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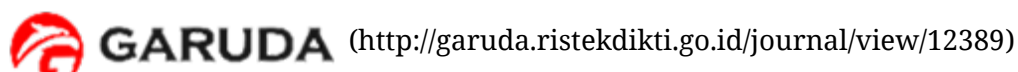
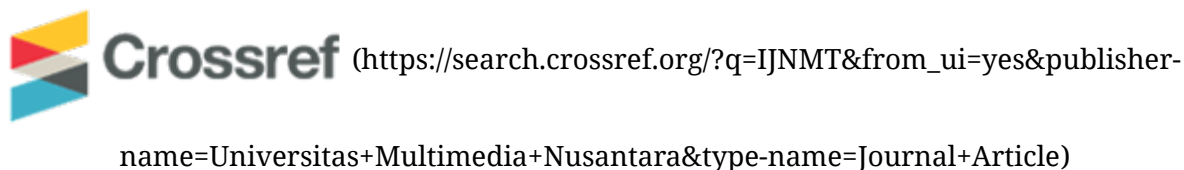
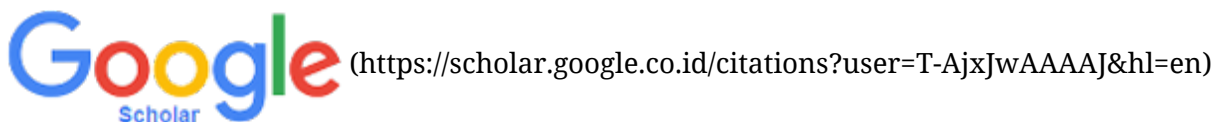


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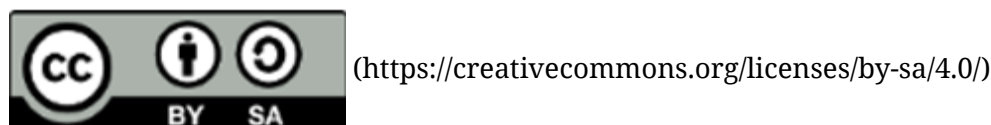
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# Development and Evaluation of Digital ID card as a Portfolio Portal

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**Abstract**— Physical ID card has been use throughout history and are still widely use today. However, such physical characteristic leads to three drawbacks. First, it is not environmentally friendly due to printed materials. Second, Physical ID card requires the need for management and physical storage, prone to damage and lost. Third, information inside a physical ID card limited and cannot be updated. This paper proposes the use of digital ID card in the form of a mobile application as a substitute to physical ID card. A survey is conducted to evaluate the use of these digital ID card. It is then concluded that digital ID card can counter the downside of physical ID card and even provides features to enhance its role such as being a portal for information.

**Keywords**—Digital ID, Information Portal, Mobile Application, Android.

## I. INTRODUCTION

The use of physical ID card is first introduced by King Henry V of England within the safe conduct act of 1414 [1]. It has then gone through a series of developments along the years including the standardized shape and size in the year 1985. And it is still widely used everywhere to exchange information between persons of interest. And even though physical ID cards makes it easier to exchange information because its small and portable size, it does have a couple of flaw due to its physical nature.

The first flaw of physical ID card is that it requires physical material. Printed materials such as matte or photo paper are the common material for an ID card. Printing large and repeated amount of ID card would not be environmentally friendly. This problem can be solved by the use of a digital ID Card. Although some bio-degradable or recycled paper are also use in the making of an ID card, a digital version of an ID card would lower the need of such material.

Another flaw of physical ID card is that it requires manual management and storage. Physical ID card is highly prone to damage from heat, water, time, pressure, scratch, and can also be lost. To store and to retrieve an ID card could also be laborious. Digital ID card would have no such drawbacks. It will be easily stored and retrieve.

Furthermore, information contained within a physical ID card cannot be updated. If a person changes his/her contact than he/she would be required to create another ID card. Today where contact and address keep rapidly changing, this will not suffice. The information contained within a physical ID card are also limited to the card's size and design. There are limit to the amount of information a physical card could contain. While as we could include more dynamic information inside a digital ID card.

These three flaws could all be accommodated by transferring the physical ID card into a digital one. A digital card would require physical material and can be stored and exchange through multiple media. A digital card could also be retrieved easily through a query. And the information within a digital card could also be updated and or changed with ease. And while it is related, this research will not discuss matters on government-issued ID card (E-KTP in Indonesian) as the goal of the research is to use the ID card on casual / business premises.

## II. RELATED WORKS

Several works on using digital ID card as a replacement for physical card has been conducted. Knowee is a digital card provider where user can create their own card and exchange information over it [2]. But, knowee's information are limited to contact. Camcard is another alternative for digital card [3], while camcard offers more feature such as email and linkedin account search, information inside the card cannot be customized according to the user's need.

Inigo card provides team feature so that a team design and team information could be updated simultaneously [4]. Inigo also provide popular social media links Haystack card also provide these type of link [5] but neither of these cards provides customized number of link outside of social media or make them accessible in the card. This lower the value of these cards as a tool to introduce a person. There is also an effort to create an ID card to be used in the university context but it is limited to the purpose of arranging attendance of students [6]. A more complex approach



in this matter has been conducted by ONE Card, Where ONE card can be used as a payment tool or exam card. but this card is also very much limited use to only inside the university [7].

According to GlobalWebIndex [8] on average in 2017 a person has 7.6 social media. The uses of this media is actually quite similar to a digital card which is to store data of an individual. Information on a person's interest and work are listed on these media. But there are also other media such as deviantart for arts or researchgate for academics which are specifics to a person's interest. This type of information can be more valuable to share among peers than the usual social media information. If an ID card were to stay relevant this information would need to be included with the card. Thus, A digital ID card with customized portal link to this information is proposed.

Adding information to a limited size card would require management of space. If a digital card would like to be customized in terms of information. It should also be customized in terms of looks and positioning. This is also important because style and design is one of the key interest elements in a physical ID card. This paper proposes to provide solution to providing more information and storing them in a digital ID card. Thus preserving the benefit of traditional ID card in a digital one.

### III. METHODOLOGY

The common information within an ID card consist of name, address, and contact (by e-mail, phone number, etc) [9]. This information is useful when they are exchanged. While it is enough for today's daily uses, it can be so much more. Customized and personalized information has the potential to be even more beneficial. For example, an academic staff would normally be interested in knowing other academic's research interests, an artist would benefit from sharing a link to his/her portfolio. And while it is possible to post that information on social media, they are usually posted on other more specific media (to name a few: researchgate for academics, deviant arts for artist). The inclusion of such information inside an ID card is therefore proposed. However, there are problems that needs to be addressed beforehand.

First, there are a large of number of mediums to store information and the number keeps on growing. [Inside fact here if found]. So, a predefined list of sites and resource would not be sufficient in an ID card. The range of types of resources is also a problem that needs to be consider since there are so many. It is decided in this research to limit the type of resources to a URL. A URL as the name suggests is a universal resource locator, or a link in modern term. Using url we can link different sites and resources to be attached to our digital card. Hyperlinks are then added to the card so that users can directly access those resources.

The Second problem that arise is how to show that information unto the digital card. One of the reasons why ID card are popular is that it is concise and small in sizes. The ability to include personalized and customized link enables unlimited amount of extra information inside a limited amount of card spaces. While it is beneficial to include more information, too much information is not good. Too much information would distract reader from important link, it will also clump up the design and made it unaesthetically pleasing. Not to mention the placing of this information should also be put into consideration. To solve the number of link, it is proposed to keep the number of link to a maximum of 5. To solve the aesthetic and positioning problem, it is proposed to use a grid-based system to build the custom digital card looks.

The third problem is how to model the physical card into a digital card. Most of the digital mentioned in related works uses an image as digital card representation. The information stored within their software is then visualized unto that image. This system aims to minimize the difference between physical and digital card. While it has its benefits, this system has a downside, the information inside each card is static and does not allowed any interaction in the card itself. This leads to less interactive and less intuitive software. This research proposed using interactable component inside the digital card. By using this component, User can easily navigate desired information within a card.

#### A. Grid-based Positioning

To solve the problem with positioning, a grid-based component positioning system is developed. The digital card we propose consists of a  $M \times N$  digital grid. After several initial adjustment we choose  $M$  to be 57 and  $N$  as 30 so the grID is not too small and too big. If the grID was too big, it will be hard to place a component according to the user's needs. If the grID was too small, it will take more memories to load or store them.

User are allowed to choose which information from their data they're going to show in the digital card. The data would have two information. The Title information is the information shown on the digital card. While the data information is the link connected to the title information. By doing this, users are able to attach any kind of information and data they wanted.



Figure 1 Card Interface

Shows an example of digital card created with the application. All the information on the card is perfectly update-able and dynamically linked to outside resources. The image also shows a different design template to show how the component can be moved across the digital card. This research uses several design templates as oppose to user customizable design, as the purpose of the research is to analyse and evaluate the use of the digital card.

#### B. Information Portal

Extra information is displayed in another page along with the QR code for the current card. Every information is comprised out of two elements: an identifier, and a link. User can then tap on the link to go to whatever information the user set beforehand. Figure 2 showed the user interface for extra information alongside additional button for additional feature such as scan QR for new card, library to search card and a profile page to edit information.



Figure 2 Extra Information

#### C. Card Exchange

One of the key factors in the success of physical ID card in its time is its portability. It is simple and fast to exchange information via those cards. Digital ID card should also be as simple and as fast to exchange with. There are a lot of ways to exchange digital information. And though it is possible to use them all in this application, Because of the limitation in time and resources, it is decided to implement a QR code interface for information exchange.

```
[{'Key':'Research Portfolio','Value':'www.research.com','Link':'www.researchgate.com/User=123124?'},{'Key':'Design','Value':'www.deviantart.com','Link':'www.deviantart.com/User=123124?'}]
```

QR Code basically are extensions of traditional bar code. QR code are two-dimensional bar code, able to store up to 7089 characters in a single code [7]. The other benefit of QR Codes are that it can printed in a smaller spaced, it is dirt and damage resistant, it can also be read from any direction [7]. In This research QR code are used to stored link to distribute a card. Which then turn allow the card to be exchange.

Information contained in the QR Code is the basic information of a card. The additional information of

```
{'Id':1,'Name':'John Doe','Title':'Main Photographer', 'Website':'www.johndoephotography.com','PhoneNumber':'+6281223344555','Email':'john.doe@johndoephotography.com','Address':'JI Dago 909, Bandung, Indonesia'}
```

the card is then acquired via web server when necessary. Figure 3 showed the information inside the QR Code in json form. Security feature for

information in this research has not yet been implemented but is advised for future works.

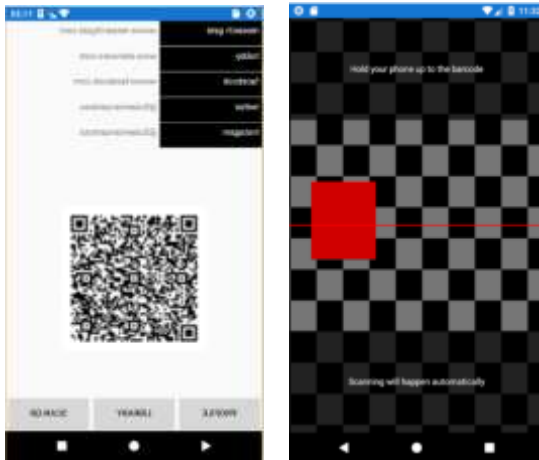


Figure 4 QR Code Interface

Figure 4 shows the Card Exchange interface using QR Code. When a user scans the QR code. Information in the QR Code will be transferred unto the receiver app.

IV. APPLICATION DESIGN AND IMPLEMENTATION

Aside from the information inside the digital card, several other information is needed to be stored inside the application. The information inside the digital card can be categorized into several item. The first type of information is the basic card information. This is the information usually stored inside the physical card. Person's name, address, phone number, email address is one of that information. The second type of the information is the portfolio information. This is the added information useful for the individual. Any link to any website containing resources or information of the individual could be stored here. This information enables the digital card to be a better representation of a person'.

Information on the application is stored in two separate places, in the mobile application and in the server. The mobile app stored the information inside an SQLite database. While the web server stored in the information in MYSQL database. The database inside the mobile apps only contains one table for user card.

Figure 5 shows a sample json for extra information. The field Key is the label for the information, The value is the label for the link, while the link is the url address for the resource.

Figure 6 shows an ER-Diagram for the application. The field ExtraInfo Contains json object for various information inside a card. This is done to prevent complexities in the Mobile Database.

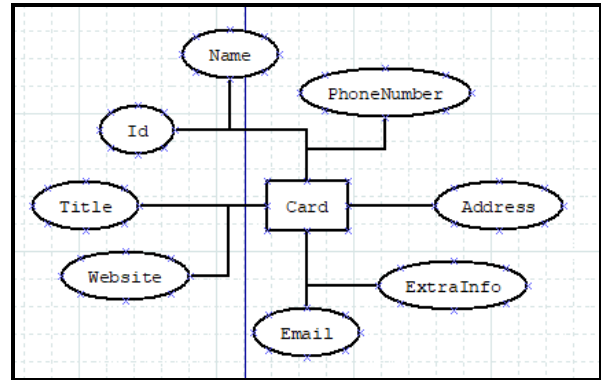


Figure 5 ER Diagram mobile application

Database inside the web server consist of 3 tables, the card info, the card extra information and the card connection. Figure 7 shows the ER-Diagram for the web server.

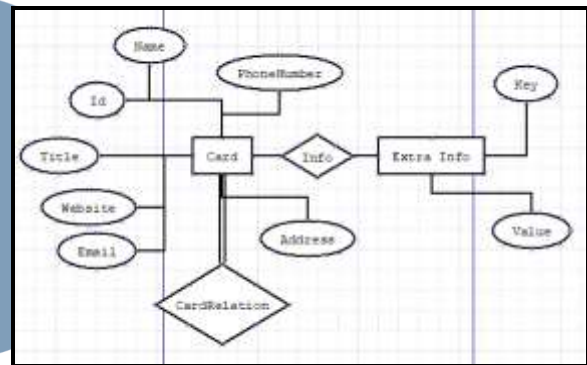


Figure 6 Sample Json for added information

The CardRelation table holds relation between each card. This enables the application to easily add a card and maintain the integrity of the information in the card. If the user changes the card information within the application, it will also change in the other application whenever it is connected to the internet to update its information.

The mobile application is structured in a MVC like structure as shown in figure 8. CardDatabase class is the controller part of the application which operates to manage card data through the help of web services. Web service is designed to control data exchange between server and mobile app.

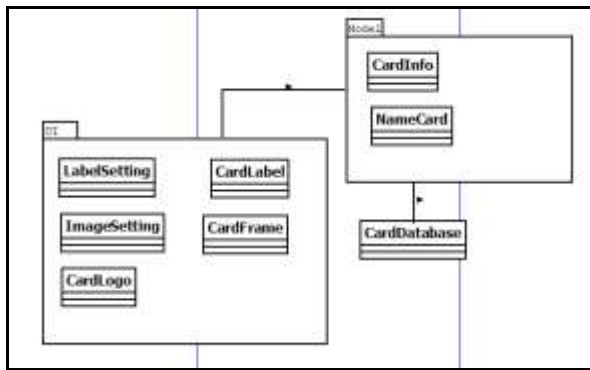


Figure 7 Class diagram for mobile application

## V. EVALUATION

To evaluate the use and benefits of Digital ID card and its added feature, a survey is conducted. The survey conducted is modified based on the TAM (Technology Acceptance Model) [11] with an emphasis more on the perceived usefulness (PU). The survey is conducted on 3 types of individuals. Academics, university students to represent an interest group, and random individuals. From 50 responses categorized in Figure 9, 70.6% are university students while 11.8% are academics. The rest of the data are from random individuals. The variety of respondents are shown in figure 9

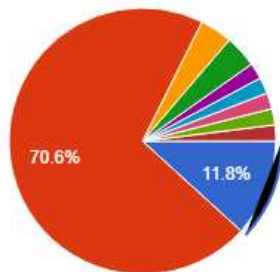


Figure 8 Survey respondent category

Every participant is given a set of questions with a value of 1 to 10 as a qualitative answer. The following are the summaries for the results of each question. Academics' survey results were originally separated from the other group. But since it shows the same trend, it was put back together for easy viewing.

Question 1: How useful it is to transfer from physical ID card to a digital ID Card?

Question 2: How useful is the added extra information on the digital ID Card?

Question 3: How useful QR Code is to transfer card information?

Question 4: How efficient it is to search for card in digital ID Card?

Question 5: How useful is the ability to add/remove or change information in a digital ID Card?

Question 6: How important is customizable design in a digital ID card?

Question 7: How likely it is for you to transition from physical ID card to digital ID card?

Result for question 1: How useful it is to transfer from physical ID card to a digital ID Card?

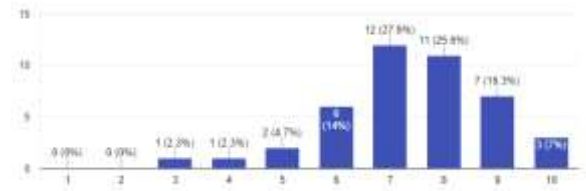


Figure 9 Question 1 result

From Figure 6 it is shown that 90.8% of respondents feel that digital ID card is useful as opposed to physical ID card.

Result for question 2: How useful is the added extra information on the digital ID Card? (in your profession)

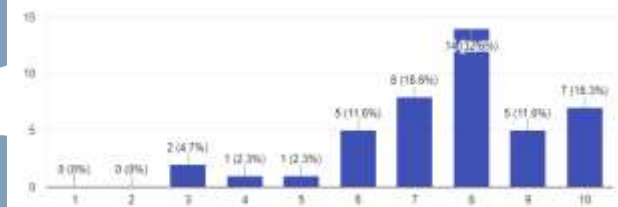


Figure 10 Question 2 result

From Figure 7 it is shown that 90.7% of respondents feel that digital ID card is beneficial in their line of work. It is also important to note that Academics' respondent results mark all above 7 points.

Result for question 3: How useful QR Code is to transfer card information?

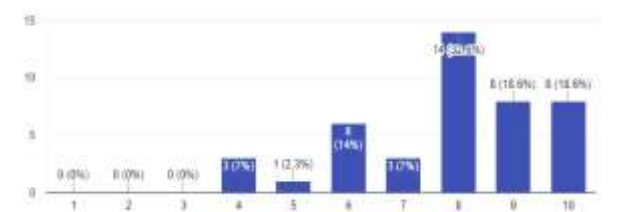


Figure 11 Question 3 results

From Figure 8 it is shown that 90.7% of respondents feel that QR Code is useful to transfer card information. Academics' results show varied responses but are all greater than 6 points.

Result for question 4: How efficient it is to search for card in digital ID Card?

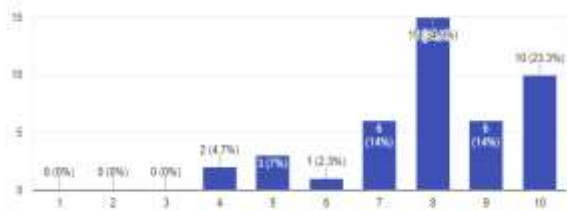


Figure 12 Question 4 results

From Figure 9 it is shown that 88.3 % respondent find it efficient to search for a card in the ID card application.

Result for question 5: How useful is the ability to add/remove or change information in a digital ID Card?

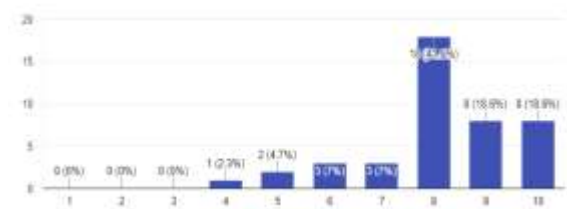


Figure 133 Question 5 results

From Figure 133 it is shown that 93% of respondent finds the ability to change information in the Digital ID card top be useful. Academics scored this question highly as well with all response are above 7 point.

Result for question 6 : How important is customizable design in a digital ID card?

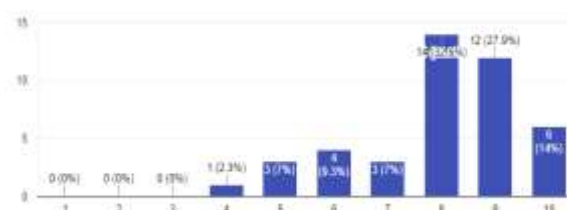


Figure 44 Question 6 results

From Figure 4 it is shown that a majority of respondent ( 74.5% answered above 7 ) thinks that it is important to have a customizable design in a digital ID card as shown in the application.

Result for question 7: How likely it is for u to transition from physical ID card to digital ID card?

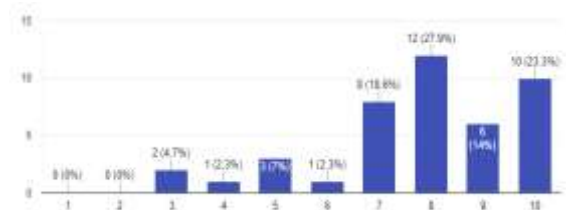


Figure 55 Question 7 results

Figure 5 shows that 86% of respondent claim to be more likely to transition to Digital ID card.

Aside from the question. Respondents are also asked to give a suggestion. Several notable insights coming from the respondent suggestions includes the inclusion of security features as the information inside could potentially be misused, hybrID integration by allowing the digital card to be printed and then scanned to digital, upgrade in user interface such as drag and drop capability, and other technology support such as NFC.

## VI. CONCLUSION

From the survey conducted is then concluded that digital ID card is indeed more beneficial. It is also shown that information portal on Digital ID card is indeed beneficial to all respondent. Lastly, It is also shown that the proposed digital card are interesting enough as a replacement for physical card. There are some hesitation shown in the survey to transition into digital ID card (12%), but this is probably from other aspect other than its functionality as shown in other questions.

## FUTURE WORKS

Additional feature needs to be added to support overall functionality of the digital cards. One of the most prominent features should be to implement security as the information contained in a digital card are all personal information that could potentially be misused. Other suggestions from the respondent can also be considered.

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