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Procedia - Social and Behavioral Sciences 181 (2015) 405 – 413

Procedia
Social and Behavioral Sciences

3rd International Conference on Leadership, Technology and Innovation Management

Usage level and future intent of use of quick response (QR) codes for mobile marketing among college students in Turkey

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Abstract

Quick Response (QR) Codes are becoming a part of our lives. As mobile technologies are booming, QR codes are being used for various purposes, one of which is for mobile marketing. In this study, our goal was to investigate the current use and future intent of use of QR codes in mobile marketing among college students. We surveyed 241 college students in the beginning of 2013. The findings indicate that while more than 80% of students recognized QR codes, only half of them had used QR codes before. Furthermore, while the interest in using QR codes is currently low, the likelihood of using them is slightly higher than the current interest. Therefore, we can simply conclude that we are more likely to see higher adoption levels of QR codes among the traditional-age college students in the future. However, we also believe that mobile marketers need to find ways to promote the use of QR codes, teach how to use them, and increase adoption levels if they want to benefit from this new technology.

Keywords: Quick Response Codes, QR Codes, Mobile Marketing, Consumer Behavior, Mobile Commerce

Peer-review under responsibility of Uluslararası Stratejik Yönetim veYöneticiler Derneği (usyyd) (International Strategic Management and Managers Association).

1. Introduction

As new mobile devices and the supporting technologies are introduced, marketing found a new venue as mobile marketing. Especially, the use of smart phones and other mobile devices are quickly spreading among teenagers and college students. As a result, mobile marketing is attracting more attention day by day. A significant amount of marketing effort is also geared towards the needs of this market segment.

One of the supporting technologies for mobile marketing is quick response (QR) codes. Today, QR codes are used for many different purposes such as making purchases, accessing additional information in the web, giving out discount coupons, and interacting with social media. The use and popularity of QR codes is increasing quickly all around the world (Shin, Jung, Chang, 2012). Since the use of mobile devices is expanding, the companies and organizations that effectively use QR codes might gain a competitive advantage over the ones that are not using QR codes, especially in certain marketing segments such as college students or youngsters. The most common way of using QR codes is via a smartphone. Users install a software program into their smartphones that reads and interprets a quick response code.

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Peer-review under responsibility of Uluslararası Stratejik Yönetim veYöneticiler Derneği (usyyd) (International Strategic Management and Managers Association).
doi:10.1016/j.sbspro.2015.04.903

After the software interprets the information in the code, it further completes the necessary action. In the next section, QR codes are explained in detail.

In this study, our goal is to research how well QR codes are known among college students and their intent to use QR codes in the future.

The rest of the paper is organized as follows. In the second section, we provide details on the history and current use of QR codes. The third section summarizes our literature review on the subject. Details of our research are found in section four. The last and fifth section includes our conclusion.

2. Quick Response (QR) Code

QR codes are first developed by a Japan company (Denso Wave Incorporated, 2013) in 1994 to enable tracking of automotive parts. A QR code is actually a form of matrix barcode technology. Like matrix barcodes, it is possible to read information out of it. The advantage of QR codes is that it can store quite an amount of information inside. It is possible to embed text, video, advertisement, personal information, business card information or any type of digital information that can be thought of. Today, new mobile devices enable us to install a piece of software that can read a QR code on a newspaper, magazine, product, advertisement etc. Marketers can also store a web link (uniform resource locater – URL) to QR codes. Using these links, customers are sent to a specific e-content, e-store or any other form of cyber marketing environment. For example, it is possible for a metro commuter, going home after work, to scan a QR code in an advertisement placed inside metro car. After scanning, the commuter is able to read the details of the product advertised and even buy the product on the way to home.

International Standards Organization and International Electrotechnical Commission (ISO/IEC) have published two standards since 2000. The first version (ISO/IEC 18004:2000) was published in 2000 and the second version (ISO/IEC 18004:2006) in 2006 revises the first version.

A sample QR code is below:

Fig 1. 1st generation QR code providing a link to English wikipedia homepage

The storage capacity of a QR code depends on the characteristics of the data stored. For example, it is possible to store more symbols if the stored data is numeric only. The storage capacity of a QR code is presented in table 1.

Table 1 QR Codes Data Capacities

QR Code Data Capacities	
Numeric only	max. 7,089 numbers
Alphanumeric	max. 4,296 numbers and characters
Binary (8 bits)	max. 2,953 bytes
Kanji, full-width Kana(*) (Chinese Language)	max. 1,817 characters

Currently, QR codes are in its third generation. In every generation, the storage capacity of QR codes increased and new features are incorporated such as adding company logo inside the code.

Fig. 2. An example of placement of company logo in a 3rd generation QR code

3. Literature Review

Since the use of QR codes in mobile marketing is rather a new concept, the number of studies conducted on the issue is rather limited. Based on our literature review, we were able identify only a few number of published studies on the subject.

Shin, Jung, Chang (2012) investigate user's intentions for using QR codes. They investigate the relations between perceived information quality, perceived system quality, perceived usefulness, perceived ease of use, customer attitude, customer intention, customer behavior, perceived interactivity, and subjective norm. They formed their research model based on a Technology Acceptance Model (TAM). Their study shows that quality of QR codes effects the user intentions and behaviors towards using QR codes. Narang, Jain, Roy (2012) examined effect of QR codes on consumer behavior.

A very similar study to our work is conducted by Sago (2011). In fact, this study is based on one of his suggestions for future studies. He surveyed undergraduate students from a private college in US to examine the usage level and effectiveness of QR codes for integrated marketing communication purposes. The study basically showed that even though the students are aware of QR codes, the adoption level of QR codes is low. Compared to females, males are more interest in using QR codes. We have to note that there are differences between our study and Sago's study. Sago investigates the relation between the interest of using QR codes in the future and the likelihood of using QR codes in the future. We believe the reason behind that is the low adoption rate of QR code use at the time of study. However, in our study, we investigate the relation between the current interest of using QR codes and the likelihood of using QR codes in the future. Additionally, some of the categories in our survey questions are extended.

There are also other uses of QR codes in various industries and other areas. An example study comparing 2D barcode (QR code) and RFID technology is conducted by Qian, Yang, Wu, Zhao, Fan, Xing (2012). They analyzed the performance of traceability system in wheat flour mills by using 2D barcode and RFID technology. In that application, in a wheat flour mill, even though using 2D barcode and RFID technologies increases the cost, it increases the sales income. Canadi, Höpken and Fuchs (2010) examine QR codes in online travel distributions. Kuacharoen, Warasart (2012) examined the use of digital signatures and QR codes for paper-based document authentication.

4. Methodology

4.1. Research Goal

In this survey, we aim to identify how well QR codes are known among college students and their intent to use QR codes in the future.

4.2. Research Questions

Some of our research questions are taken from Sago (2011). Our research questions are as follows:

Q1: How well QR codes are known among college students?
Q2: Where do college students encounter QR codes?
Q3: How well QR codes are adopted among college students?
Q4: What do college students use QR codes for?
Q5: How interested are college students to use QR codes now?

Q6: How likely are college students to use QR codes in the future?
Q7: Is there a difference in the QR code use between male and female college students?
Q8: Is there a difference in the future intent of QR code use between female and male college students?

4.3. Research Design

The survey is applied in a private college in Istanbul, Turkey. The participants are traditional-age college students. Traditional-age means the age of an average college student without giving long breaks in his/her education before attending college. The study was open to any majors in the college.

The survey instrument is self-administered questionnaire. Most questions are closed form. In some questions, we left space to fill in for participants if the item in question is not listed in the survey form. The instrument is kept simple and focused.

4.4. Sample and Data Collection

The study is conducted on 241 college students in a private university in Istanbul, Turkey. The survey took place between February 2013 - March 2013. 103 male students and 135 female students took part in the research. The age of the students range from 18-33. The median age is 20. Table 2 presents the basic information regarding the study participants. Three students did not put in gender information. Therefore, the data gathered from those surveys are not used in gender specific research questions.

Table 2. Basic information regarding the study participants

Total number of students participated	241
Number of male students participated	103
Number of female students participated	135
Mean age of participants	20

4.5. Results and Analyses

SPSS v.19, a software tool for statistical analysis, is used in the analysis of the data. Before analyzing the data further, we looked at the reliability of the survey responses. “Reliability means that a measure should consistently reflect the construct that it is measuring” (Field, 2009). One of the ways of measuring the reliability of the data is the Cronbach’s Alpha values. If this value is below 0.8, we can say that all of the items are reliable and the entire test is consistent (Ho, 2006; Hair et al, 2009).

Table 3. Factor Loadings and Cronbach's Alpha Reliabilities

Total Variance Explained: 63.492; KMO: .848; Bartlett's Test of Sphericity: 1731,796**	In Future	In Today
Cronbach's Alpha	.908	.862
To get a coupon, discount or deal	.753	
Access additional information	.832	
Access the web site	.766	
Access Video	.752	
Make Purchase	.736	
Interact with social media properties	.722	
To get a coupon, discount or deal		.650
Access additional information		.731
Access the web site		.721
Access Video		.698
Make Purchase		.623
Interact with social media properties		.668

KMO (Kaiser-Meyer-Olkin) measures sampling adequacy of the survey study (Field, 2009). KMO gets a value between 0 and 1. If KMO is between 0.8 and 0.9, the sampling adequacy is great (Hutcheson&Sofroniou, 1999).

Based on the results of factor analysis measuring sampling adequacy and Cronbach's Alpha test measuring reliability, it is concluded that the sampling adequacy and the reliability of the survey study is more than satisfactory (Table 3).

Our first research question is aimed to identify the recognition levels of QR codes among college students. Table 4 shows the recognition levels of QR codes among college students. The results indicate that more than 80% of students have seen QR codes before. Furthermore, the percentage of males and females that have seen QR codes before are close to each other. Therefore, we can deduce that currently QR codes are commonly known among college students.

Table 4. Recognition Levels of QR Codes

	Females No - %	Males No - %	Total No - %
Recognized	113 – 83,7	84 – 81,5	197 – 82,8
Not Recognized	22 - 16,3	19 – 18,5	41 – 17,2

The answers related to our second research question are summarized in table 5. With this question, we wanted to learn where college students had seen QR codes. In this question, the students are allowed to check more than one item. The most common answer is product packaging. The second most common response is pharmaceutical and drug packaging. The number of these two responses is quite high when compared to the number of other responses. We can infer that QR codes are becoming widespread in packaging. Coupons, magazine advertisements, newspaper and magazine news, newspaper advertisements, and catalogs are other venues the students have seen QR codes. The number of responses in these venues is quite similar. There are also some other venues such as television and documents. As a result, we can deduce that the students observed QR codes in a variety of venues.
Table 6 shows the results related to our research question 3. We define the adoption as having used QR code before at least once. Less than half, around 43 %, of the college students used QR codes before. One interesting observation is that the adoption levels of male students are higher than adoption levels of female students or in other words, QR codes are adopted less among female students. While half of the male students adopted QR codes, only 37.4 % of female students have adopted QR codes.

Table 5. Where QR Codes Had Been Seen

	Females No - %	Males No - %	Total No - %
Product Packaging	78 – 56,9	51 – 49,5	129 – 53,5
Pharmaceutical & Drug Packaging	72 – 52,5	42 – 40,7	114 – 47,3
Coupon	37 – 27,0	38 – 36,9	75 – 31,1
Magazine Advertisement	36 – 26,2	30 – 29,1	66 - 27,4
Newspaper and Magazine News	34 – 25,0	36 – 35,0	70 – 29,0
Newspaper Advertisement	34 – 24,8	30 – 29,1	64 – 26,6
Catalog	33 – 24,0	20 – 19,4	53 – 22,0
Outdoor Advertisement	26 – 19,0	28 – 27,2	54 – 22,4
Television	23 – 16,8	20 – 19,4	43 – 17,8
Documents	11 – 08,0	13 – 12,6	24 – 10,0
Other	22 – 16,0	10 – 09,7	32 – 13,3

Table 6. Adoption Levels of QR Codes

	Females No - %	Males No - %	Total No - %
Used	49 – 37,4	51 – 49,5	100 – 42,7
Not Used	82 – 62,6	52 – 50,5	134 – 57,3

Our next and fourth research question is about where QR codes are used. We inquired the students as to what they used QR codes for. The results are presented in table 7. Making purchases and accessing additional information are among the highest uses of QR codes.

Table 7. Purposes for Using QR Codes

	Females No - %	Males No - %	Total No - %
Make Purchase	46 – 33,6	22 – 21,3	68 – 28,2
Access Additional Information	28 – 20,4	24 – 23,3	52 – 21,6
Interact with Social Media	21 – 15,3	15 – 14,6	36 – 14,9
Sign up to Receive More Information	14 – 10,2	20 – 19,4	34 – 14,1
Get Coupon	25 – 18,2	08 – 07,8	33 – 13,7
Access Video	10 – 07,2	19 – 18,4	29 – 12,0
Other	04 – 03,0	09 – 08,7	13 – 5,4

One of our main research goals was to investigate the interest level of college students in using QR codes. We use a 5-point Likert scale in our fifth research question. The results are shown in table 8. Making purchases and accessing additional information have the highest means. This is also consistent with the results obtained from our fourth research question. One interesting result is that currently the interest levels are not very high and there is still room to grow. Another interesting result is females are more interested in using QR codes and then males are. In almost every category, the mean scores of interest levels of females are higher compared to interest levels of males. Additionally, there is a significant difference in the mean scores of interest level of using QR codes for making purchases between males and females. Females are more interested in making purchases using QR codes.

Table 8. Interest in Using QR Codes now

	Females Mean	Males Mean	Total Mean
To get a coupon, discount or deal	2,57	2,19	2,38
Access additional information	2,92	2,46	2,69
Access the web site	2,53	2,31	2,42
Access Video	2,40	2,19	2,29
Make Purchase	2,86	2,19	2,52
Interact with social media properties	2,59	2,33	2,46

Notes: a LRF - Likert Response Format (Five point: 1=strongly disagree to 5=strongly agree)

Table 9 presents the responses to our research question six regarding how likely the college students are to use QR codes in the future. Again, we use a 5 point Likert scale in this question. The mean scores are higher compared to the scores from table 8. This is likely to indicate that the trend to use QR codes is up. Again, females are more likely to use QR codes than males are. The results indicate that college students will most likely to use QR codes for accessing additional information.

Table 9. Possibility of Using QR Codes in the future

	Females Mean	Males Mean	Total Mean
To get a coupon, discount or deal	3,17	2,77	2,97
Access additional information	3,25	2,89	3,07
Access the web site	2,97	2,73	2,85
Access video	2,98	2,71	2,84
Make a purchase	3,14	2,70	2,92
Interact with social media properties	3,13	2,78	2,95

Notes: a LRF - Likert Response Format (Five point: 1=strongly disagree to 5=strongly agree)

Based on the Independent Samples t-Test conducted on the current use of QR codes and future intent of use of QR codes, it is concluded that compared to male college students, female college students are using QR codes more frequently and will more like to use QR codes in the future (Table 10).

Table 10. Independent Samples t-Test

Group Statistics					Levene's Test for Equality of Variances		t-test for Equality of Means	
N=224	Gender	N	Mean	Std. Dev.	F	Sig.	t	Sig.
Today	Female	124	2,6210	0,92329	8,159*	0,005	2,578	0,005
	Male	100	2,2733	1,09419			2,532	0,006
Future	Female	128	3,1042	1,00914	11,034**	0,001	2,391	0,009
	Male	101	2,7525	1,21669			2,339	0,01

Based on the paired samples test, there is a significant difference between two averages. Therefore, we conclude that the adoption of QR codes will be higher in the future (Table 11).

Table 11. Paired Samples Test

N=221	Mean	Std. Deviation	Std. Error Mean	Mean Differences	Std. Deviation	t	Sig.
Future	2,9604	1,11649	,07741	,48265	,88610	8,097**	,000
Today	2,4596	1,02409	,07101				

5. Conclusion

With this study, our goal was to investigate the current use and future possibility to use QR codes in mobile marketing among college students. In the beginning of 2013, we surveyed 241 students from a private college in Istanbul, Turkey. 57 % of participants are female students and 43 % of participants are male students. The mean age of participants is 20. A self-administered questionnaire was used as the survey instrument.

We summarize our findings as follows:

- While more than 80% of students recognized QR codes, only half of them had used QR codes before. Therefore, we can state that while the recognition level of QR codes is high, the adoption level is low.

- Students have seen QR codes in a variety of venues.

- Currently, the main uses of QR codes are making purchases and accessing additional information.

- Female college students are more interested in using QR codes than male college students are. Additionally, female college students are more likely to use QR codes in the future.

- While the interest in using QR codes is currently low, the likelihood of using them is slightly higher than the current interest. As a result, we conclude that we are more likely to see higher adoption levels of QR codes among the traditional-age college students in the future.

- As indicated earlier, a similar study with some differences is conducted by Sago (2011). Sago's study is conducted in USA located in North America and our study is conducted in Turkey located in Europe. Some of the results based on our study are quite different than the results from Sago's study. Our study indicates that female college students are more interested in using QR codes now and more likely to use QR codes in the future. In Sago's study, compared to female college students, male college students are using QR codes with a higher percentage and more likely to use QR codes in the future. Therefore, even though the two studies are not the same, the gender difference in the results should be investigated. The investigation of this difference is a good candidate for future work.

We also calculated the Pearson Product Moment Correlation (PMCC) between the current interest of using QR codes and the likelihood of using QR codes in the future. The correlation is 0,66. This indicates a strong positive correlation. As a result, we can say that the use of QR codes will likely to be higher in the future.

Even though the recognition level of QR codes is high, the adoption level is low. Therefore, we believe that mobile marketers need to find ways to promote the use of QR codes, teach how to use them, and increase adoption levels if they want to benefit from this new technology. Mobile marketers must not assume that college students, who are believed to be more open to new technologies compared to the rest of the population, are able to use new technologies easily without any related training and education. Technology Acceptance Model (TAM) might be used to study mobile commerce (Yang, 2007).

6. Limitations and Opportunities for Future Research

Naturally, there are limitations in this study and opportunities for future research. One of the limitations is that the study is conducted at a single private college in Turkey. An opportunity for future research may be extending this study to other colleges and universities in Turkey and other countries.

As listed in the previous conclusion section, a prospective future work is the investigation of differences in the results of our study and Sago's study.

Even though, the research scope is limited with traditional-age college students, it may be extended to other populations. However, we should note that the adoption levels in other populations may be much lower than found in this study. Trying to drive conclusions from very low adoption levels might require careful analysis.

QR code is a relatively young technology. The amount of studies conducted on the subject is very limited. This is one of the reasons why we kept our study strictly focused. As the literature is enriched with other studies, the studies may be deepened and widened to investigate further complex research questions with other research models.

The study is conducted in Istanbul. It is possible to extend the study to other geographical regions. Istanbul is a modern city compared to many other regions of the country. The population in the city is subject to new technologies more likely than other cities are.

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