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<td><strong>Author(s)</strong></td>
<td>Ishii, Yasuo; Takeyasu, Kazuhiro</td>
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An Analysis of the Questionnaire Investigation for Using IC Card on Purchasing

Yasuo Ishii · Kazuhiro Takeyasu

ABSTRACT

Electronic money usage is widespread at present such as IC traffic cards on the railroad. In addition to the railroads, places such as convenience stores, supermarkets, and restaurants, payment by electronic money has become possible in Japan.

Use in the traffic system and convenience stores has become popular mainly in the prepaid type IC cards such as Suica and Edy from 2001. After that, 2 major groups of the retailing business newly issued the group cards such as nanaco and WAON in April 2007.

This paper analyzes the thought of consumers for about the IC cards, which has a big influence on the buying behavior of consumers.

For this purpose, we created a questionnaire survey of using IC card on purchasing. We utilized the text mining method such as Key Graph. Reviewing past researches, there are some related researches. But analyses were based on simple accumulation such as common questionnaires. There have been a few investigations on this.

The purpose of this survey is to examine the thought of consumers about the convenience and the need of the purchasing with IC card. In addition, this survey seeks to clarify the general opinions of consumers concerning IC card systems. Moreover, this survey strives to learn about consumers' awareness of IC card systems, their expectations for IC card systems, the information they need.

Some interesting and instructive results were obtained. These are utilized for constructing a much more effective and useful IC card system which should be popularized by consumers.

Key Words: electronic money, IC card, prepaid type, post-paid type, point program
1. INTRODUCTION

Electronic money usage is widespread at the present time such as IC traffic cards on the railroad. In addition to the usage for railroads, payment by electronic money has become possible in such places as convenience stores, supermarkets and restaurants.

There are two types of electronic money. They are categorized by payment methods. One type is the prepaid type which is centered around JR East’s Suica, private railways’ PASMO in the metropolitan area, and Edy, which bitWallet issues. Another is the post-paid type. There are some electronic money such as iD, QUICPay and Smartplus which are connected to the credit card mainly in the cell phone wallets, and private railways’ PiTaPa in the Kansai area.

Use in the traffic system and convenience stores has become popular mainly in the prepaid type IC cards such as Suica and Edy from 2001. After that, 2 major groups of the retailing business newly issued the group cards such as nanaco and WAON in April 2007. They made the enriched card of the point program, and became popular for the payment inside the convenience store and supermarket. As a result, nanaco of the seven & eye Holdings jumped out to the top, at the number of the purchase payments within only 2 months after being launched in June, 2007. As the rapid popularization of the IC card being promoted, the competition among companies for getting new customers became hard.

This paper analyzes how electronic money is introduced into the market at present under the rapid popularization of using IC cards, which has a big influence on the buying behavior of consumers and how they will become popular in the future. While taking into consideration the advantages and the disadvantages of various kinds of electronic money, the development of electronic money using IC cards in the future is discussed.

The purpose of this survey is to examine the thought of consumers for about the convenience and the need in purchasing with IC card. In addition, this survey seeks to clarify the general opinions of consumers concerning IC card systems. Moreover, this survey strives to learn about consumers’ awareness of IC card systems, their expectations for IC card systems, the information they need.

The rest of the paper is organized as follows: The outline of the questionnaire research is stated in section 2. The outline of the examinees is stated in section 3. In section 4, analysis is executed. In section 5, remarks are made regarding the results of
the analysis, and section 6 is a summary.

2. OUTLINE OF THE QUESTIONNAIRE RESEARCH

We make a questionnaire investigation for using IC card on purchasing. The outline of questionnaire research is as follows.
(1) Scope of investigation: Young Person, Japan

(2) Period: October 2007~January 2008

(3) Method: Mail and self writing

(4) Collection: Number of distribution 600,
Number of collection 259
(collection rate 43.2%)

3. OUTLINE OF THE EXAMINEES

Outline of the examinees is as follows.

①Sex (Q18)

- Male: 81%
- Female: 19%

②Age (Q18)

- 18~22: 33%
- 23~29: 16%
- 30~39: 28%
- 40~49: 15%
- 50~59: 8%

③Address (Q18)

- Ibaraki: 0%
- Gunma: 0%
- Saitama: 3%
- Chiba: 0%

Fig. 3.1. Outline of the examinees (sex)
An Analysis of the Questionnaire Investigation for Using IC Card on Purchasing

- Tokyo : 9%
- Kanagawa : 10%
- Mie : 0%
- Shiga : 0%
- Kyoto : 4%
- Osaka : 49%
- Hyogo : 18%
- Nara : 5%
- Wakayama : 2%
- Yamaguchi : 0%

Fig. 3.2. Outline of the examinees (age)

Age (total)

- 18-22: 33%
- 23-29: 18%
- 30-39: 28%
- 40-49: 16%
- 50-59: 8%

Fig. 3.3. Outline of the examinees (address)
4. ANALYSIS OF QUESTIONNAIRE RESULTS

Questionnaire results are analyzed using three methods. First, summary by single variable is explained in 4.1. Second, Analysis by Key Graph is used in 4.2. Third, analysis by Correspondence is used in 4.3.

4.1 Summary by single Variable

① Q1: What kind of electronic money do you have?

ICOCA is the most one users have, which is followed by Edy, Suica, PiTaPa and PASMO. On the contrary, smartplus and QUICpay have only several percents share. Cards of payment for traffic are prevailing. In Kasai area, ICOCA and PiTaPa are prevailing and in Kanto area, Suica and PASMO are prevailing. Edy has relatively a big share in both areas.
An Analysis of the Questionnaire Investigation for Using IC Card on Purchasing

Q1 (Kansai)

Fig. 4.2. What kind of electric money do you have (Kansai)?

Q1 (Kanto)

Fig. 4.3. What kind of electric money do you have (Kanto)?
2. Q2: What kind of electronic money do you use?
The tendency is similar to the result of Q1. Edy is slightly decreasing compared with Q1 (Fig. 4.1).

![Fig. 4.4. What kind of electronic money do you use?](image1)

![Fig. 4.5. What kind of electronic money do you use (Kansai)?](image2)
Q3: What kind of electronic money do you use the most?
The tendency is also similar to the result of Q1 and Q2. Comparing the result of Q1 and Q2, Edy is not so used in Kansai area in spite of the condition that card holding rate is rather high.
Fig. 4.8. What kind of electric money do you use the most (Kansai)?

Fig. 4.9. What kind of electric money do you use the most (Kanto)?

Q4: Why is that?
“Able to use as a ticket for a railway and /or bus” and “Able to settle payment without having change” are dominant. Comparing Kansai area with Kanto area, the former one selects “Because it is a post-paid style” and “Charging money is troublesome” much
more than the latter one. It may be because PiTaPa, which is well used in Kansai area, is "Post-paid style and is also the style that charging money is not required".

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**Fig. 4.10.** Why is that (Q4)?

**Fig. 4.11.** Why is that (Q4: Kansai)?
5 Q 5 : What kind of method do you most often use when riding on a railway?
Pre-paid style (about 80%) is dominant. ICOCA (about 40%) is the most among them.
Fig. 4.14. What kind of method do you most often use (Kansai)?

Fig. 4.15. What kind of method do you most often use (Kanto)?

6. Q6: Why is that?

"Able to use as a ticket for a railway and/or bus" "Able to use when riding on the railway" and "Able to settle payments without having change" are dominant items.
An Analysis of the Questionnaire Investigation for Using IC Card on Purchasing

Fig. 4.17. Why is that (Q6: Kansai)?

Fig. 4.18. Why is that (Q6: Kansai)?
Q7: Do you know the electronic money nanaco, released by Seven & I holding in spring, 2007?
As for nanaco, 50% examinees do not know in kansai area, while about 30% do not know in Kanto area.

Fig. 4.19. Do you know nanaco?

Fig. 4.20. Do you know nanaco (Kansai)?

Fig. 4.21. Do you know nanaco (Kanto)?

Q8: Do you want to use the electric money nanaco?
About 70% examinees do not want to use nanaco in both areas.
Q9: Why is that?

The answer “Able to use at convenience store” was slightly much more for who answered “want to use it” in Q8. Those who selected “Able to get additional points” in Kansai area were more than those of Kanto area. It may be because they can get additional points by using PiTaPa.
Fig. 4.23. Why is that (Q9)?

Fig. 4.24. Why is that (Q9: Kansai)?
10 Q10: Do you know the electronic money WAON released by ION Co. Ltd., in spring, 2007?

![Bar chart showing Q9 (Kanto)]

Fig. 4.25. Why is that (Q9: Kanto)?

About 65% examinees answered that they do not know it.

11 Q11: Do you want to use the electronic money WAON?
79% examinees answered that they do not want to use it.

Fig. 4.27. Do you know WAON (Kansai)?

Fig. 4.28. Do you know WAON (Kanto)?

Fig. 4.29. Do you want to use nanaco?

Fig. 4.30. Do you want to use nanaco (Kansai)?

Fig. 4.31. Do you want to use nanaco (Kanto)?
Q12: Why is that?
Those who want to use it selected the items "Able to settle payment without having change". But the point is rather low and they are weak on the whole.

Fig. 4.32. Why is that (Q12)?

Fig. 4.33. Why is that (Q12: Kansai)?
Q12 (Kanto)

- General Merchandise Store
- Without having change
- Get addition points
- Exchange points
- Shop usually used
- Only have that kind of electronic money
- Pre-paid style
- Miscellaneous

Fig. 4.34. Why is that (Q12: Kanto)?

Q13: What is an important point when you use electronic money?

"Able to use when buying at the shop usually used", "There are many shops in which electronic money can be used", are selected well.

Fig. 4.35. What is an important point?
Fig. 4.36. What is an important point (Kansai)?

Fig. 4.37. What is an important point (Kanto)?
Q14: Where do you use electronic money most often?

"Convenience store" and "Shop in station" are selected well for the place electronic money is used. Much differences have been revealed for the usage by Kanto area and by Kansai area. As for convenience store, about 45% in Kansai area while about 25% in Kanto area. On the other hand, as for shop in station, 15% in Kansai area and about 40% in Kanto area.

Q15: How many often do you spend electronic money in a month?

Usage of 1~9 frequencies in a month occupies nearly half of the share. 1~2 times in a week would be often the case.
Q15 (total)

Fig. 4.41. How many often do you spend?

Q15 (Kansai)

Fig. 4.42. How many often do you spend (Kansai)?

Q15 (Kanto)

Fig. 4.43. How many often do you spend (Kanto)?

Q16 : How much electronic money do you spend in a month?
Usage money of 0~3000yen in a month takes nearly half of the share. Amount of usage by electronic money is rather small.

Fig. 4.44. How much do you spend?
Q16 (Kansai)

Fig. 4.45. How much do you spend (Kansai)?

Q16 (Kanto)

Fig. 4.46. How much do you spend (Kanto)?

Q17: What do you expect for electronic money in the future?

"Combine plural electronic money", "Increase the amount of shops in which electronic money can be used", "Add additional service such as points, discounts" and "Strengthen security" are the dominant answers.

Fig. 4.47. What do you expect?
An Analysis of the Questionnaire Investigation for Using IC Card on Purchasing

Fig. 4.48. What do you expect (Kansai)?

Fig. 4.49. What do you expect (Kanto)?
4.2. Analysis using Key Graph

Key Graph is a method to visualize the data structure using key words. Data occurrences at the same period of time are exhibited by the link of Key Graph. We use Key Graph software [7].

(1) What kind of electronic money do you use the most? / Why is that?

Two clusters are formed. One is a railway card cluster which uses “Suica” “PASMO” “ICOCA” and “PiTaPa”. “Able to use as a ticket for a railway and/or bus”, “Able to settle payments without having change” are the main reasons to hold.

Another cluster is a shopping card cluster which uses “Edy”, “nanaco” and “iD”. “Able to use where buying at the shop usually used”, “Able to get additional points” are the main reasons to hold which implies that they choose convenience and incentive of getting points.
(2) What kind of method do you most often use when riding on a railway? Why is that?

One big cluster is formed. “Suica”, “PASMO”, “ICOCA” and “PiTaPa” are all selected. “Because it is a post-paid style” and “Charging money is troublesome” are selected simultaneously for the reason of using “PiTaPa”.

(3) Do you want to use the electronic money nanaco?

One big cluster is formed. “Able to use at convenience stores”, “Able to settle payments without having change”, “Able to get additional points”, etc. are esteemed.
(4) What is an important point when you use electronic money?/ How many often do you spend electronic money in a month?/ How much electronic money do you spend in a month?

One big cluster is formed. Items concerning convenience such as “Able to use when buying at the shop usually used”, “There are many shops in which electronic money can be used” are esteemed especially. Next, items concerning an additional value such as “Points are added”, “Discount” follow them.

Heavy users who spend electronic money more than 40 times in a month, and those who use 10,000~19,999 yen select “Able to confirm purchase history”. This item has strong connection with such items as “Security is strengthened”, “Able to confirm residual money”, “Reliable company issues electronic money”, which imply having higher order of needs.
(5) What is an important point when you use electronic money? / How about the situation using electronic money? / What do you expect for electronic money in the future?

Fig. 4.54. What is an important point when you use electronic money? / How about the situation using electronic money? / What do you expect for electronic money in the future?

One definite cluster and vague cluster (co-occurrence rate is rather low) are formed. In the definite cluster, “Able to use when buying at the shop usually used”, “There are many shops in which electronic money can be used”, “Add additional services such as points, discounts”, “Points are added”, “Combine plural electronic money”, “Increased amount of shops in which electronic money can be used” are selected well.

In another cluster, “Able to confirm residual money”, “Able to confirm purchase history”, “Reliable company issues electronic money”, “Able to change by various means” are selected well which contains rather high needs. Heavy users select “Able to confirm purchase history”.

大阪府立大学経済研究 第54巻 2 (224) [2008.9]
(6) Do you want to use the electronic money nanaco?/ Why is that?

Two clusters are formed. One is a cluster exhibited on the upper right in Fig. 4.55. “Able to use at convenience stores”, “Able to settle payments without having change”, “Able to get additional points”, “Able to use when buying at the shop usually used” are selected well which have the positive meaning. On the other hand, another cluster forms by the contents of negative attitude for having card.

(7) Do you want to use the electronic money WAON?/ Why is that?
Two clusters are formed. One is the left-hand side cluster which has the positive meaning such as “Able to settle payments without having change”, “Able to get additional points”, “Able to use when buying at the shop usually used”. Another one is a cluster which has the negative meaning.
4.3. Correspondence Analysis

(1) What is an important point when you use electronic money?

Two clusters are formed. One is a cluster concerning convenience such as "Able to use when buying at the shop usually used", "There are many shops in which electronic money can be used", "Easy to handle", "Able to use via mobile phone", "There are many places when we can change money", "Able to charge by various means". Another one is a cluster concerning high level request for reliability of card such as "Security is strengthened", "Able to confirm residual money", "Able to confirm purchase history", "Many people use it".
1. Able to use when buying at the shop usually used
2. There are many shops in which electronic money can be used
3. Easy to handle
4. There are many places where we can charge money
5. Points are added
6. Security is strengthened
7. Discount
8. Able to charge by various means
9. Able to confirm residual money
10. Reliable company issues electronic money
11. Convenient to settle debts
12. Ample service besides points and discounts
13. Able to use via mobile phone
14. Able to confirm purchase history
15. Many people use it
16. Upper bound restriction when using
17. Have a variety of money charging services

Fig. 4.57. What is an important point when you use electronic money?

5. REMARKS

ICOCA is the most one users have, which is followed by Edy, Suica, PiTaPa and PASMO. On the contrary, smartplus and QUICpay have only several percents share. Cards of payment for traffic are prevailing. In Kasai area, ICOCA and PiTaPa are prevailing and in Kanto area, Suica and PASMO are prevailing. Edy has relatively a big share in both areas.

The reasons of using electronic money are “Able to use as a ticket for a railway and/or bus” and “Able to settle payment without having change”. Comparing Kansai area with Kanto area, the former one selects items “Because it is a post-paid style” and “Charging money is troublesome” much more than the latter one. It may be because PiTaPa, which is well used in Kansai area, is a “Post-paid style” and has also the style
that "charging money is not required".

The important points when using electronic money are "Able to use when buying at the shop usually used", "There are many shops in which electronic money can be used".

Heavy users select "Able to confirm purchase history", "Able to confirm residual money", "Reliable company issues electronic money", "Able to change by various means", which contain rather high needs.

The expectations for electronic money in the future are as follows. "Combine plural electronic money", "Increase the amount of shops in which electronic money can be used", "Add additional service such as points, discounts" and "Strengthen security" are the dominant answers.

6. CONCLUSION

Electronic money usage is widespread at present in Japan such as IC traffic cards on the railroad. In addition to the usage for railroads, payment by electronic money has become possible in such places as convenience stores, supermarkets and restaurants.

This paper analyzed the thought of consumers for about the IC cards, which had a big influence on the buying behavior of consumers. For this purpose, we created a questionnaire survey of using IC card on purchasing. We utilized the text mining method such as Key Graph.

Some interesting and instructive results were obtained. The important point when using electronic money are "Able to use when buying at the shop usually used", "There are many shops in which electronic money can be used", "There are many places when we can change money", "Points are added", "Combine plural electronic money", "Increased amount of shops in which electronic money can be used". They seek convenience and high level reliability.

These are utilized for constructing a much more effective and useful IC card system which should be popularized by consumers.

In conclusion, we appreciate Mr. Yuji Higuchi and Mr. Kazuya Akaishi for their helpful support of work.

REFERENCES
APPENDIX: Questionnaire about Using Electronic Money by IC card

Please answer the following questions. Please write down 0 to the answering items. Plural selection is allowed for Question 1, 2, 4, 5, 6, 9, 12, 13, 17. Select ①～⑤ of the right column for the Question 7, 8, 10, 11.

1. What kind of electronic money do you have?

<table>
<thead>
<tr>
<th>Q1</th>
<th>①Edy</th>
<th>②Suica</th>
<th>③PASMO</th>
<th>④nanaco</th>
<th>⑤WAON</th>
<th>⑥ICOCA</th>
<th>⑦PiTaPa</th>
<th>⑧iD</th>
<th>⑨QUICPay</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>⑩</td>
<td>Smartplus</td>
</tr>
</tbody>
</table>

2. What kind of electronic money do you use?

<table>
<thead>
<tr>
<th>Q2</th>
<th>①Edy</th>
<th>②Suica</th>
<th>③PASMO</th>
<th>④nanaco</th>
<th>⑤WAON</th>
<th>⑥ICOCA</th>
<th>⑦PiTaPa</th>
<th>⑧iD</th>
<th>⑨QUICPay</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>⑩</td>
<td>Smartplus</td>
</tr>
</tbody>
</table>

3. What kind of electronic money do you use the most?

<table>
<thead>
<tr>
<th>Q3</th>
<th>①Edy</th>
<th>②Suica</th>
<th>③PASMO</th>
<th>④nanaco</th>
<th>⑤WAON</th>
<th>⑥ICOCA</th>
<th>⑦PiTaPa</th>
<th>⑧iD</th>
<th>⑨QUICPay</th>
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<td></td>
<td></td>
<td></td>
<td>⑩</td>
<td>Smartplus</td>
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</table>

4. Why is that?

<table>
<thead>
<tr>
<th>Q4</th>
<th>①Able to use as a ticket for a railway and/or bus</th>
<th>②Able to settle payments without having change</th>
<th>③Able to get additional points</th>
<th>④Able to exchange points with other goods/services</th>
<th>⑤Able to use when buying at the shop usually used</th>
<th>⑥Only have that kind of electronic money</th>
<th>⑦Because it is a pre-paid style (not credit card style)</th>
<th>⑧Because it is a post-paid style</th>
<th>⑨Charging money is troublesome</th>
<th>⑩Miscellaneous ( )</th>
</tr>
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大阪府立大学経済研究 第54巻 2 (224) （2008.9）
5. What kind of method do you most often use when riding on a railway?

| Q5  | Pre-paid style | Suica | PASMO | ICOCA | Post-paid style | PiTaPa |

6. Why is that?

| Q6  | Able to use as a ticket for a railway and/or bus |
|     | Able to settle payments without having change |
|     | Able to get additional points |
|     | Able to exchange points with other goods/services |
|     | Able to use when riding on the railway |
|     | Able to use when riding on the bus |
|     | Only have that kind of electronic money |
|     | Because it is a pre-paid style (not credit card style) |

7. Do you know the electronic money nanaco, released by Seven & I holdings in spring, 2007?

| Q7  | Do not know it | Slightly not sure | Fairly ordinary | Slightly known | Very well |

8. Do you want to use the electronic money nanaco?

| Q8  | Do not think so | Slightly not think so | Fairly think so | Slightly known | Very much |

9. Why is that?

| Q9  | Able to use at convenience stores |
|     | Able to settle payments without having change |
|     | Able to get additional points |
|     | Able to exchange points with other goods/services |
|     | Able to use when buying at the shop usually used |
|     | Only have that kind of electronic money |
|     | Because it is a pre-paid style (not credit card style) |
|     | Miscellaneous ( ) |

10. Do you know the electronic money WAON released by ION CO. Ltd. in spring, 2007?

| Q10 | Do not know it | Slightly not know it | Fairly ordinary | Slightly known | Very much |

大阪府立大学経済研究 第54巻 2 (224) [2008.9]
11. Do you want to use the electronic money WAON?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Do not think so</th>
<th>Slightly not think so</th>
<th>Ordinary</th>
<th>Slightly think so</th>
<th>Think so</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11</td>
<td></td>
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</table>

12. Why is it?

**Q12**
① Able to use at General Merchandise Store
② Able to settle payments without having change
③ Able to get additional points
④ Able to exchange points with other goods/services
⑤ Able to use when buying at the shop usually used
⑥ Only have that kind of electronic money
⑦ Because it is a pre-paid style (not credit card style)
⑧ Miscellaneous ( )

13. What is an important point when you use electronic money?

**Q13**
① Able to use when buying at the shop usually used
② There are many shops in which electronic money can be used
③ Easy to handle
④ There are many places when we can charge money
⑤ Points are added
⑥ Security is strengthened
⑦ Discount
⑧ Able to charge by various means
⑨ Able to confirm residual money
⑩ Reliable company issues electronic money
⑪ Convenient to settle debts
⑫ Ample service besides points and discounts
⑬ Able to use via mobile phone
⑭ Able to confirm purchase history
⑮ Many people use it
⑯ Upper bound restriction when using
⑰ Have a variety of money charging services
⑱ Miscellaneous ( )

14. Where do you use electronic money most often?

**Q14**
① Convenience store ② Super market ③ Shop in station ④ Book store ⑤ Library ⑥ Vending Machine ⑦ Miscellaneous ( )

15. How many often do you spend electronic money in a month?

**Q15**
<average> ( ) times

16. How much electronic money do you spend in a month?

**Q16**
<average> ( ) yen
17. **What do you expect for electronic money in the future?**

Q17 ① Combine plural electronic money
② Strengthen security
③ Add additional services such as points, discounts
④ Increased amount of shops in which electronic money can be used
⑤ Increased places where users can charge money
⑥ Easy explanation on how to use
⑦ Combination of credit card function and cash card function
⑧ Certification of card owner using the electronic money card when the user uses net banking
⑨ Increased kinds of mobile phone by which user can use electronic money
⑩ Age certification by electronic money card when the user uses Liquor or Tobacco vending machines
⑪ Able to use to paying tax
⑫ Age certification by electronic money card when the user enters into a bar or an adult movie theater
⑬ Able to use by mobile phone
⑭ Able to confirm purchase history
⑮ Many people use it
⑯ Upper bound restriction when using
⑰ Have a variety of money charging services
⑱ Miscellaneous ( )

18. **About yourself**

Q18 <Age> ( ) years old  <Sex> ① Male ② Female
<Address> Prefecture : ( ) City : ( )