THE IMPORTANCE OF USING GOOGLE API CHART AS A CONTENT OF QR CODE

Hussain Abo Surrah, Fardus Saeed
Taif University, Taif, Saudi Arabia

Abstract: Charts are an excellent way to illustrate data. With the advent of Smart phones, we witness a steady growth of interesting applications of QR (Quick Response) codes. Using charts as a content of QR code makes them easier to share and enlarges the benefit of QR code uses while the movement of using QR codes in Arab society is still in its infancy. This paper can serve as the first step for the users to develop a unprecedented way to apply the QR code to have a great potential of this technology in everywhere by using Google API chart.

Keywords: Google API, Chart, QR code.

INTRODUCTION

QR codes, developed by a Japanese company, have been around for over fifteen years [3]. A QR Code is short for (Quick Response) is a two-dimensional barcode readable by QR scanners, smart mobile phones with a camera. The code consists of black modules arranged in a square pattern. The information that can be embedded in these codes can be text, numbers and URL. You can encode your chart when using our system that suggest by this paper. The new features in our research will be add is customizing the chart and storing it to a QR code as a content. About the Structure and Size, each QR Code is a regular square array constructed of several nominally square modules, including an encoding region and function patterns, namely finder, separator, timing patterns, and alignment patterns. Function patterns cannot be used to encode data, and the QR Code symbol is surrounded by quiet zone on all four sides. The QR code can store multiple of data several hundred times & show it at anywhere with different ways and size [1].
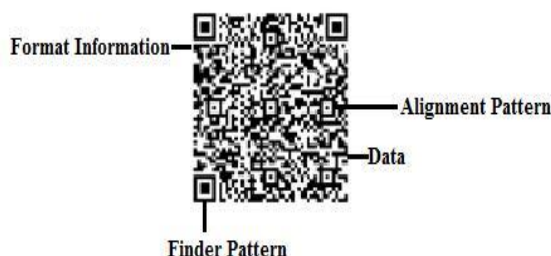

Figure 1.1: QR Code Layout

Everyone can scan it by QR code scanner [4]. QR code scanner is software for Smartphone can install (free & paid) from appropriate market like Google play for windows phone, AppStore for iPhone and AppWorld for blackberry [13]. In fact our QR code tries to provide a new service for users In line with the new technology requirements in our life to improve how this technology can be used to its full potential with Google API chart.

PREVIOUS WORK

QR codes were first created in Japan in 1994 by **Denso-Wave, a subsidiary of Toyota** to track the products and account for inventory. The first QR codes used the Kanji character set, which enabled them to store 1,817 characters. In 2002, Japanese innovators developed the idea to enable their new mobile phone cameras to also act as barcode scanners.

It was thought that such technology would be capable of instantly connecting users to URL addresses on the internet with the snap of a picture, and what was once a vision has now become reality [1].

Microsoft is one company who has created this code and called an **MS tag**. The **MS tag** can only be read by a **Microsoft Tag Reader** and this the main drawback of it. Microsoft has their very own 2D barcode format known as a High Capacity Color Barcode, or 'Tag'.

ZXing Project is one which provide the QR code generation. This system is a little different, the data is not actually stored within the code itself, but on external servers and that leads to exceed the time of scan!

In July 2008 **Google Company** posted in its official blog "QR Codes now available on Google chart API" [12]. The Google chart API is one of set tools Google supporting. Google Chart Tools provide a perfect way to visualize any analytical data. While the Google chart API is a primary tool will used in our research.

Until now, no trying to generate QR code with new content! All of the previous work dedicated to how to apply the QR code effectively in marketing, education …etc.

Actually, today there is no single work using QR code. But all of these provide the similar services to the users. In addition, there is no QR code generator dedicated to Arab users. By this paper and in practices way the QR code will apply in a new service like charts. Chart with QR code can display a data easier and more organized. Despite the presence of tens of QR code generator there is no chart used with QR code and that is the most motivation of this paper.

By this paper the Arab users of Smartphone can scan, store and share the charts or other content of QR code in seconds.

Charts are the content of QR Code:

Chart with QR Code make a sense. It can help make any data more effective, interesting, easy to understand, easy to analysis, compare and share. Because they help effectively transfer information about a subject to people who are both informed and uninformed about that subject. It shows only the pertinent information about it as well, and shows how that information compares to other information. "A picture is worth a thousand words" This is certainly true when presenting numbers, percentages, and relationships forever and explaining data. Reasons to create charts as content of QR Code are Charts and graphs can be incorporated into any medium Reports Web Pages Poster Word Processing Document Desktop Publishing Document and Products for Creating. Provide a visual representation of data effectively clarify information and represent many different types of data. Also it can make important trends easily recognizable. Allow users to perceive information quickly and aid data interpretation.

Customization Chart & How encode it in a QR code:

System customized user's need such: Customize the size of QR code. Customize the color of QR code, the type of Google API chart and the number of variables will represent in charts. Resizing the actual chart by choosing from four available sizes in our system, also the chart titles and subtitles can be 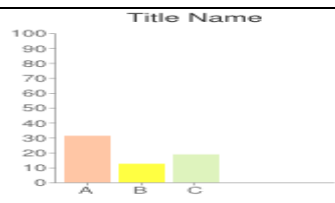changed. Formatting a selected axis allows users to change the units, numbers displayed, or the labels. Modifying the appearance of the chart automatically update according to the data entered by user. There is no changing on the color of plotted areas; it takes the default color that embedded in the system.

How Does it Work:

Our QR code Generator system implemented using Google chart API. While PHP used for implementing chart function and HTML, CSS used for the system Interfaces. The method for dealing with QR Code Generator that will be used is data interring to the generator system then build it as QR Code that support UTF-8 encoding. This type of applications requires the user to have a device that can play or display multimedia resources from the web. The creation the QR code is creation the URL that represents the chart as content of the code and code itself. The Table 1.1 below shows how it does work:

cht=<chart_type>
chs=<chart_size>
chco=<color>
chds=< Coordinates>
chd=<variable_value>
chtt=<chart_title> chxt=< axises >
chxl=<variable>
chl=<$rootUrl> which is the content of QR code that represent by URL syntax
choe=<Arabic_Encoding> which is UTF-8

Where <chart_type> is one of the the following types:

Table 1.1: The Chart Type Description

Chart Type	Description	Examples
URL Syntax: http://chart.googleapis.com/chart?chs=440x220&cht=bvs&chco=FFC6A5|FFFF42|DEF3BD|00A5C6|DEBDDE& chds=0,160,0,160&chd=t:50,20,30,0,0&chtt=Title%20Name&chxt=x,y&chxl=0:|A|B|C||		
cht=bvs	vertical bar chart with stacked bars. The chart has three series and multiple series are stacked. Can't specify different series colors in **chco**, the colors will be displayed by default color. but you can specify a size for each bar by adding its value for **Chd.** You can also specify a title of chart by adding it to **Chtt** and subtitle to **Chx** and **adding ' | '** between one subtitle to another. Finally, Specifying the size of chart manipulated by height & width in **chds**.	 **Figure 1.2: Example1** chs=440x220 cht=bvs chco=FFC6A5|FFFF42|DEF3BD|00A5C6|DEBDDE chds=0,160,0,160 chd= t:50,20,30,0,0 chtt= Title%20Name chxt=x,y chxl=0:|A|B|C||
URLSyntax: https://chart.googleapis.com/chart?cht=p3&chs=150x150&chd=t:10,40,50,0,0&chl=A|B|C||&chtt=Title%20Name		

cht=p3	A three-dimensional pie chart.Supply one data series only; subsequent data series are ignored. By default, pie segment colors are interpolated from dark orange to pale yellow. The Google Chart API calculates the circle's radius from the minimum of width and height specified in the chart size (**chs**) parameter. If you are including labels, you probably need to specify the size of the width to be twice the size of the height, to ensure that your labels are fully visible. If you are including labels in a three-dimensional pie chart, you probably need to specify the size of the width to be 2.5 times the size of the height, to ensure that your labels are fully visible.	Title Name **Figure 1.3: Example** **cht=p3** **chs=150x150** **chd= t:10,40,50,0,0** **chl= A|B|C||** **chtt= Title%20Name**

URLSyntax: https://chart.googleapis.com/chart?chs=250x250&cht=v&chco=FF6342,ADDE63,63C6DE&chd=t:50,40,20,20,30,10,0

&chdl=A|B|C&chtt=Title%20Name

cht=v	A three-circle Venn chart. By default, Venn circle colors are interpolated in **chco.** If there are fewer colors than circles, the last color specified is repeated. However, this makes the chart hard to read. To draw a Venn chart with three-circle you have to specify: A, B, C values. Then, specify the overlap value between 'A' with 'B', 'A' with 'C', 'B' with 'C', Finally 'A' with 'B' with 'C'.* To specify a two-circle chart, specify zero for circle C, and do not specify any overlap values that include C.	Title Name **Figure 1.4: Example3** **chs=250x250** **cht=v** **chco=FF6342,ADDE63,63C6DE** **chd= t:50,40,20,20,30,10,0** **chdl= A|B|C** **chtt= Title%20Name**

QR URL Syntax:

 //print out the QR code

$url="https://chart.googleapis.com/chart?cht=qr&chs=$size&chl=$rootUrl&choe=UTF-8&chld=L&chco=$color";

 echo '<img src="'.$url.'">';

Cht=qr	Now to generate the QR cod as shown in the example, the system just encode the variables value taken from user then simply the code will displayed! The content of QR code can be taken from **$rootUrl** that specified above. Then the **$url** will present the QR code with the color, size and the encoding that user customized by using our system in link below: **QR4arab.com**	Figure 1.5: Example4 **cht=qr** **chs=$size** **chl=$rootUrl** **choe=UTF-8** **chld=L** **chco=$color";**

PERFORMANCE ANALYSIS

The performance—responsiveness and scalability—is a make-or-break quality for system. While a key system component would scale enough to meet that user's higher demand. Adopt a "make it run, make it run right, make it run fast" strategy, there is no performance problems occurred and the system meet the performance objectives. QR code Generator system has the best response times.

When information is embedded into a system, the user can retrieve the content directly through the mobile devices in 2-5 seconds [1]. So no need to improve response time or throughput. The architecture of QR code Generator system can support scalability goals and appropriate with services which provided. The kind of system's services approximately sufficient to meet users need and it will be improve if need.

PERFORMANCE COMPARISONS

There are a numbers of generator system encoding text, numbers and URL using java libraries which Zxing provided [6]. But our system built by Google API chart which add unprecedented service- beside the text, numbers and URL- that provide images chart as content of QR code.

RESULTS

Using Google API chart to create charts as a content of QR code leads to:
  a. Build a simple, flexible and unprecedented systems to generate it.
  b. Enlarge the uses of QR code with new content.
  c. Help make any data more effective, interesting, easy to understand & analysis and compare.
  d. Help sharing information effectively.

CONCLUSION AND RECOMMENDATIONS

Charts with QR codes can be very common to use. In this paper, we explore what's beyond the simple use of QR codes and introduce some suggestions on how this technology can be used to its full potential which inspire other researchers in this field. That is why we recommend to apply this technology In a broadest way as possible until we establish digital cities. But when we want to summarize our recommendation to this paper, we recommend to start where we finish and work on expanding the types of charts that the QR code can encode depending on Google API chart

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