FACTORS INFLUENCING THE EFFECTIVE USAGE OF QR CODE: A STUDY AMONG READERS OF TRIVANDRUM CITY

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Abstract: QR codes (Quick Response codes) is an emerging technology that is applicable in various fields, and replaces traditional ways of reading, entertainment, marketing, education and a lot more. QR code has become a common content in print media that allows it to overcome the limitations of the medium. It act as a bridge between real and virtual fields. QR codes have now become part of various contents of the print medium for providing additional information, entertainment, reading assistance, audio video content, interactive purposes etc. The study focusses on the utilization of this technology by the readers and how utilisation change with the gender difference. The study would also analyse the factors that influence the usage of this technology as well as the factors that inhibits readers to not use the technology.. The objectives of the study is substantiated with the Unified Theory of Acceptance and The Use of Technology and its extension (UTAUT 1 & 2) which together provides seven constructs that determine the acceptance and use of a technology.
Key Words: QR codes, determiners, utilization, effort expectancy

INTRODUCTION

ABOUT QR CODES

QR code technology is an innovation that is being widely applied in the print medium and getting widely popular among the common users. QR code (Quick Response codes) is a two dimensional barcode invented by the Toyota Motors subsidiary Denso Wave in 1994 to track vehicles and their parts during the manufacturing process. QR codes are made of black and white pixels arranged in a squared matrix (Sahu & Gonnade, 2013). QR code possesses a high capacity of storing information. A QR code is capable of storing various types of data, like numeric, alphabetic characters, audio/video content, hiragana, binary, symbols and control codes. A QR code can store 7089 characters in one symbol (Ji Qianyu, 2014). QR code consists of different areas that are reserved for specific purposes such as finder, separator, timing patterns, alignment patterns and functional patterns (Pandya & Galiyawala, 2014). The finder patterns located at three corners of the symbol are intended to assist in easy

location of its position, size and inclination (Chen et al. 2012). QR codes can render multimedia content embedded within them which makes the feature more unique and attractive.

Features of QR code

High capacity encoding of data

QR codes are distinguished from conventional barcodes due to its high capacity to encode data. Barcodes are capable of storing a maximum of approximately 20 digits while a QR code is capable of handling several hundred times more information. QR codes can encode up to 7089 characters and it could also include different types of data (Denso Wave 2014b).*Figure 1.1*: QR encode numeric and alphabetic characters (Denso Wave 2014b)
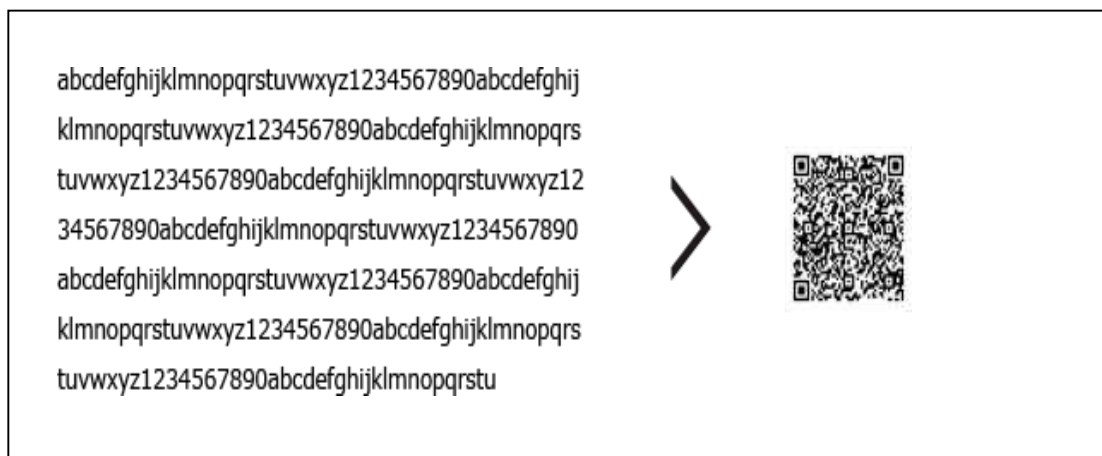

Small printout size

QR codes store information both horizontally and vertically. Space of information storage in a QR code is one tenth the space of a traditional barcode (Denso Wave 2014b).

Kanji and kana capability

QR code is capable of encoding Japanese Industrial Standard level 1 & 2 of kanji character case. Kanji is literally "Chinese character". They are ideograph; each letter represents a meaning. One kanji or kana character is efficiently encoded in 13 bits and this allows QR codes to hold more than 20% data than any other two dimensional symbols (Ji Qianyu, 2014).

Figure 1.2: Kanji and Kana into QR code (Denso Wave 2014b)
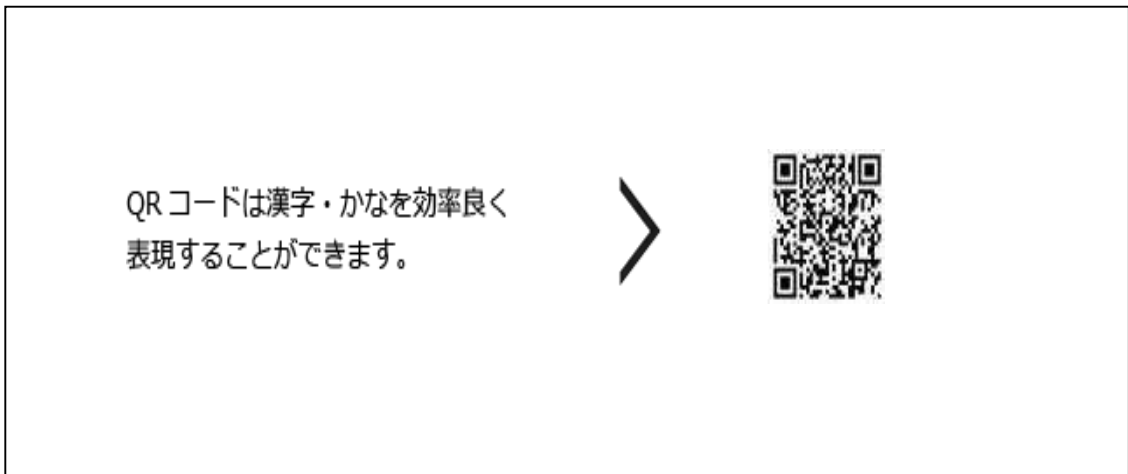
Dirt and damage resistant

Error correction capability is one of the key features of QR codes. Information can be restored in a QR code even if the code is partially dirty or damaged. Unit that constructs the data area in a QR code is called a codeword. Maximum 30% of codeword can be restored where one codeword is equal to 8 bits (Denso Wave 2014b).

Figure 1.3: Dirt and damage of QR codes (Denso Wave 2014b)
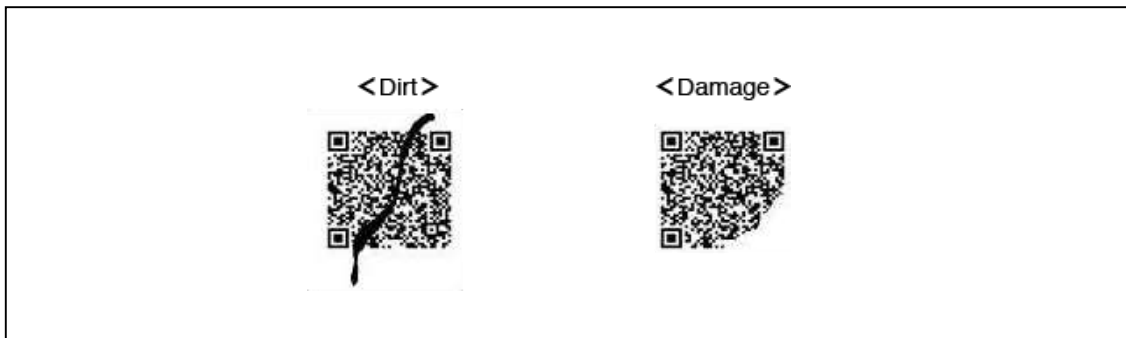
Readable from any direction in 360 degree

QR codes contain position detection patterns that are located at three corners of the symbol. This enables users to read QR codes in high speed 360 degree direction. The position detection patterns ensure stable reading, circumventing the effects of background interference (Denso Wave 2014b).

Structured appending feature

QR codes contain variety of data areas. Each data symbol can be divided into 16 data symbols which makes it convenient to print (Denso Wave 2014b).

Types of QR code

QR code model 1 and model 2

QR code model 1 is the original and primary QR code which is capable of coding 1,167 numerals with its maximum version being 73 x 73 modules. Model 2 is an extension of model 1.

Model 2 can be read smoothly even if it is distorted in one way or the other. QR codes printed on a curved surface or whose reading image is distorted due to the angle of reading can be efficiently read by referring to the alignment pattern embedded in them. QR code model 2 can encode up to 7089 characters (Denso Wave 2014c)

Micro QR code

Micro QR code consists of only one position detection pattern compared to the regular QR codes containing position detection patterns at three corners of the code. Apart from this micro QR code requires only two module wide margin. Micro QR code is convenient for printing in smaller areas than a regular QR code. The data storage in micro QR code is less [max 35 numerals] compared to regular QR code (Denso Wave 2014e).

*Figure 1.4*: Micro QR code and regular QR code (Denso Wave 2014e)
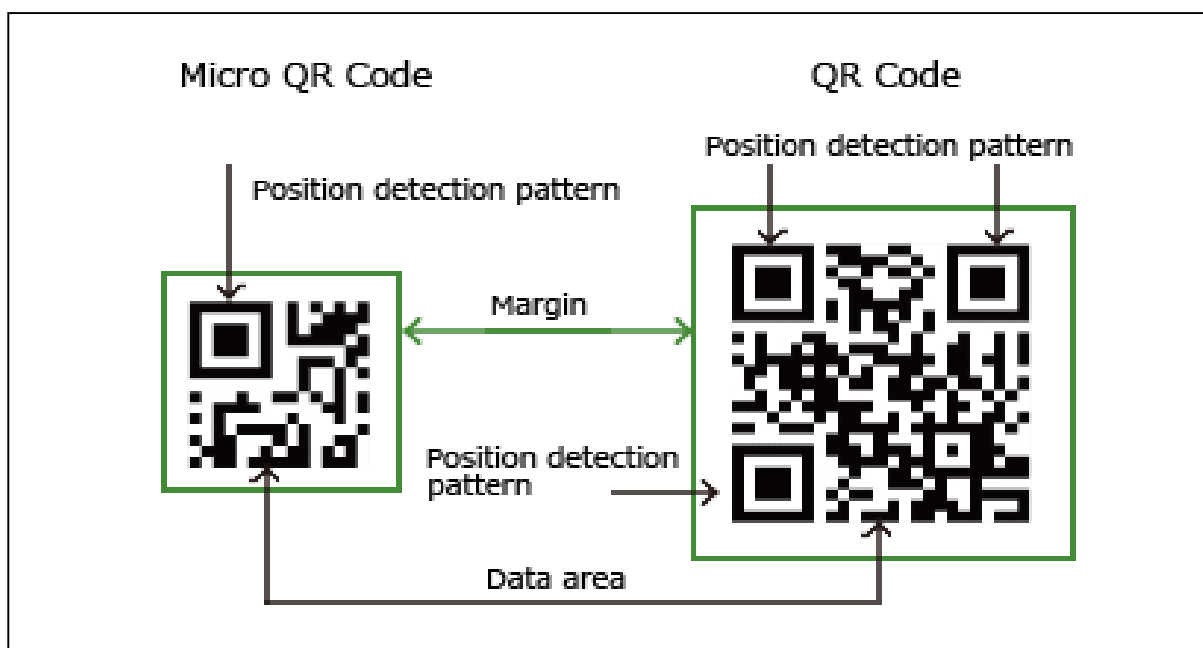
iQR code

iQR is a two dimensional matrix type which allows easy reading. An iQR code can store 80% more information than a regular QR of same size. Using iQR code smaller sized QR codes can be generated. iQR codes have high data capacity than normal QR codes (Denso Wave 2014f).

SQRC

SQRC stands for "Single QR Code". A single QR code can store public and private data in which private data can be read only by a dedicated reader with specific cryptographic key (Denso Wave 2014g).

Figure 1.5: Private data encoding in SQRC (Denso Wave 2014g)
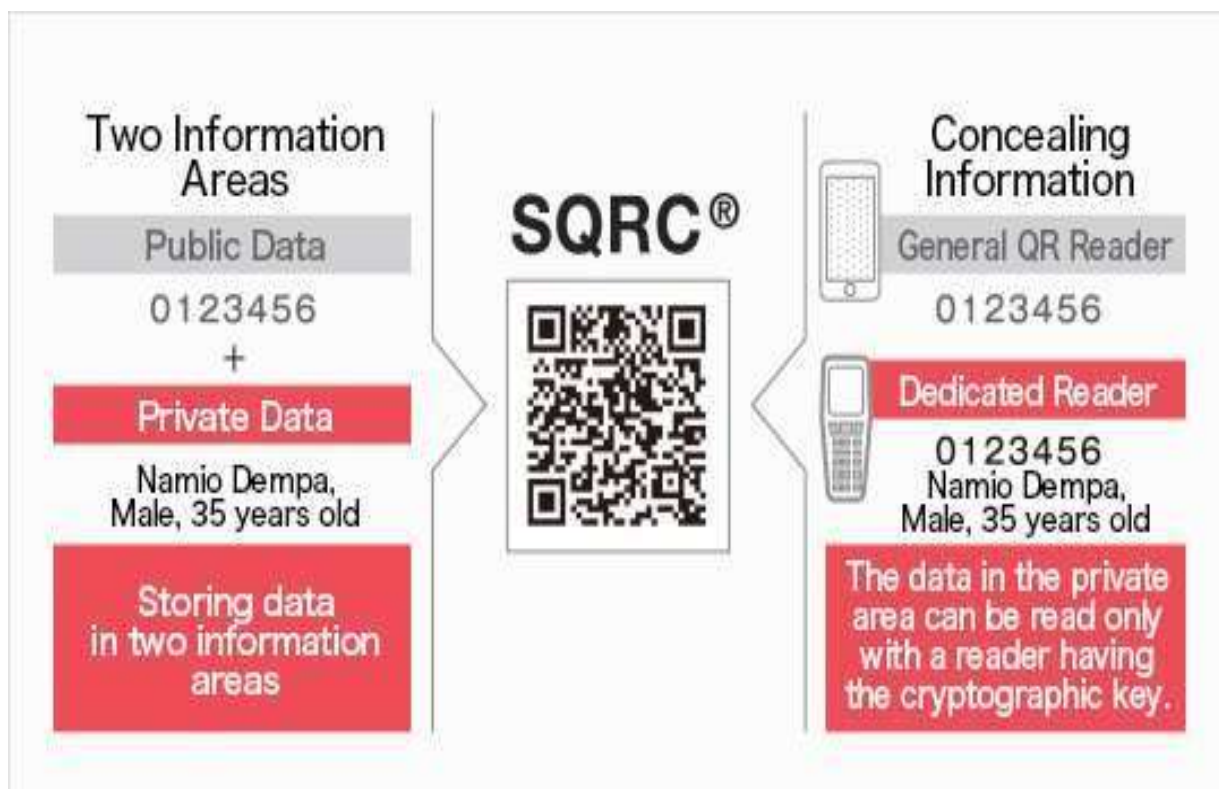
Logo Q

This type of QR codes contain an image or illustration. Logo Q has an area for encoding image. These QR codes can integrate images, logos and illustrations of source provider which makes the QR code unique. Logo Q helps in recognizable ability of vision (Denso Wave 2014h).

QR codes are utilised in various arenas including print medium. Print medium has recently adapted the technology to give a new dimension of information to their readers. The technology is used in various kinds of print publications primarily to provide additional information as an extension to the printed content and as a marketing or business tool

accompanied with print advertisements. As an extension, QR codes are also used as a tool for entertainment via print medium which make them act as a bridge between real and virtual world. Audio visual content embedded within the QR codes are also used in print publications to assist their reading habit.

Keralites generally have good reading habit and are willing to adapt to new technologies (http://www.thehindu.com/news/cities/Kochi/what-the-average-malayali-loves-to-read/article6184747.ece). The technology of QR code is gaining its momentum in Kerala especially in print publications. The common people are getting more familiar with the technology and its application. There exists different factors that motivate as well as inhibit individuals from using a technology. This study tries to analyse how effectively people utilise QR codes. The study again tries to evaluate the various factors that influence the usage of QR codes and factors that inhibit non users of QR code. This research project also look into the gender difference in usage of this innovative technology.

REVIEW OF LITERATURE

This section includes the review of studies conducted on the subject and the theoretical framework upon which this study is built on. Most of the works reviewed here are based upon the QR code technology and its application in marketing, library, education etc. The theory used to study the usage of the technology is the Unified Theory of Acceptance and Use of Technology 1 & 2.

Thayer (2012) conducted a study at Ottenberg University on Consumer attitudes towards using QR code in retail setting. QR codes (Quick Response codes), also known as 2D bar codes, act as a source of information. The usage of QR codes has unique application in marketing sector and consumers are the beneficiaries. Consumers have different attitudes towards Quick Response codes and the use of QR codes differently. This study focusses on the use of QR codes in retail sector by analysing the factors that affect the usage of a particular technology

by the consumers. A quantitative study using survey method found that Korean and Japanese consumers are more willing to use QR code compared to American consumers. According to Technology Acceptance Model (TAM) the ease of usage of a particular technology as well as the knowledge about the same determine the usage of that technology. This theory is consistent with the utilisation of QR codes by the consumers in marketing sector. Apathetic motivation, perceived usefulness and perceived ease of use influence consumer attitude towards using QR code technology. If a consumer finds that using QR code technology is easier and adds benefits in the form of discounts and offers he/she is more likely to use this technology. Marketing industry has a wide application of QR code as a tool to enhance their business but huge effort has to be put upon the promotion of Quick Response codes to make it much familiar for the consumers. QR code and its application have a great future in the retail setting if consumers are properly guided in the utilisation of the technology. Even though Quick Response codes and their application are accessible to anyone who owns a smart phone it is clear that there are various extrinsic factors that determine the future of QR code technology.

Sohu and Gonnade (2013) conducted a study on QR codes and their application in India. The paper examines how QR code is composed and decoded. QR code and its innovation is applicable in different areas. India, being a quick adapter of new technologies has adopted QR code and has started applying in various fields including marketing, documentation, promotion campaigns, educational applications, print media etc. QR code has found its place in communicating instructional information for performing critical tasks using text, images or videos. QR code is applied in documentation of important information, authorisations, and is also used to give emergency contacts by providing access to important departments, officials via click to call, text messaging and e mail. Wide application of QR code is found in marketing sector where QR codes are incorporated in tools like business cards and brochures that make these business tools interactive. Direct mail services make use of QR codes that enable the user arrive on a desired URL. Educational applications of QR code are an exploratory area where the innovation has a great future. QR code printed in a book can, on scanning, link the reader

to reviews, trailers and additional resources. QR code is yet to have various possible applications that increase the bandwidth of its future.

Mehandale et al. (2017) conducted a study on the use of QR code in class rooms. The research paper studies the usage of QR code in the field of education. QR Codes can be integrated with smart phones and can serve as an effective teaching aid in class rooms. This technology can be applied from the lower school level to graduate level in the field of academics. QR code is a paper based hyperlink that can link the user to enormous source of information. QR codes can increase the motivation and interest among students through instructional activities. This technology is found to have innovative uses in field of education such as enhancement of knowledge. It helps to collect information, to provide assignments, for learning and to encourage outdoor activities. All these applications suggest that QR codes have wide utility by incorporating multimedia access in education. The unique characteristics of QR code add to its variable and innovative applications. QR code has the ability to quick read so that the information encoded can be easily decoded. It also has high capacity to encode data which contains both numeric and alpha numeric characters. Another feature of QR code is that it requires less space. QR code has changed the conventional face of education through learner centred learning where learners can share and produce academic content via online with QR coding technology. It has made the education interactive where information and education won't dwindle within the pages of the text books. The study shows that QR code integration in learning will enhance motivation, communication, collaboration and critical thinking in the classroom.

Ramsden (2008) conducted a study at University of Bath on the use of QR code in Education. One of the applications of QR code in education is to use it as a presentation material. References made during lectures and presentations can be linked with online sources through the application of QR code where students can scan QR codes and have access to the supporting web source. This can also serve to formulate feedbacks. This application has a wide significance in distant educational learning materials. Another application noted in the study is

the integration of QR codes with alternate reality games. Alternate reality games comprising of series of challenges, narrative and collaborative community enhance collaborative problem solving ability. QR codes enable students to access just in time information during lectures. This allows students to link to support materials online during the lectures. QR codes also give better feedback opportunity through online responses. QR codes link real and virtual learning process that in-turn provide better outcome in the academic field.

Cata et al. (2013) reported that QR code is the latest phenomenon in mobile marketing world. This paper studies the applications of QR code in accordance with marketing theories and suggestions to utilise the full potential of QR codes in mobile marketing practices. Marketing community imbibes QR codes on products, notices, brochures, magazine pages, advertisement pages and other marketing media. QR codes provide better interaction with consumers by engaging them with services, information of products, discounts and additional communication related to the businesses. The major limitation in utilisation of QR code in marketing field is the end user confusion. Consumers who are not tech-savvy, may not know how to scan QR codes and may not be clear about the kind of information they receive after scanning the code. Yet another hurdle is the different types of QR code scanning applications and un-customized websites by marketers. Based on different types of Mobile Marketing Systems (MMS) and its unique interaction pattern, QR code is applied differently. Based on the study Interaction- Intense communication which include hybrid approach can lead to best results of using QR code in marketing purposes meanwhile Interaction Mild communication (Type B MMS) implementation is used for informational purposes where consumers require more information. Proper implementation and awareness among users can lead to the advancement in implementation of QR code in mobile marketing.

Parabhai et al. (2017) conducted a study at Indian Institute of Advanced Study, Shimla on use of QR code in library. QR code and its application are incorporated by libraries to enhance their services. Libraries utilise QR code technology to share their documents and ease the data entry process. It makes the libraries fully automated and helps to know consumers

much better. It also serves as an information provider where libraries can share brief information to users via QR code. It is applied to inform about required documents and assists in providing library services. QR code can store enormous data which in a library setting would link their users to all resources available in the library. It can take readers or users across all sections of library through videos, audios, and websites. QR codes also enable users to avail text messages for references and also provide contact information like click-to-call services to connect with library staffs and patrons. QR codes give an opportunity to change the mode of information handling in this present era of technology. Reading itself is changing its face and the hub of reading is also attempting a change with QR codes. To make effective usage of QR codes among user community, library professionals must organise effective user awareness and orientation programme.

Probst (2012) conducted a study on the expectation of QR codes in print media. QR codes have successfully incorporated in the field of print medium. This study focusses on the current functionalities, benefits, limitations and future expectation of QR codes in print medium. QR codes are used in academic journals, trade publications, popular press publications etc. QR code is widely used in print media especially magazines for ad campaigns and as a print based promotional medium. In magazine sector the rise and utility of QR code is visible. Three different methods were used in this study for compiling data and research. First was a detailed analysis of the studies conducted in the field. In the second stage informational interviews were conducted with three subject experts. The final stage was an online survey. QR codes can track the number of scans and identify the medium from which the users scanned it. This application can be utilised to identify the medium for advertisers to continually place their ads. Printed advertisements have become both interactive and digital. QR code has become an inevitable part of print medium through its various applications.

QR codes or quick response codes have been applied in fields of marketing, advertisements, education, library management and in print medium. The above discussed studies and focus on the major aspects and applications of QR codes. The present study aims

to focus on the utilisation of QR codes in print publication by readers. In the era of digitalisation print medium converged through its digital platforms. Malayalam publications too have adopted the QR code technology and not only applied it in marketing and advertisement. Print media extended the application of QR codes by utilising its ability to enhance reading experience by encoding entertaining contents like videos, photo-shoot visuals which add to reading experience of readers. QR codes were also designed to assist the reading by encoding audio contents of printed text which not only enhances reading experience but also allows readers to do multiple tasks by listening to their favourite content. Such innovative applications of QR code in print media gives scope for studying the utilisation of this technology by readers.

THEORETICAL FRAMEWORK

Utilisation of a technology is determined by various factors. Many theories attempt to explain the user's intention to utilise a particular technology. The Unified Theory of Acceptance and Use of Technology (UTAUT) were formulated by Viswanath Venkatesh, Michael G. Morris and Gordan B. Davis with four core determinants of intention and usage and up to four moderators of key relationships (Venkatesh et al 2003). Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) formulated by Viswanath Venkatesh, James Y.L Thong and Xin Xu is an extension of UTAUT. This newer version incorporated three more determinants of intention and usage along with four moderators which explain user intentions to use a technology and their usage behaviour. The UTAUT was formulated through review and consolidation of eight models that explain user behaviour. They are Theory of Reasoned Action (TRA), The Technology Acceptance Model (TAM), The Motivational Model (MM), The Theory of Planned Behaviour (TPB), The Model of PC Utilisation (MPCU), The Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT). The four core determinants according to UTAUT include Performance expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. The extension of UTAUT 1 incorporates three constructs into

existing theory and they are Hedonic Motivation, Price Value, and Habit. According to UTAUT 1, **Performance expectancy** is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh et al 2003). The key constructs pertain to this determinant as per the other models are perceived usefulness (TAM), extrinsic motivation (MM), job fit (MPCU), relative advantage (IDT) and outcome expectations (SCT). **Effort expectancy** is defined as the degree of ease associated with the use of the system. Three constructs from existing models pertaining to this determinant is perceived ease of use (TAM), complexity (MPCU) and ease of use (IDT) (Venkatesh et al 2003). **Social influence** is defined as the degree to which an individual perceives that important others believe he/she should use the new system. (Venkatesh et al 2003). **Facilitating conditions** are defined as the degree to which an individual believes that an organisational and technical infrastructure exist to support use of the system (Venkatesh et al 2003). Gender, age, experience and voluntariness of use are factors that moderate impact of four key constructs.

According to the extended Unified Theory of Acceptance and Use of Technology (UTAUT 2), **hedonic motivation** is defined as the fun or pleasure derived from using a technology plays an important role in determining technology acceptance and use (Brown and Venkatesh 2005). **Price Value** is the concept that the cost and pricing structure may have a significant impact on consumer's technology use (Venkatesh et al 2012). **Habit** is defined as an extent to which people tend to perform behaviours automatically because of learning (Limayem et al 2007) while Kim et al. (2005) equate habit with automaticity.

UTAUT and its extension are applied here, as the major objective of this study is to analyse how effectively readers utilise QR code in print publications and factors influencing its usage. Quick Response code is a technology that requires user action to scan a particular code on their device to access its offered services. Action of the user, which is driven by his/her intentions to use this technology, determines the utilisation of QR code. The seven key determinants of

the theory are applied to analyse the intention and usage pattern of QR code by the study group. QR code utilisation of readers may depend on various factors that influence their action upon the technology. Readers scan the QR code in magazines for getting more information of the source, online shopping, discounts, subscriptions, entertainment and for alternative reading experience. The further intention of usage varies from intrinsic to extrinsic factors. All these can be analysed by the application of seven key constructs; performance expectancy, effort expectancy, social influence and facilitating conditions of UTAUT 1 and hedonic motivation, price value and habit of UTAUT 2. Constructs of the theory help analysing the utility pattern and factors that affect the utilisation of QR code based on the response of the study group.

OBJECTIVES

- To examine how effectively readers utilise QR codes seen in print publications

- To identify the gender difference in usage of QR code technology

- To identify the major factors that influence the usage of QR code

- To identify how QR code becomes a means of entertainment

- To identify how QR code assist reading

- To identify the problems faced by readers in QR code usage

METHODOLOGY

This study follows a combination of both qualitative and quantitative methods. At the first phase of the study we collected data using a questionnaire from 50 respondents of different age categories from Trivandrum city. Questionnaires where conveniently distributed among respondents of five age categories. The first part of the questionnaire consists of demographic details while latter contains questions concerned with objectives of the study. Collected data was organised into spread sheets which were then organised into charts and graphs to study the data in relation with the theory applied. Percentage analysis of the data collected was used as tool of analysis. Bar diagrams and pie charts were also used for the presentation of data. The objectives were further studied through the responses from four semi structured interviews of

the respondents. Among the interviewees two were users of QR codes and two were non users.

The interview questionnaire was designed to seek the experience of the respondents on the

usage of QR code and factors that affect the user intention. The key determinants of UTAUT

are applied upon the responses to conduct the study and draw conclusions.

RESULTS, ANALYSIS & INTERPRETATION
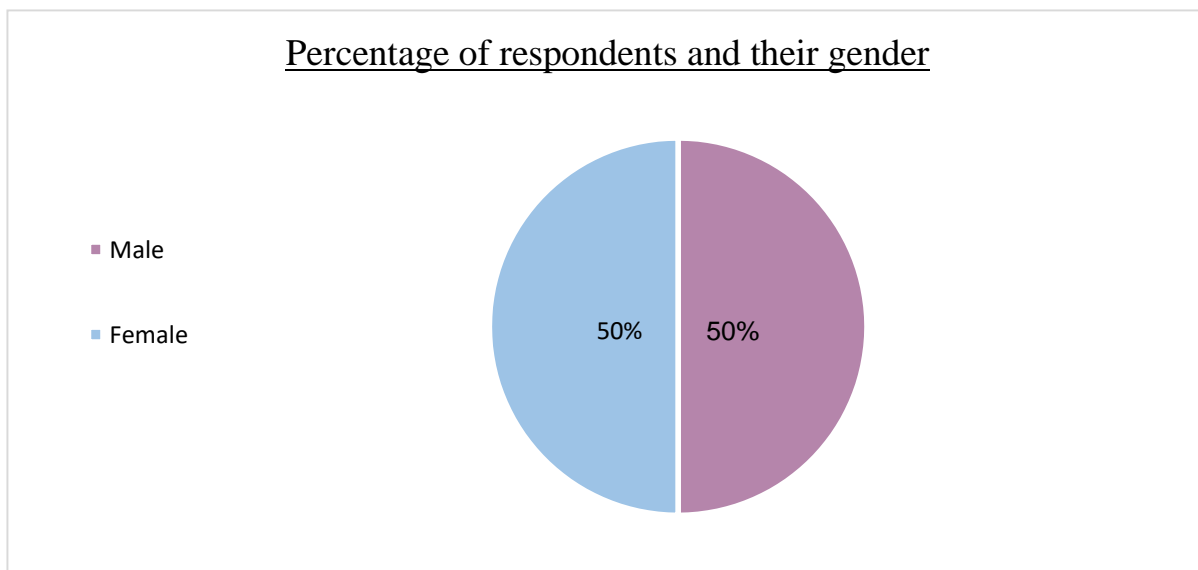
Results of Survey

Figure 4.1: **Age category of respondents.**
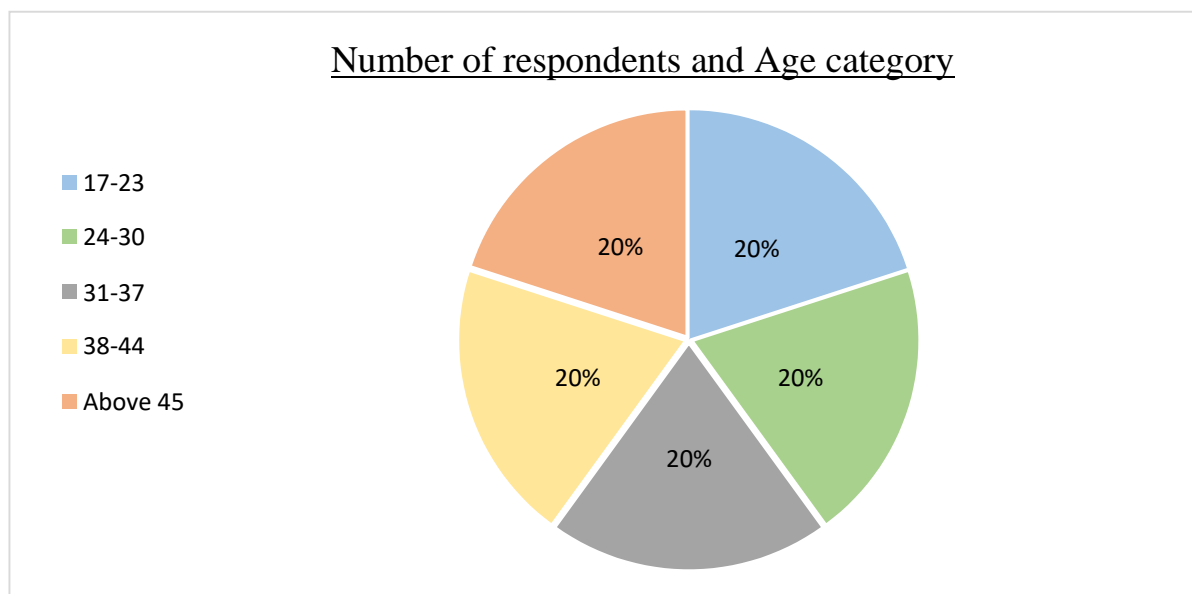
Result:

Respondents are categorised into five age groups starting from 17-23, 24-30, 31-37, 38-44

and above 45. The total number of respondents was 50, and among them 10 each were from

each age category.

Figure 4.2: **Gender of respondents**

Percentage of respondents and their gender

Result: Among the total number of respondents 50% are male (25) and 50% are female (25).

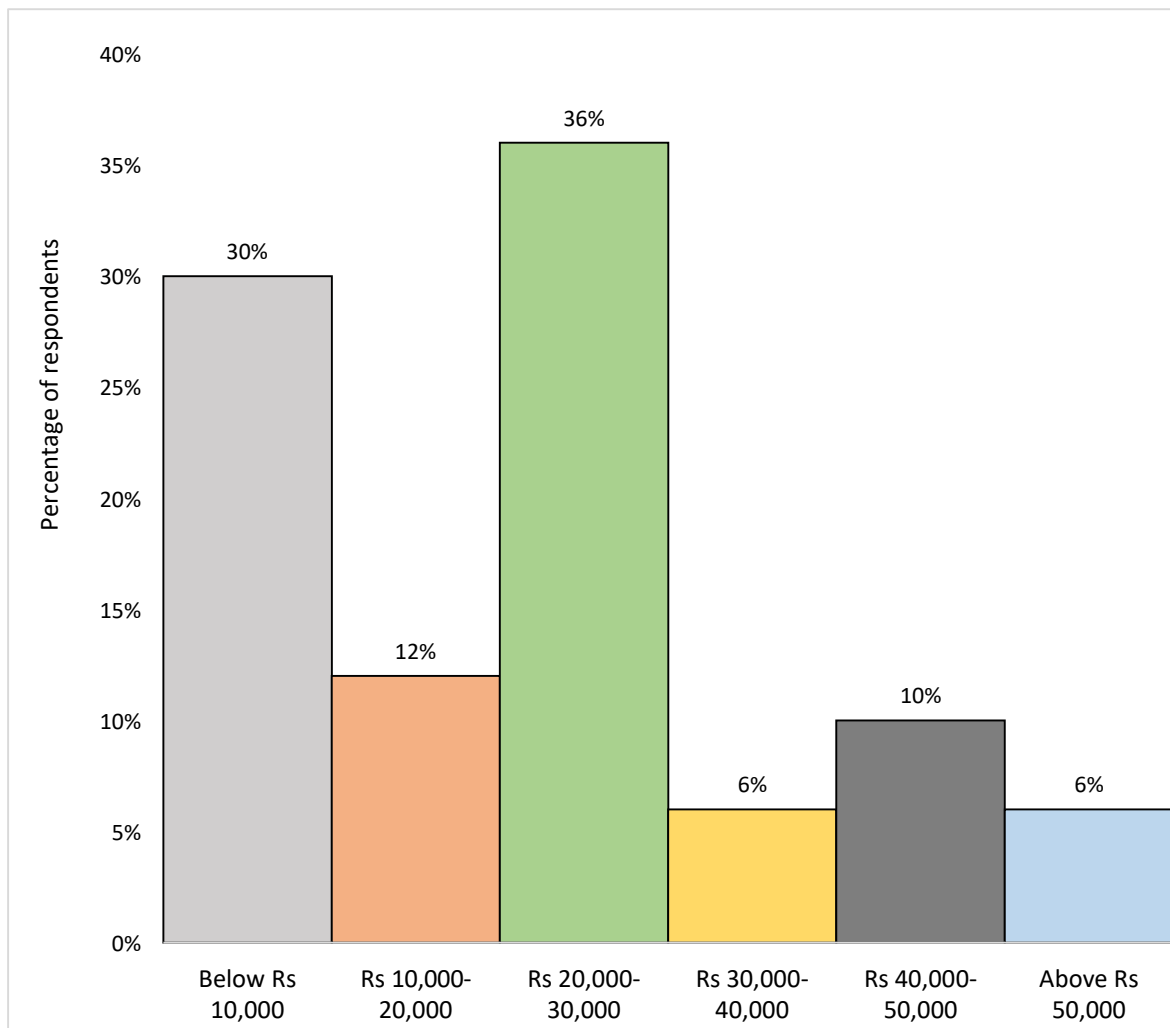*Figure 4.3*: **Occupational status of respondents**
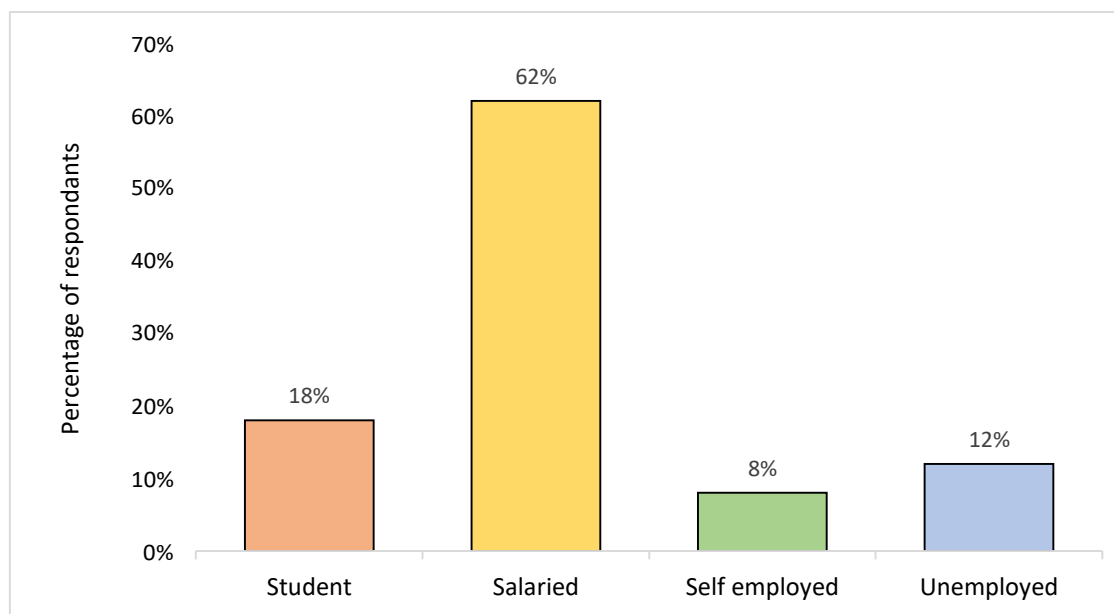
Result:

Among total number of respondents 18% (9) of them are students, 62% (31) of them are

salaried, 8% (4) of them are self-employed, and 12% (6) of them are unemployed.

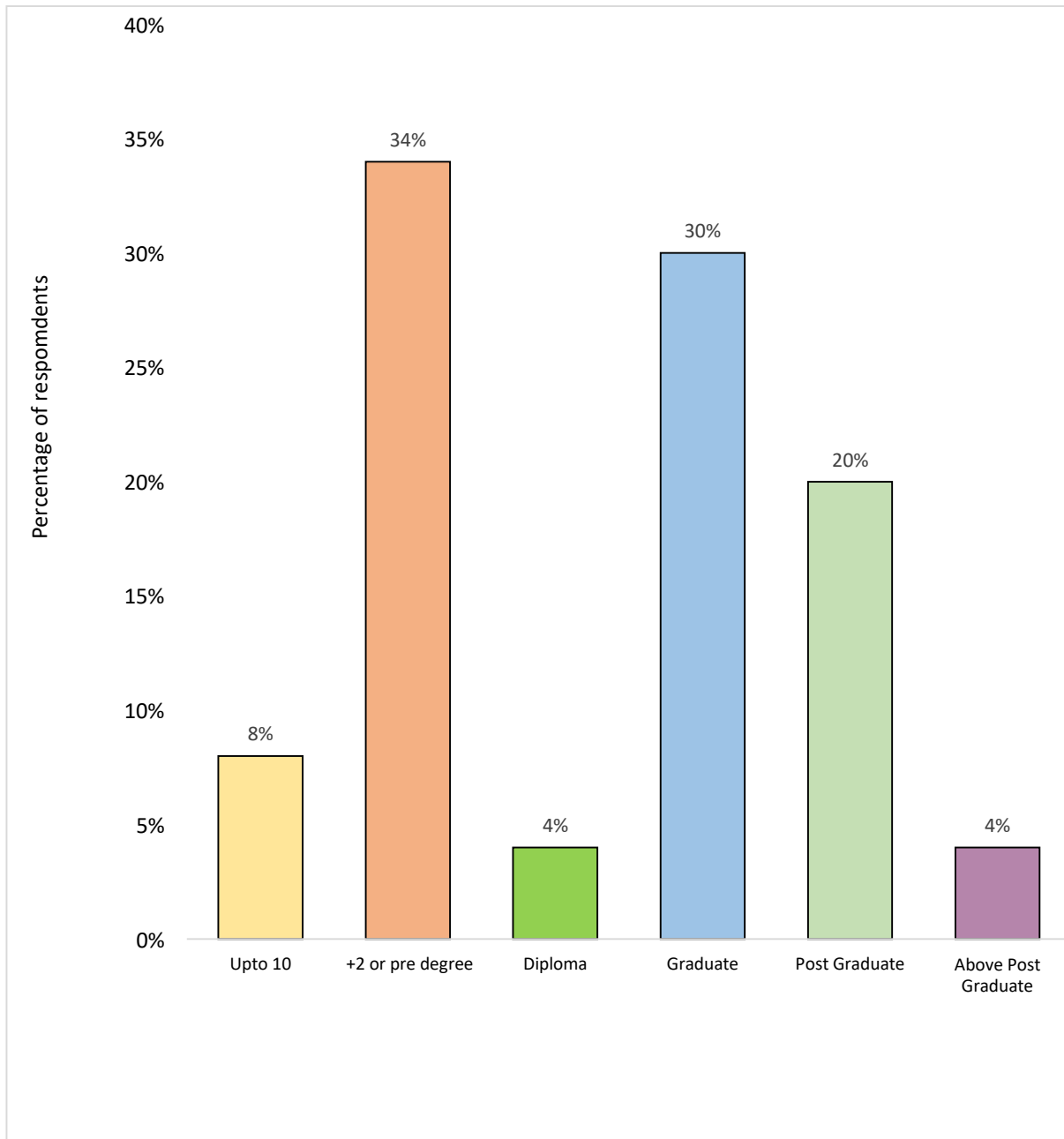*Figure 4.4*: **Monthly income status of respondents.**

Results :

Among the total number of respondents

- 30% have income below Rs 10,000

- 12% have income between Rs 10,000-20,000

- 36% have income between Rs 20,000-30,000

- 6% have income between Rs 30,000-40,000

- 10% have income between Rs 40,000 and 50,000

- 6% have income above Rs 50,000.

Figure 4.5: **Educational qualification of respondents**

Result:

The diagram shows the educational qualification of the respondents. Among the 50 respondents (4 respondents) have SSLC (10th standard) as their educational qualification. 34% (17 respondents) are having qualification upto 12th or pre degree. 4% (2 respondents) are diploma holders and 30% (15 respondents) are graduates. 20% (10 respondents) are post graduates and the remaining 4% (2 respondents) are having above PG qualification.
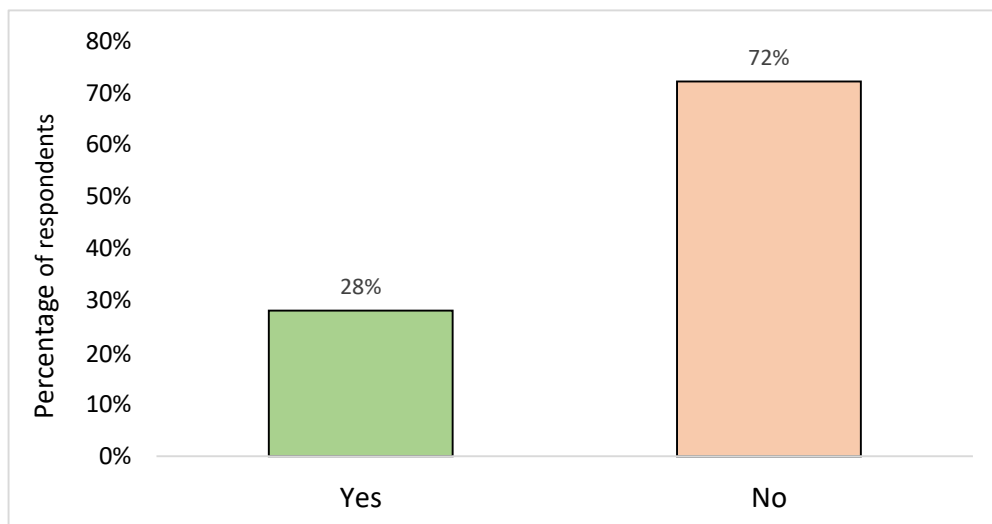
*Figure 4.6*: **Reading pattern of print publication.**
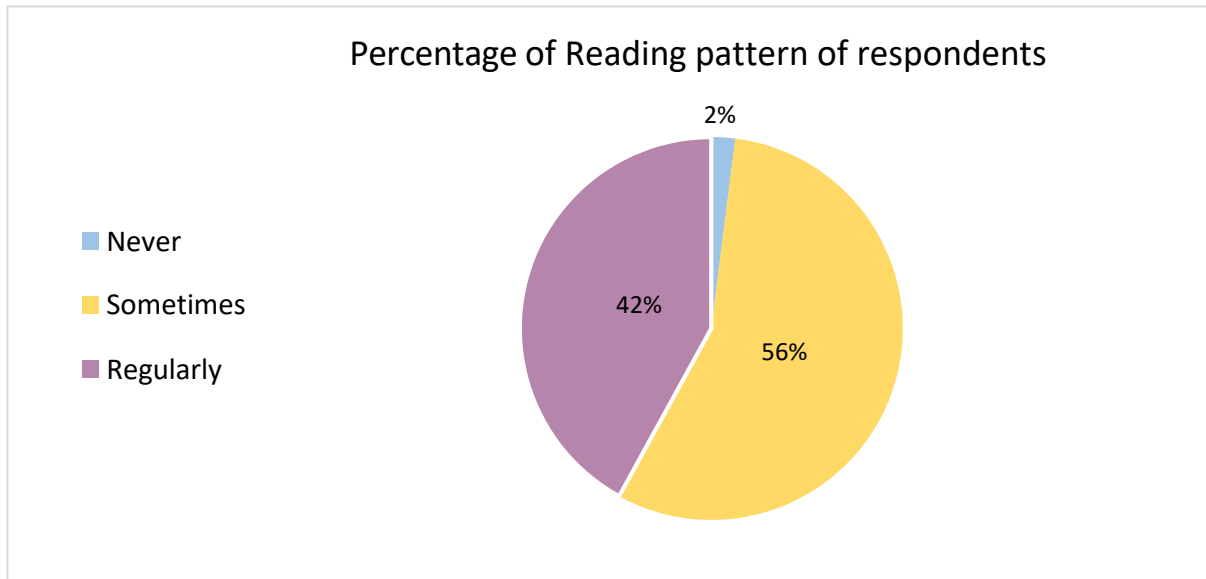
Result:

Among the respondents 42% (21 respondents) read print publication regularly while 56% (28 respondents) sometimes read print publication and 2% (1 respondent) never read print publication.

Figure 4.7: **Percentage of QR code usage**

Result: Among the respondents 28% use QR code while 72% (36 respondents) do not use QR code.

Figure 4.8: **Identification of QR code by respondents.**

Identification of QR code

100%

■ number of respondants
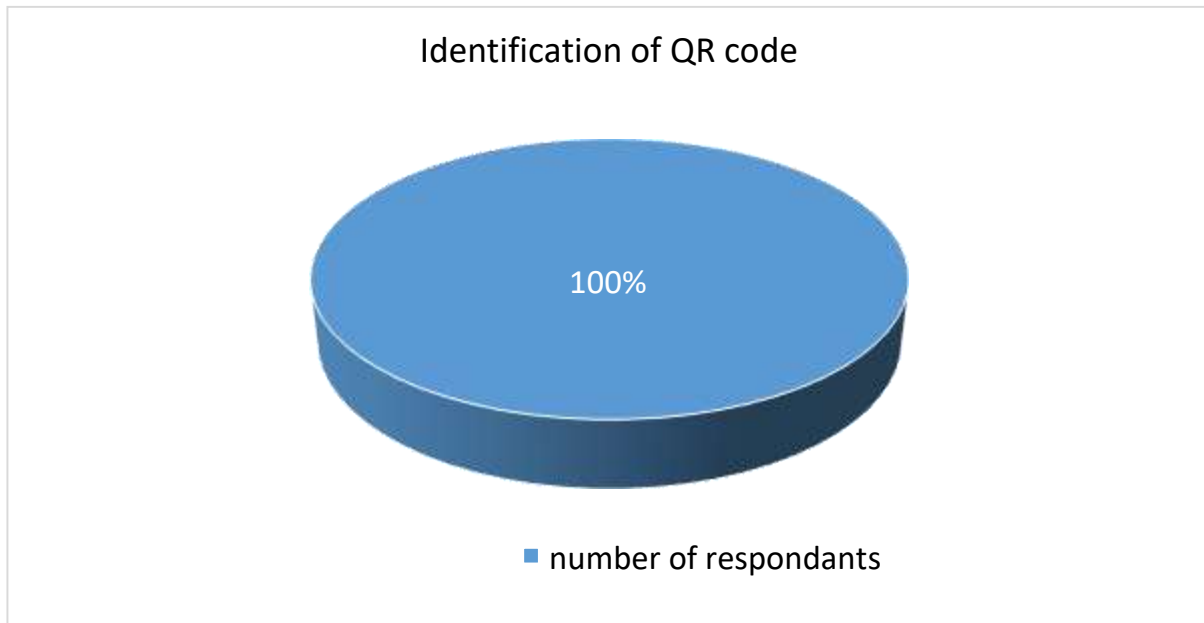
Result:

All respondents correctly identified QR code.

All users as well as non-users identified QR code correctly in the questionnaire. As technology is growing at a fast phase and integration of different media is inevitable, people of all age categories, occupation and educational status come across with technology of all kind. This result clearly shows that respondents of all categories have in one way or other come across QR code technology regularly. Though 100% of respondents identified QR code correctly, the utility and usage pattern is determined by factors both extrinsic and intrinsic. Identification of this technology by all respondents itself shows the impact of technologically driven society. The penetration of smartphones and wide availability of internet at a cheap rate may be the reasons for familiarity of new technologies. For the survey, people from all age categories are selected as respondents. It is interesting to note that even individuals above the age of 45 who are not considered to be tech savvy also identified QR codes correctly. This may be because of the increasing usage of QR code technology by print publications.

*Figure 4.9*: **Factors inhibiting usage of QR code.**
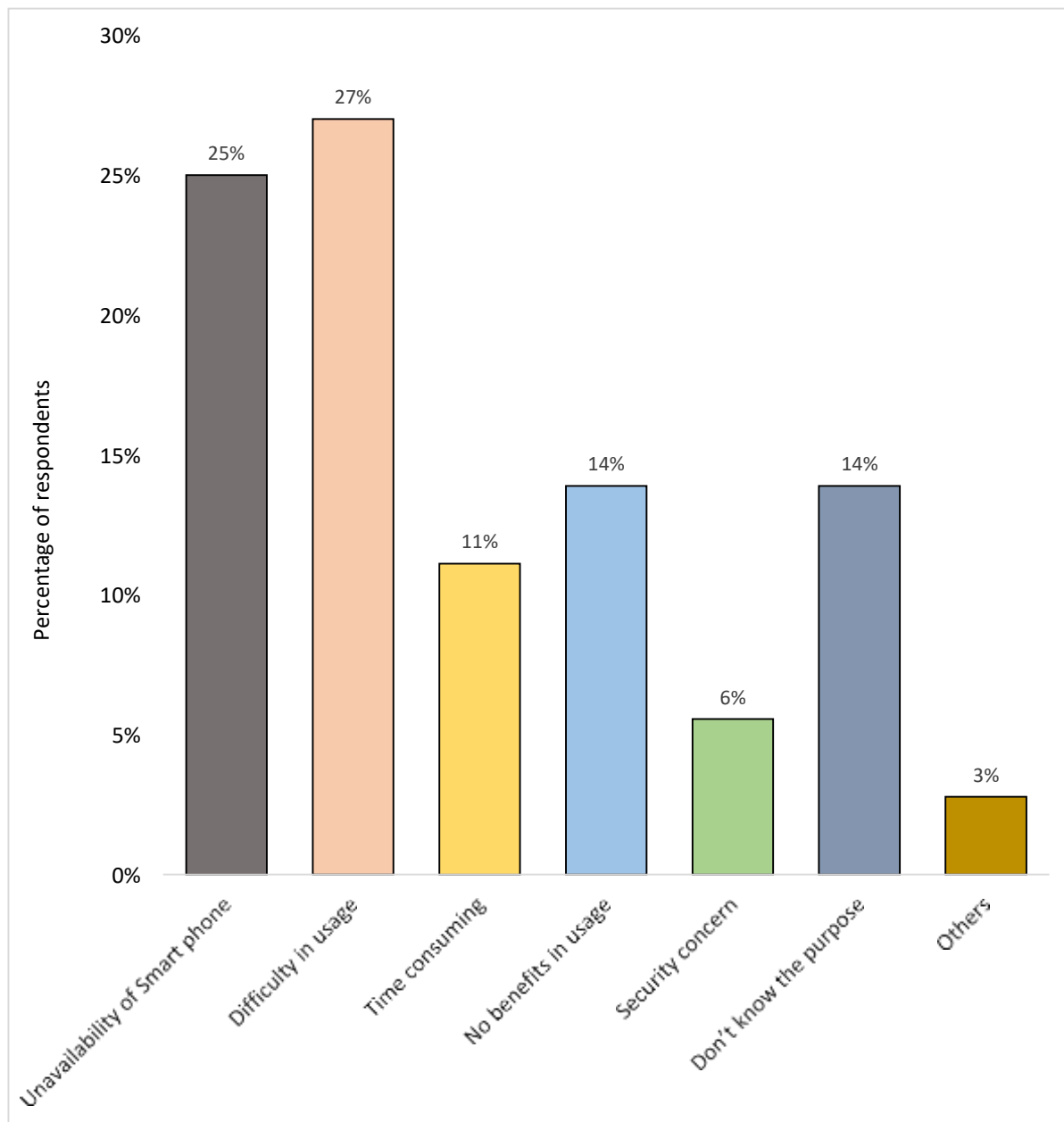
Result:

Among 36 non-users 25% (9 respondents) don't use QR code due to unavailability of smart

phone while 27% (10 respondents) haven't used QR code because of the difficulty in usage.

11% (4 respondents) don't use QR code as the process of usage consumes time, 14% (5

respondents) do not use QR code because they think there is no benefits in QR code usage, 6%

(2 respondents) never used QR code since they have security concern, 14% (5 respondents) do not know the purpose of QR code and 3% (1 respondent) have their own unrevealed personal reasons for not using QR code. The non-users of QR code give different reasons for their non-usage of QR codes. Basic reasons that affect their non-usage of QR codes include unavailability of smart phones, difficulty in usage, time consumption, lack of benefits in usage, security concerns and lack of awareness regarding the purpose of QR codes. Among these reasons difficulty in usage is found to be the most influential reason for not using QR codes. Difficulty in usage is the reason for 27% of the non-users for not using QR codes. According to Unified theory of acceptance (and use of technology 1) effort expectancy is one of the determinants that influences the intention and usage of a technology. As defined by the theorists, degree of ease associated with the usage of a system determines its utilisation. Majority (27%) of the non- users finds the process of scanning QR codes difficult. This inhibits them from using the QR code technology. Utilisation of QR code requires manual scanning through smart phones. Ease of this process as perceived by the individual determines utility of QR codes. Another factor that inhibits 25% of non-users from using QR code technology is the unavailability of smart phones. In order to access the information embedded in a QR code one needs to scan it through their smart phone. According to UTAUT 1, facilitating condition i.e. the organisational and technical infrastructure that exists to support use of the system is the key determinant that influences use of a technology. Here facilitating condition is smart phone and unavailability of smart phone is the factor that negatively affects the usage of 25% of non-user respondents. 14% of non-users of the QR code are not moved by the technology as they think there is no benefit in using QR code. This reason can be connected with the performance expectancy, a key determinant of UTAUT. If a particular technology helps an individual to have gains in a job performance or related benefits it could motivate the use of that technology further. For 14 % of non-users, QR codes do not provide them with any benefits and that in turn prevent them

from using that technology. Lack of knowledge about the purpose of QR code and its process are the other factors that influence the usage of QR code. Even though 100% of respondents were able to identify QR code, the usage of the technology by many is affected due to their ignorance about its purpose. Security concern and time required to scan QR codes also serve as reasons that inhibit the utilisation.

Figure 4.10: **Frequency of QR code usage**

Frequency of QR code usage among users

21%

79%
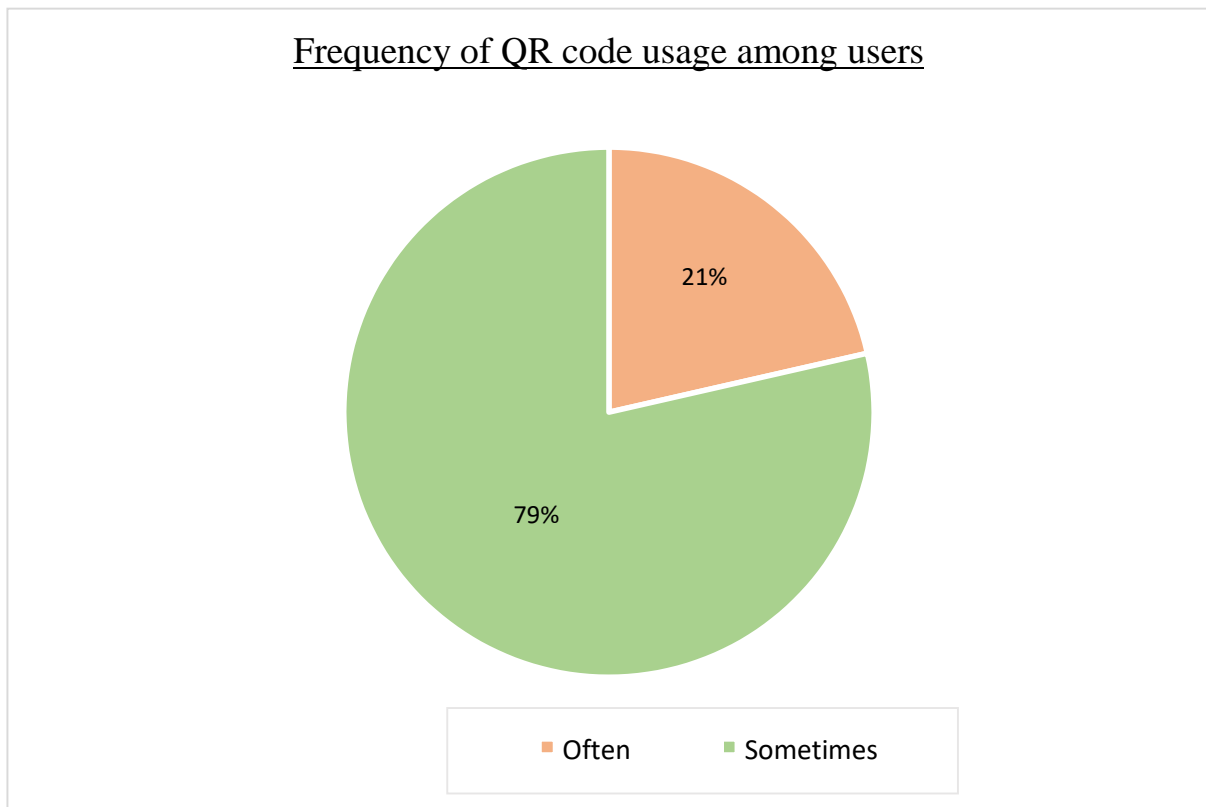
■ Often   ■ Sometimes

Result: Among the QR code users 79% sometimes scan QR code while 21% often scan QR code. Pattern of usage of QR code suggests that the technology and its potential are not completely utilised by the users as well as publications. Even though QR code has a wide application, regular users of QR code is very less. This frequency of usage may be because individuals find QR code and its usage difficult. The wide applications of QR code in variety of ways by publications also determine the usage pattern. This frequency of usage suggests that QR codes are yet to be effectively used by publication.

Fig 4.11 **Frequency of usage of male users**
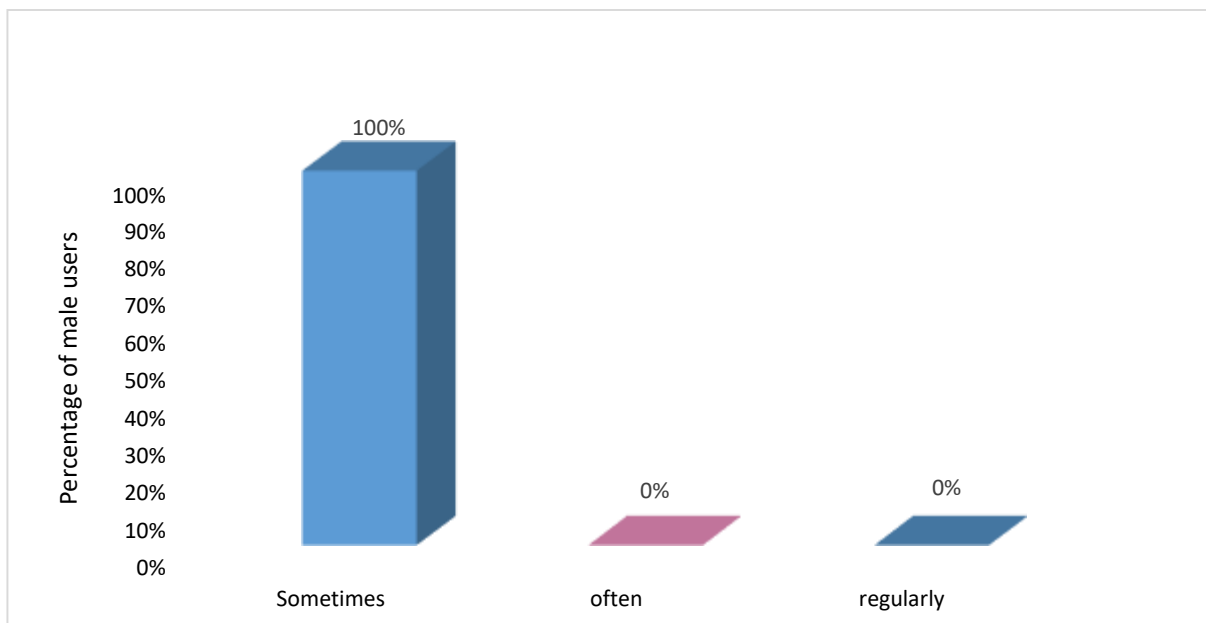
Result: All the male users use QR codes sometimes.

*Fig 4.12* **Frequency of usage of female users**
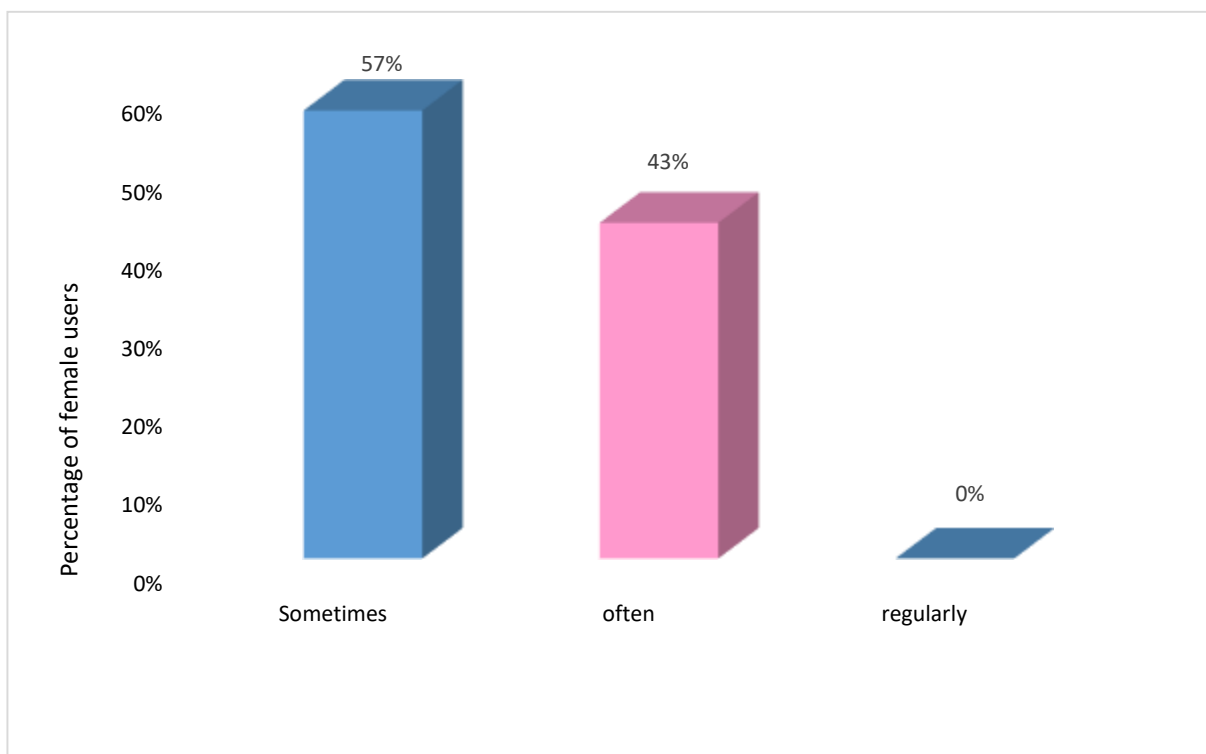
Result: Among the female users 57% use QR code sometimes while 43% use QR code often.

ANALYSIS OF FIGURE 4.11 & 4.12

Among QR code users 50% are male and 50% are female. Even though the gender of individuals serves as a moderator of key determinants that influence use of technology, the data analysis suggests that QR code technology is utilised by men and women equally even though frequency and usage purpose varies. The above two graphs shows that QR codes are more accepted and widely used by females than males. From the survey men sometimes use QR code while females use it more often. This frequency of usage may be because women get more assistance in their day to day activities by using QR codes. QR code's ability to assist reading when women can undertake other household activities may have accelerated the frequency of usage. Even though there is some kind of acceptance of QR codes among women population, none of the respondents are regular users. This points to the need of more penetration of the technology among women users. But compared to women, the male respondents' usage of QR codes is much limited. The pattern of usage suggests that the QR technology needs to get wide acceptance among them. According to UTAUT the gender difference is one of the moderators of the factors that affect the technology usage. In the case of QR code technology and its usage gender has not moderated the utility but it has an effect upon the frequency as well as pattern of usage.

*Figure 4.13*: **Different purposes for which users scan QR code**.
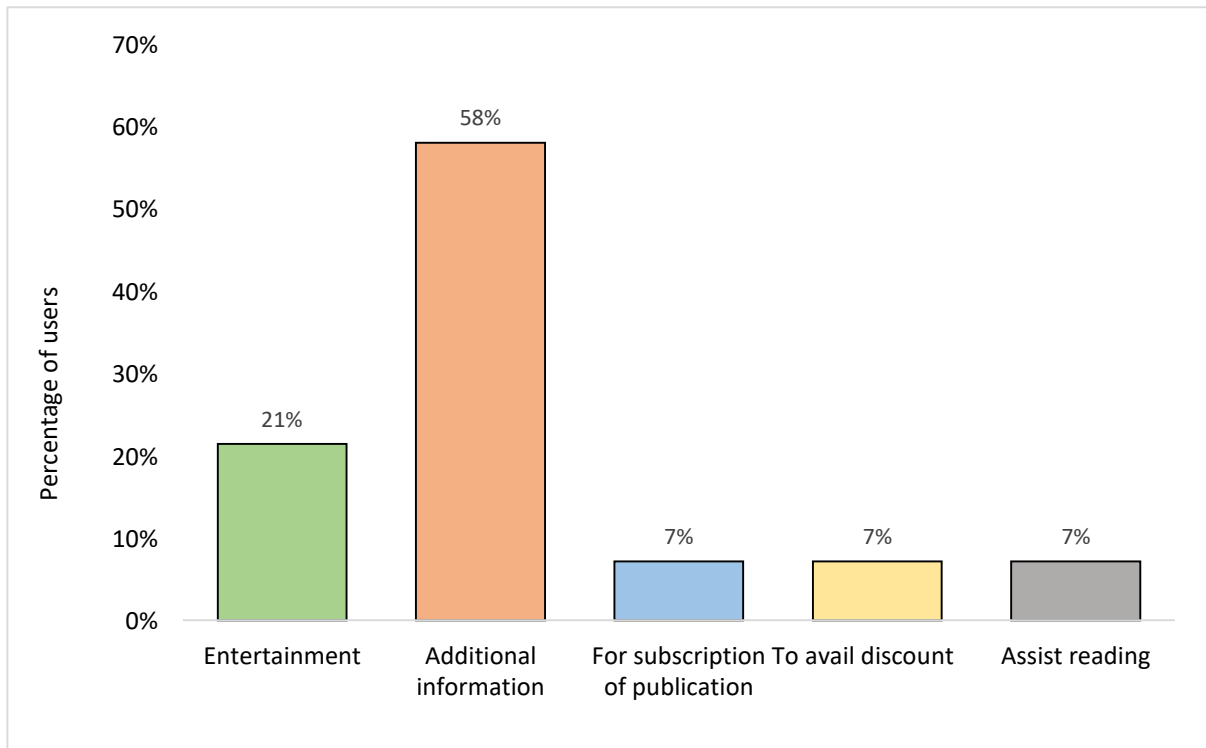
Result: Among the users of QR code 58% use QR code for additional information, 21% use QR code for entertainment, 7% use QR codes for subscription of publications, another 7% use QR code to avail discounts and rest of the 7% use QR codes to assist their reading process. Majority of the QR code users scan quick response codes for additional information. The main advantage of QR code is that it can encode large amount of information to a limited space, thereby saving the much valuable space from designs, both print and digital. Among the respondents 58% of the users use QR codes for getting additional information that the source provider intends to give, while 21% of users scan QR code for entertainment. According to the UTAUT 2, hedonic motivation is one factor that determines use of technology. One of the major applications of QR code is that it gives users access to additional multimedia content and this adds to the entertainment value to the resource provider. This has a direct impact on technology usage. The rest of the 21% of users utilise QR codes for subscription of publications, and reading assistance.

Figure 4.14: **QR code usage pattern of female users**
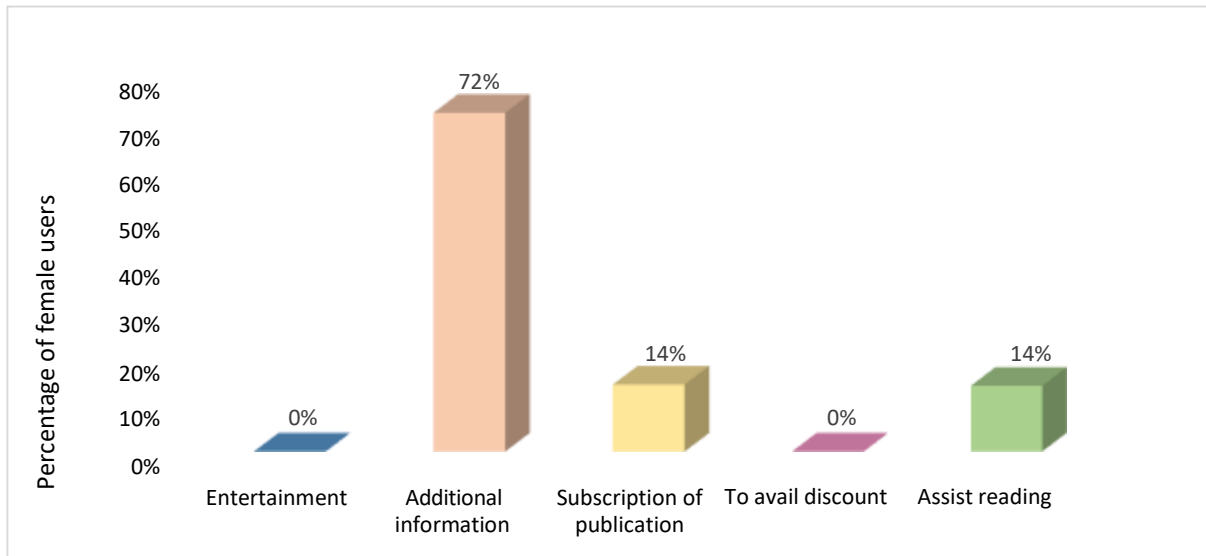
Result: Among the female users 72% use QR codes for getting additional information while 14% of users use it for subscription of publication and another 14% use it to assist reading process.

**Fig 4.15 QR code usage pattern of male users**
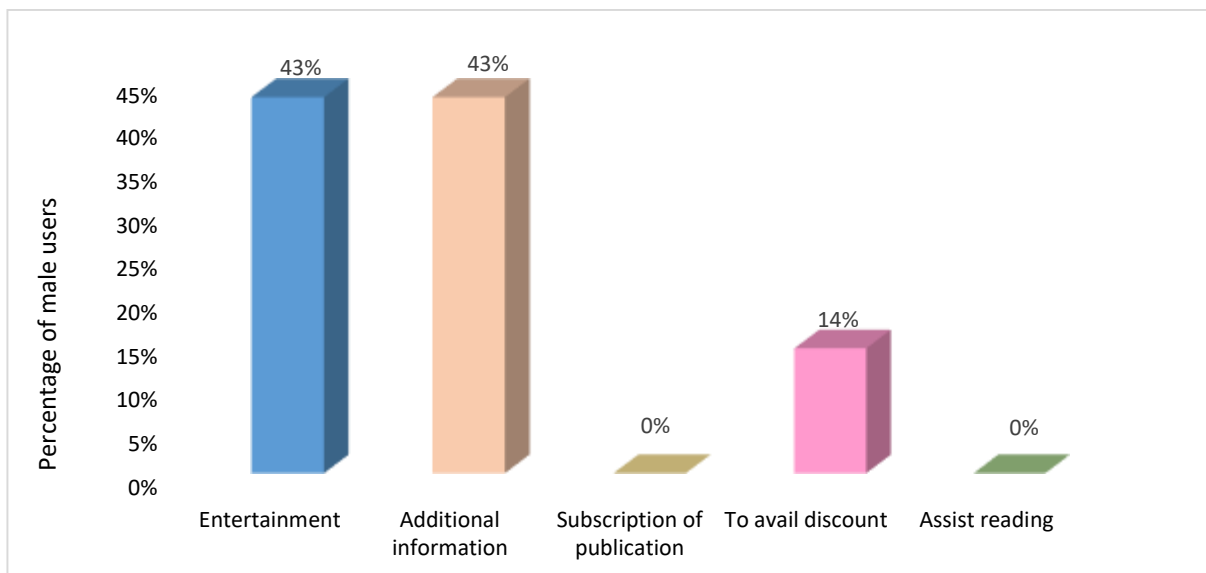
Result: Among the male users 43% use QR code for entertainment while another 43% use it for getting additional information and 14% users utilise it to avail discounts.

ANALYSIS OF FIGURE 4.14 & 4.15

The above results show that QR codes act as gateways to further information and also assist both content creators and users in a variety of ways. Female users don't use QR codes for entertainment which indicates that hedonic motivation is not a determining factor for females to use QR code technology. Female users make use of this technology for enhancing and assisting their reading experience. QR codes enable women readers to enjoy the content while doing other activities. This usage is also noted by the respondents interviewed in this study. QR codes provide additional information about various source providers which is utilised by majority of female users. Female users also scan QR codes for subscription of publications which earlier required filling up subscription forms and posting it. QR codes now replace this process and it is accepted among readers.

The usage of QR codes among men is dependent on hedonic motivation. At the same time hedonic motivation doesn't influence female users to use the technology. Male users also scan QR codes to get additional information on the subjects they are interested in. Additional information and entertainment are equally used applications of QR code. QR codes are extensively used for enhancing business. They are also used for marketing of products and services. QR were extensively used on marketing of various products. Nowadays QR codes are used along with advertisements in print medium. QR codes accompanying advertisements may encode product description, information about the enterprise, discounts of products etc. This seems to be an effective application of QR code in the field of marketing. Male users seem to scan QR codes to avail discounts of products. This is one noted usage of QR codes by male users. At the same time the survey analysis also shows that male users don't use QR codes for subscription of publication and assist their reading. The usage patterns and purposes vary among male and female.

Figure 4.16: **Occupational status of QR code users.**
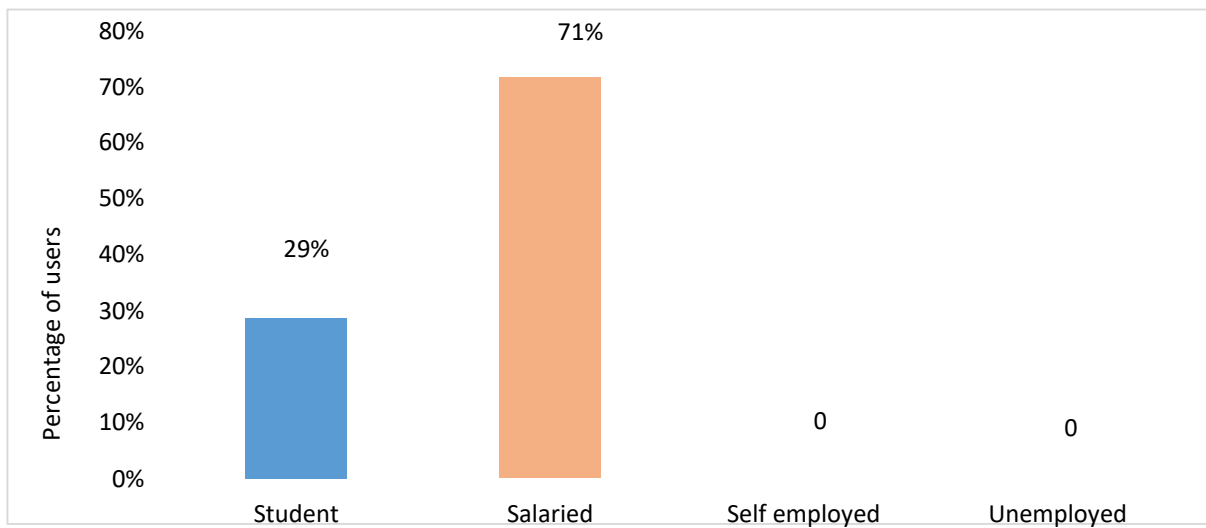
Result: Among the total number of QR code users, 29% are students and 71% are salaried. The salaried class of users seems to have more access to smart devices that can scan QR codes. Since QR codes provide embedded information including multimedia content within smart devices employed individuals find it easier to access the content during travel or at workplace. In case of self-employed and unemployed their working hours and pattern is more flexible so that they may not need QR codes to access the embedded content.

Figure 4.17: **Educational Qualifications of users.**
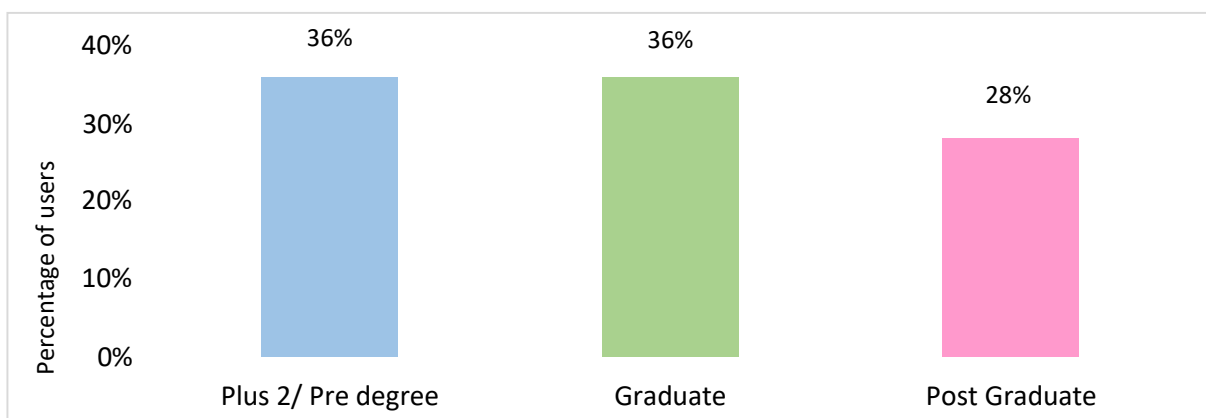
Result: Among the total number of users 36% have educational qualification of plus2/pre degree, 36 are graduates and 28% post graduates.

Figure 4.18: Age wise classification of QR code users


Age category of users
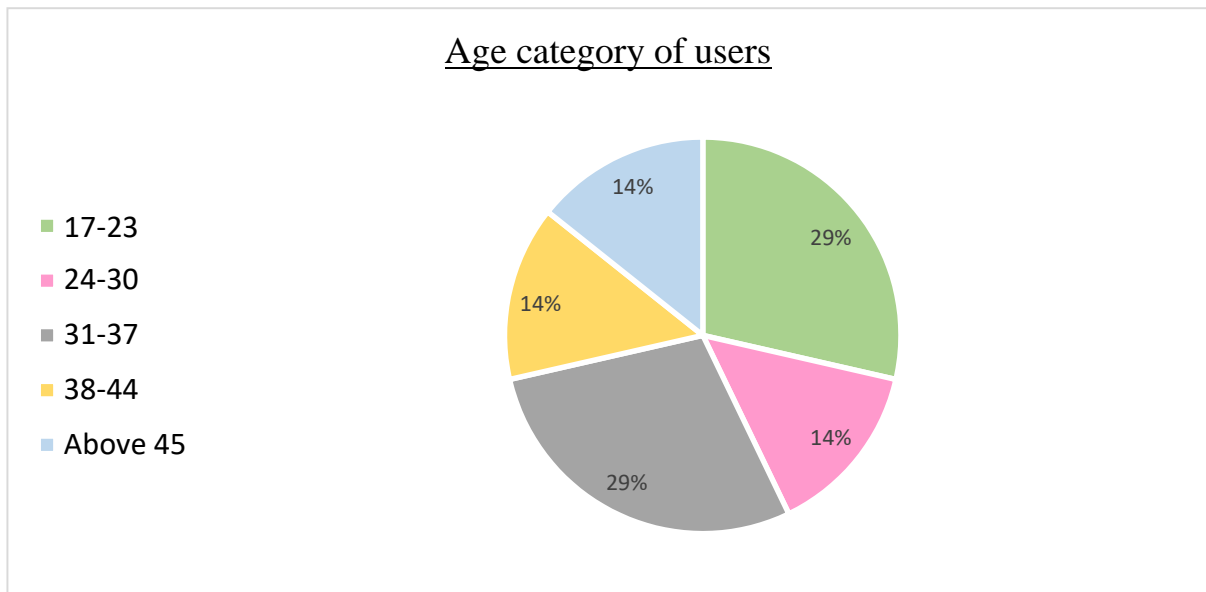
Result: Among the total number of respondents 29% are between the age of 17-23, 14% are between the age of 24-30, 29% are between the age of 31-37, 14% are between the age of 38-44 and rest 14% are above 45. Age is not found to be a determining factor in QR code usage. Respondents for all age categories use QR code even though their percentages vary. 14% of users from age above 45 suggest that QR technology is even accepted by people of a generation who are considered to be digital immigrants. This acceptance may be the result of media convergence, cheaper smart phones and spread of internet usage.

Figure 4.19: Educational Qualification of non-users of QR code
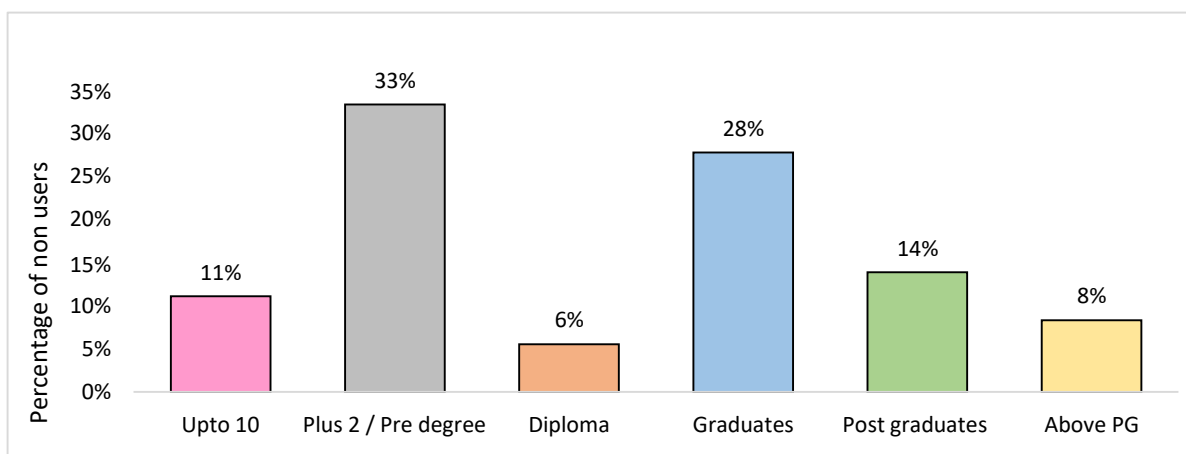
Result:

Among the non-users 11% have educational qualification upto 10th, 33% have qualification of Plus 2/pre degree, 6% hold diploma, 28% are graduates, 14% are post graduates and 8% have qualification above post-graduation.

Figure 4.20: Occupational Status of non-users of QR code
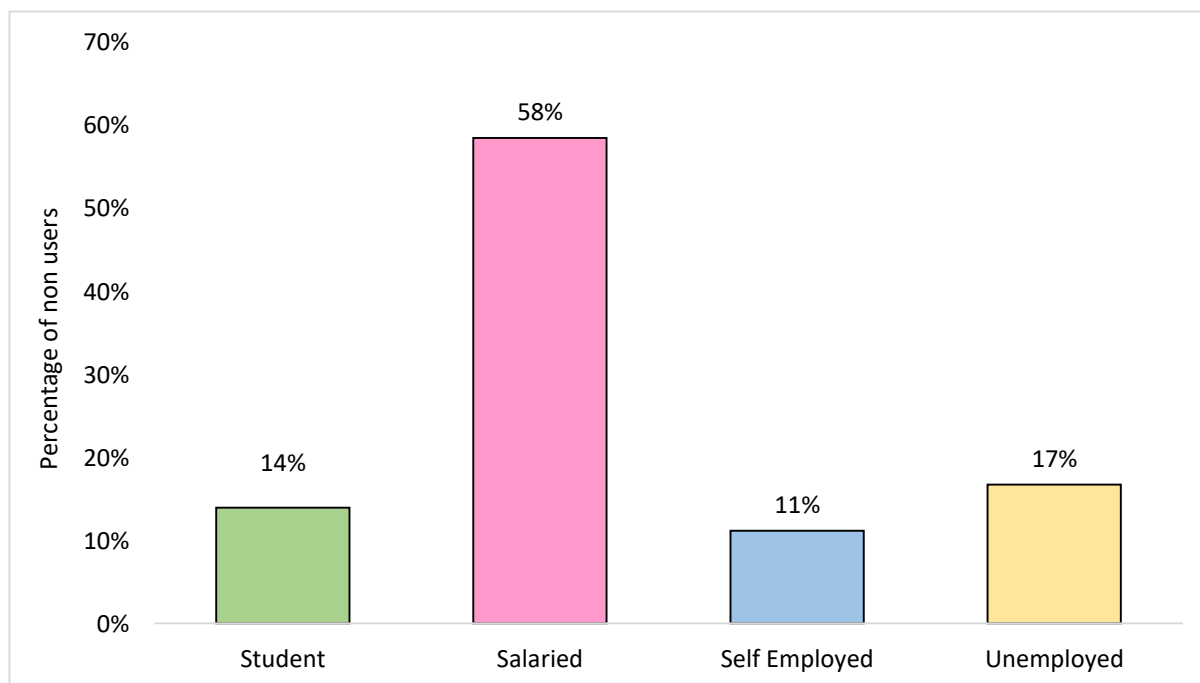
Result:

Among the non-users 14% are students, 58% are salaried, 11% are self-employed and 17% are unemployed.

Interview with QR code users

Experience of using QR code

According to respondent 1 (R1) and respondent 2 (R2) QR codes are mostly used for getting additional information. Users scan QR codes accompanying automobile advertisements for getting further information about the source. QR codes are becoming very common among newspapers, which provide more information about the articles, news stories and features and are scanned by users to get further information about the print content. QR codes also make the print medium more interactive where readers become part of various activities offered by the source provider. R1 scan QR codes in magazines to sign in to various contests and to get linked with their websites. QR codes can be created for personal purposes like sharing invitations, route maps etc. "I also create QR codes for accessing and sharing files that I create and upload, for sharing directions in invitations and so on" says R1. QR codes can be used by individuals both for retrieving as well as sharing information. QR codes extend the amount of information that one could get from a printed sheet. Scanning a QR code gives access to additional information about topics whose content is limited in publications.

Readers' usage of QR codes

Based on the observations of R1 & R2 people are not properly utilising QR codes even though it has a lot of uses and application. During the initial stage QR code scanning required an additional application but now latest android mobile phone cameras have built in QR code scanners so that we don't require any additional application. Camera itself detects QR code when they are pointed to a QR code. Even though it is so convenient people don't use QR code

unless they are forced to or there is no other way to access a particular information. QR code usage needs to gain momentum even though its features are becoming so common among print publications. At the same time R1 comments that students utilise QR codes to collect more detailed information. He also suggested that publications should initiate activities to popularise QR codes and their features among readers so as to influence potential readers to use QR codes.

Factors affecting the usage of QR code

QR code is an extension for particular information. QR code is a medium that gives accessibility to a new dimension of information. This feature of QR code influenced R1 to utilise QR code. QR code provides added information of the source that created that particular QR code. Individuals' interest in the subject along with the provision of QR code enhances the usage of this technology. "The major factor that attracts me to use QR code is the interest I have upon the topic related to QR code. That decides whether I should scan QR code or not" says R2. Usage of QR code is enhanced if it satisfies individual needs and purposes. If it is useful and effective for readers' needs they will definitely scan QR code.

Limitations of using QR codes

As per the experience of R1 there is no practical difficulty in usage of QR codes. Since mobile phones are available for everyone, QR codes can be easily accessed. "I have used different phones. In some phones since their software is not properly updated camera itself cannot detect and scan QR codes, in such phones we require an application" says R1. A generation who is not tech savvy may find it difficult to download an application from Play Store. For them the process of scanning QR code is difficult. For the young generation QR code scanning does not have any practical difficulty. Another limitation pointed out by R2 is the internet connectivity. Since most of the QR codes are connected to web services and web pages, if the internet connection is not proper there is a difficulty in usage. For accessing QR code we need internet and smart phone at the same time. The lack of strong internet is a barrier for QR code usage for many.

Enhancement of entertainment through QR code

QR code enhances the entertainment of users. Usually QR codes are seen in print medium in which entertainment is limited to textual literature and pictures. But QR code bridges the gap between print and audio visual media in the case of entertainment. The multimedia content that is embedded in QR code adds a new dimension to reading. Respondents also see QR code as an infotainment provider. "I see QR code as a source of infotainment. I scan QR codes from magazines like Vanitha and other weeklies to get more information. Along with information I enjoy videos linked to it through QR codes" says R2. QR codes thereby enhances the reading experience through print medium by providing information that is not limited to a printed paper along with entertainment feature. Entertainment has become one of the factors that motivate an individual to use QR code. "I used to enjoy various content by scanning QR codes. If I see any feature or content which I am interested in I definitely scan QR code attached to it. Entertainment is one factor that influenced me to use QR code" says R2. This also indicates how hedonic motivation has become an influential factor to use a technology.

Audio visual experience through QR code

Respondents have audio visual experience through QR codes. Individuals scan QR codes accompanying the source in print media which thereby overcome the limitation of print media to involve auditory and visual senses. "I have audio visual experience through QR code from automobile advertisements where they link two to three minute videos in QR code so that I could access more appealing information that can also involve my other senses" says R1. QR also gives good experience for viewing various kinds of tutorials. QR codes link visuals associated with the content of articles and features in magazines and newspapers. Based on the responses of interviewees scanning QR codes to access audio visual content seems to be a good experience for readers.

QR code changing the way of reading

Print media is a traditional media. Content in print media is limited to text and images. Therefore reading was also limited to printed text and photographs. With the intervention of QR codes, print medium now can encode both audio and visual content and thus can overcome the limitation of traditional print medium. QR codes create an extra dimension of reading. It complements our reading as well as our imagination. It helps a lot for nonfictional kind of reading matter like interviews. In newspaper the quantity of information it can disseminate is limited but through QR codes the readers get an opportunity to enhance their level of reading. Through the audio visual content embedded in QR code readers can engage in other activities while enjoying the content in publication and it gives more privilege to the print medium. Reading has become a novel experience where it assists potential users to read their favourite content even in between their day to day activities. Therefore QR codes have not only added an extra dimension to reading but also have the potential to assist reading by encoding audio content of the text which the users can listen to .

Changes noticed in fellow beings using QR codes

 QR codes provide an instant access while sharing links. It helps to share information to a public or to individuals with whom we don't have personal contact. Respondents also reported that the topic of QR code is not much discussed among their fellow beings. They point out the need for popularity of the technology among people. QR codes are yet to gain momentum among common public which makes their reading more convenient and efficient. QR codes and its usage need to be popularised among potential readers which will motivate them to use the technology more efficiently.

Usage of QR code in Malayalam publication

 Usage of QR codes in Malayalam publications is now widely gaining momentum. Popular Malayalam dailies and magazines are now into the usage of QR codes to provide much better

reading experience to their consumers. Malayalam publications have started utilising the key features of QR codes to engage their readers. Publications are adding audio and background effects so that readers feel like reading audio books which are now very popular. These features of Malayalam publications are noted by respondents. Malayalam publications use the application of QR code in an effective way. Some of the magazines and weeklies too use QR code to entertain readers by embedding video contents. "One of the weeklies also provides audio content of the text through QR codes which assist our reading even at our work" says R2. Publications should also take initiatives to motivate the users to scan QR code.

Future of QR code application in Malayalam publication

Publications need to popularise the QR code provision by sharing information about how to scan QR codes. Malayalam publications are now into effective utilisation of QR code and its applications to provide a new dimension of information. Apart from the popular publications other local dailies and magazines should also try the applications of QR code which will help in wider reach of technology among all sections of the society.

Utilisation of QR codes are not only limited for retrieving additional information, but the users also make use and become part of the advanced application of the technology. QR codes serve as a bridge between real and virtual worlds along with incorporation of multimedia content. The user interaction with traditional media is another feature explored by QR code users which enables individuals to become part of media activities, competitions and more. Users have also identified the chances of better communication for their individual purpose. Reading has become novel using QR codes for individual users. It has added more reading content which doesn't limit into a page or column.

From the experience of the users QR code adds a new dimension to their reading. Print medium usually limit their content within pages and images where readers and their experience too set contained within these limits. The advent of QR code extends this to give an extra dimension and interactivity to reading. The chance of in-depth source of information and content of the

subject of interest make users viable to access the technology. QR codes also add up the entertainment of readers and this remains as one of the factors that influence the utilisation of QR code. Entertainment content embedded within the QR code is utilised by the user. Incorporation of multimedia content into the printed text adds entertainment to the reading materials which makes the technology more attractive. QR codes successfully provide entertainment along with information so that the product becomes entertainment. Thus utilisation of QR code takes into one more step apart from additional information. Entertainment serves as a factor of utilisation of QR code. Apart from entertainment QR code also provides audio and visual content for the readers that complement the printed text. This is also utilised by QR code users to enhance their reading. Even though QR code has lot of applications and areas to explore, as per the experience of users, people don't utilise QR code to its full potential. Although QR technology doesn't even require an additional application to access the technology, individuals use the QR code technology and its application if they are forced to or there is no other way to access the source. QR technology and its utilisation lacks proper reach among people even though a few individuals use it to retrieve additional information (as per user opinion). The main hindrance pointed out by users is the unavailability of strong network connection to effectively utilise QR code. For QR code users the technology support their reading positively and efficiently adding a novel dimension to their reading experience.

Interview with non users of QR code

Awareness about QR code

Respondents are familiar with QR code and its wide applications. Individuals have noted QR codes in advertisements and newspapers. Other than that respondents are more familiar with QR codes from payment apps like Paytm. Respondents have seen it in various print platforms. Since QR codes are widely used among various print publications people know about the technology and its applications.

Barriers in using QR code

The major difficulty or barrier that respondents point out in the usage of QR code is time consumption. In order to access the content one need to scan the code using their mobile phones. Respondents think that this process consumes time. "Scanning QR codes is time consuming and we can't use QR codes at any time. When you look into banking there is an option for QR code but we have other technologies instead of it which is more easy to use like swiping" says respondent 4 (R4). Fear of time consumption hinders the respondents from using the technology. "I personally feel that a barrier in usage of QR code is that I don't have phone always with me so while I notice QR code in newspapers, I feel very lazy to take the phone and scan it or it may be because of the lack of interest in that particular article" says R3 as a reason for not using QR codes. Even though respondents use QR codes they have scanned it once out of curiosity. Another barrier noted by R4 is the poor maintenance of source website linked though the QR code. Sometimes the pages get redirected that will shy away users from scanning QR codes.

Applications of QR code

Based on the observations and knowledge of respondents 3 and 4 QR codes are used in online payment apps like Paytm, phone pay, Google pay and in magazines like Vanitha and Manorama for reading purpose and in newspapers like Manorama for additional information about some special articles and so on. This shows that respondents are familiar about the major applications of QR codes.

Laborious process of scanning QR codes

Although respondents 3 and 4 have limited experience and knowledge about QR codes, the process of scanning QR codes seems to be a laborious process that in turn prevents them from the usage of the technology. Another factor is the problem in speedy internet connectivity. "There is a difficulty in usage of QR code, it may be because of any technical problem or net connection issue in my phone because once I tried to scan the QR code, it took so long for loading and finally

system got hanged. So I quickly skipped it" says R3.

Usage and application of QR codes

Many respondents do not use QR codes since they are not interested in using it. Some are lazy to scan the QR codes as they think it is waste of time when they have plenty of other options. Respondents think QR code scanning is a lengthy process and at the same time they have other easier and shorter options of entertainment. People do not usually spend lengthier time spans on a technology if it is not entertaining for them (Williams et al. 2018).

Positive Factors affecting the usage of QR codes

Non users may think of using QR codes if they feel that the usage will assist better performance in this profession and will help them in achieving career goals. They may also use QR code if there is no other way to retrieve that particular information.

Chances of usage of QR codes in the future

 Respondents were of the opinion that if usage of QR code substantiates respondents' profession then they will definitely use it. Currently everything like videos, reading materials and so on are already available even without scanning QR code. If QR code provide any special feature or added information which is not available anywhere else, then it is necessary to scan QR codes.

Worthy experience of QR code usage

The major difficulty felt by R3 and R4 is time consumption of the entire process. "I will use QR code only if that time consumption is worthy as it provides some relevant information. But for the time being, I have not yet found anything worthy in the usage of QR code personally" says R3.

QR code technology has widened its application in all areas of life. Even though the application is

wide the technology is not effectively utilised especially by print publication. Based on the interview analysis of non-users of QR code time consumption in scanning the QR code is found to be a major factor that inhibits the usage of technology. For an individual to access the content embedded within the QR code, he/she needs to scan the QR code using mobile phone or application. For some individuals this process seems to be time consuming and forbid them to use the technology. This can be closely related to the effort expectancy determinant in Unified Theory of Acceptance and Use of Technology, which points out that ease of use associated with a particular technology influences the usage of that technology. QR code although seems to be familiar among the non-users their intention to use that technology is forbidden due to the factor of time consumption.

It is interesting that people are very much familiar with the application of QR code not only in print publication but also in other areas where QR codes are used for payment purposes. But when it comes to the point of utilisation there exists a lot of factors that affect their intention to use the technology. Apart from time consumption the users have also pointed out the unprofessional management of QR code by source provider that pulls back the potential users from accessing the technology. Some of the destination pages may not be properly designed or equipped with the expected information or content. There are instances where the pages get redirected to undesired destinations or may require following more than one hyperlink to access the expected or enclosed information as described along with QR code. This is one of the factors that make individuals apathetic towards QR code. QR code is a web based technology that require internet to access its embedded content. The lack of proper internet connection, also acts as a barrier for the QR code usage. Facilitating condition as per the UTAT 2 is a major determinant of a technology usage. From the interview of non-users of QR code it is clear that this determinant is having direct significance in making the potential users unenthusiastic towards using the technology. Non users of QR code basically have an unsatisfactory opinion about the technology. Responses also suggest that exclusive information and content that is absolutely available through QR code that makes their time involved in scanning the QR code worthy would motivate their intention in using QR codes.

Apart from this, if the factors expressed by the non-users that inhibit their utilisation are harmonised, individuals may reconsider using this technology.

CONCLUSION

Corresponding to increased smart phone penetration along with cheap internet availability print publications engaged in using quick response codes that can embed large amount of information in various forms compressed into a small square which could possibly overcome the physical limitation of print medium. QR code has become a common element in almost all print based publication which acts as a bridge to virtual world of communication. QR code has become a familiar application today. But still there exists certain factors that determine the utilisation of the technology. The research project examined the factors that influence the utilisation of QR code in print publication by readers and also analysed the gender difference in the usage of QR code technology. The study indicated the wide familiarity of the QR code technology among all the respondents. Qualitative analysis of the study indicates that there is no gender difference in the utilisation of QR code technology. Female and male readers use QR code equally even though their utilisation patterns vary. QR technology seems to have more grip among women readers as 43% of them use QR code most often.

QR codes are employed by almost all print publication today and purpose of each varies from one another. QR codes seen in print publications are mostly used to provide additional information along with entertainment. Marketing and business functions are also done through QR codes in the form of discount availability & subscription renewal. In addition to all these, QR code technology is employed by the print medium to make the medium more viable to the users, thereby providing reading assistance via QR code. Additional information embedded within the QR code seems to be the most utilised service of the QR code followed by entertainment. The other utilisations like subscription of publication, discount availability and reading assistance have minimal utilisation by readers. The new dimension of information provided through QR codes as well as the indepth source of content act as an influential factor of QR code usage. Novel rendering of content along with the incorporation of multimedia technology adds up entertainment factor

provided by the technology. This has also become one of the factors that motivate QR code usage. Print media is also equipped with text and images where lack of audio visual elements of communication remains as the limitation of the medium. Through QR code audio as well as visual elements are included within the reach of print medium. QR code users also seems to utilise this audio visual content embedded within QR code and has enhanced their reading experience through the medium. Even though QR seems to be a brilliant technology that seems to have wide applications, the utilisation of QR code is hindered due to few reasons. The way of accessing content embedded in the QR code seems to be a difficult and time consuming task for a large proportion of readers which discourages them from using this technology. Unavailability of smartphone is another factor that influences the utilisation of QR code. The beneficiary factors as well as lack of knowledge of the technology have also served as elements that hold back the readers from scanning QR codes. The unsatisfactory maintenance of destination pages and internet connectivity also keep readers away from utilising QR code technology. The determinants like effort expectancy (ease of use) and facilitating conditions (existing organizational and technical infrastructure) are found to have direct influence on the utilisation of QR code technology by users. Other determiners like hedonic motivation has also seem to enhance the utilisation of technology.

QR code is a widely applied technology adding a new dimension for print medium. The effective utilisation of technology will make it as a virtue of print medium. The medium and the source provider can boost the reach and utilisation of technology.

SCOPE FOR FUTURE RESEARCH

On the basis of this study we would like to make certain recommendations for further research in the areas of effective management of QR codes by print publications and utilisation of QR code technology by Malayalam print publications. QR codes are now gaining momentum among print media. Print publications are now widely using QR codes for providing additional information related to news items, features, articles, contests, interactive purposes and subscription of publications other than advertisements. Future research could be conducted to analyse the effectiveness of QR codes in publications and how the application of QR codes benefits the publication by interviews and surveys. Even though QR code technology is popular, its usage among Malayalam print publications is yet to be improved. This area can be further studied using content analysis of different Malayalam magazines and newspapers to analyse the effectiveness of QR code usage. Much detailed interviews and surveys can be carried out at different parts of the state to have a general idea about this new technology and the levels of its usage.

LIMITATIONS OF THE STUDY

- Total number of respondents participated in the survey are very limited. Number of participants interviewed is also less.

- Study is conducted in a limited geographical area. For a broader analysis study could be extended across the state.

- Responses from print publications and business organisations that use QR codes for their benefits are not analysed.

- No studies are conducted on the utilisation pattern of QR code among readers and the usage of QR code in Malayalam publications.

- Malayalam magazines undertake the usage of QR code mostly in fields of advertising and marketing. Few magazine publications utilise application of QR code for entertainment and innovative reading experience.

- Respondents didn't show much interest to respond to the subject of QR codes.

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