOPIC) is relatively low. In addition, FLOW is indicated as a minus value. Thus, it appears that repeated terms aimed at getting a given late payer into the mood of paying do not appear to lead to payments. Rather, the factor, “Conferring on payment methods” (TOPIC, FLOW) appears to have a higher correlation with successful collection and relatively large amounts of time are being spent on this factor. Regarding the total process theme, non-relevant vocabulary items, a high negative correlation is indicated. Thus, it can be seen clearly that irrelevant topics of conversation tend to have a minus effect on collection success ratios.

3) The implications related to the payment persuasion process.

Frequent use of vocabulary items related to the three late payment collection themes, “Creation of the mood to pay,” “Conferring on payment method” and “Final confirmation of payment” appears to help to raise the level of successful collection. However, based on the new knowledge of the process that we gained, the “Creation of the mood to pay” theme seemingly did not have very high importance and that the time spent conferring on “Method of payment” was, in contrast, of high importance for successful collection. In addition, conversational topics with little or no direct relevance to the major themes tended to have a negative influence on collection success levels. Such diversions seemingly made the persuasion content ambivalent and there seems to be a possibility that such irrelevant factors have a negative effect on efforts to get the late payer to change his attitudes toward paying. It appeared that it was more effective to communicate the assumption that the late payer would pay as was his responsibility and to eliminate, as much as possible, efforts to bring about a positive mood toward payment, putting the most emphasis on “conferring concerning a method of payment” as the best way to raise the level of successful collection.

V. CONCLUSIONS

In this paper, in order to analyze a payment persuasion process, various parts of negotiation conversations were given labels indicating their role in the process. Then, these items of the content were quantified and a framework for their analysis was presented. Using actual company data for experimentation, we were able to demonstrate that the analysis framework was effective. Results showed that in order to raise the level of successful collection of overdue payments, it was discovered that it is important that more emphasis be placed on “conferring on methods of payment.” Lastly, we concluded that it is important, in order to gain deeper insight into the process, that in the future that the process be re-formulated into a series of steps and that the timing factors involved in the process regarding going from theme to theme be investigated in more detail.

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