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# The Hazards of Smoking Mobile App

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**Abstract**—One of the most preventable sources of morbidity and premature death worldwide is cigarette smoking. It contributes immensely to the loss of lives, economic growth, human capacity development, mental effects and attitude modification. At least one person dies every six and a half seconds from cigarette smoking. The need to expose the negative and adverse effect of smoking is of essence especially to the younger generations. Mobile phone which is considered as one's closest companion can be utilized through specially designed app that promotes the awareness of the hazards of smoking. This paper discusses the design and development of the Hazards of Smoking, an app which is intended for young generations to be aware of the danger and side effects of cigarette smoking. It also presents the outcome of a user evaluation that has been conducted among youngsters pertaining to the use of the app. Through the use of the app, it is hoped that enough information about the hazards of smoking will be disseminated among the youngsters and eventually persuade them to lead a healthy lifestyle without smoking.

**Index Terms**—Cigarette smoking, Hazards, Mobile app, User Evaluation.

## I. Introduction

Cigarette is a source of dire affliction on societies all over the world. The World Health Organization reported that at least one person dies every six and a half seconds from the consumption of cigarette [1]. In the course of smoking cigarette, poisonous substances such as Arsenic, Acetic Acid, Acetone, Ammonia, Benzene, Butane, Calcium, Carbon Monoxide, Carbon Tetrachloride, Ethanol, Aldehyde, Hydrazine and other noxious substances are the by-products. These noxious substances are responsible for the adverse effects which cigarette and its consumption have on its users and they also cause the adverse suffering in passive smokers [2]. The adverse effects due to cigarette smoking on individuals include tuberculosis, lung cancer, mouth cancer, gangrene, gum cancer, lip cancer, premature baby and other diseases that cause debility in human beings [3], and [4].

Several studies have highlighted the dangers of smoking starting from the economic and social perspectives, as well calls for drastic measures to minimize smoking and its spread among people especially the youth [5], [6], [7], [8], and [9]. Smoking is associated with ninety percent of deaths through lung cancer and more women die of lung cancer each year compared to breast cancer [3]. Studies also show eighty percent of deaths from Chronic Obstructive Pulmonary Disease are caused by smoking. It was agreed by all the studies mentioned above that cigarette smoking increases the risk of death in individuals and the risk of dying from cigarette smoking have increased over the last fifty years around the world [10].

In Malaysia, based on the National Health and Morbidity Survey, it was estimated that there are 5 million Malaysians or 22.8 per cent of the population are smokers [11]. According to Datuk Seri Dr Hilmi Yahaya, the Deputy Health Minister of Malaysia, fifty per cent of the smokers are above 30 years old; 40 per cent are above the age of 19, while the remaining 10 per cent are below 19. Even though the number of smokers has reduced by 0.3 per cent compared to 23.1 per cent in 2011, the reduction is still not significant enough as more awareness and efforts must be taken to stop smoking [12].

It is in the light of the danger which cigarette smoking possess to humanity that this research has been undertaken. This paper provides a synopsis of the hazards of cigarette smoking and proposes the use of a mobile app to expose the hazards of cigarette smoking to personal, environmental and economic well-being of individuals, societies and nations. Mobile apps are significantly instrumental to enhancing behavioral change in young persons and even in adults [13]. The use of mobile apps in the society is now trendy because it is not only fashionable and

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fast but its far-reaching capacity has made it very relevant in problem solving. Mobile phones are now being used as a veritable tool for health promotion [5]. Most of the new-comers to smoking field are ignorant of the malignant nature of cigarette-related disease. Owing to the debilitating nature of diseases which are contracted from smoking cigarette, we took the effort to stem the tide of the spread of cigarette consumption among people through the use of the Hazards of Smoking (HoS) app. The following sections discusses on the design and development of the app.

## II. Design and Development of the HoS App

In this section we elaborate on the process of designing and developing the HoS app. Basically the process involves two phases namely; i) information gathering, and ii) design and development.

### A. Information Gathering

In this phase, all the requirements for the development of the HoS app were listed based on the following steps. Firstly, the information about the problems was gathered and extensive review of literature about the hazards of smoking was conducted. Secondly, images to be used in the app were collected and resized to suit the mobile phone screen and saved as PNG format. Thirdly, the requirements for the Quit Smoking Calculator, a component of the HoS app to be used in estimating the cost spent on smoking were determined.

### B. Design and Development

The second phase is the most important where the process of design and development was carried out which include the series of design issues that make the app interactive and easy to use by the user. The HoS app has been specifically developed to educate people especially the young generation about the hazards of smoking. It was developed using Adobe Flash CS6 and it can be installed to any Android smartphones. In this phase, a structure as shown in Figure 1 was used as a guideline during the development process. By referring to the structure, we were able to develop all the necessary components of the app so as to suit to the needs of the user. The three most important Graphical User Interfaces (GUIs) of the app include; the Splash screen (Figure 2a), Main menu screen (Figure 2b), Harms of Cigarette Smoke Screen (Figure 2c), and Quit Smoking Calculator screen (Figure 2d).

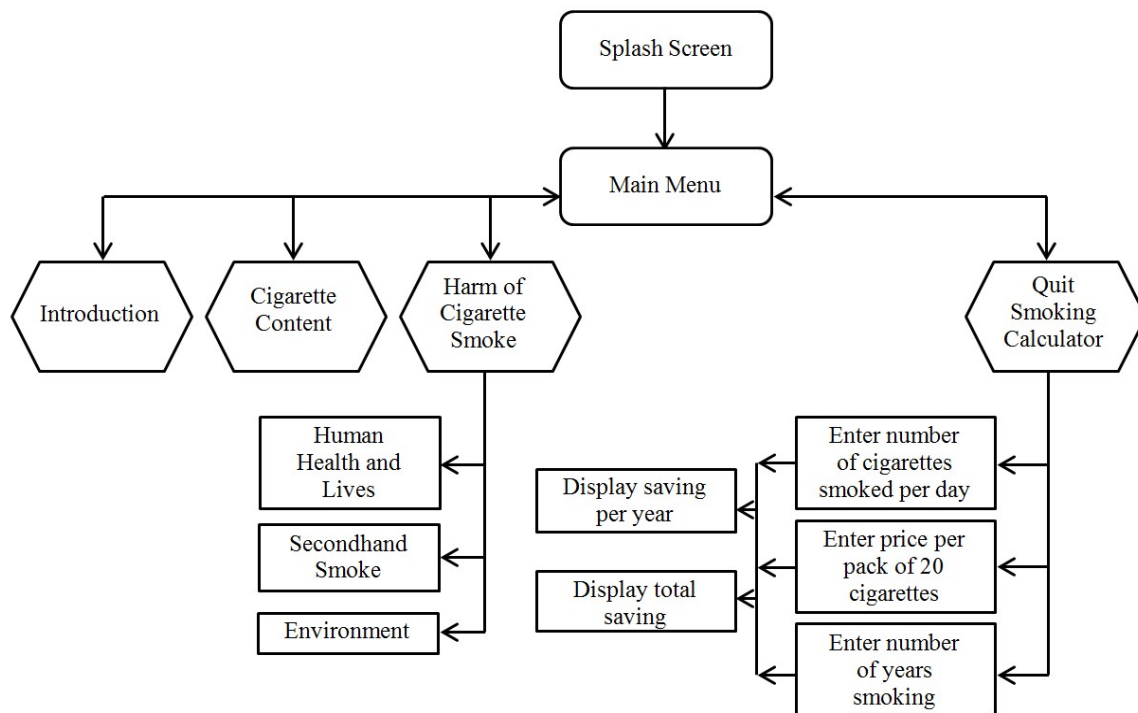


Figure 1. The structure of the Hazard of Smoking app

The Splash screen as shown in Figure 2a is the background image that shows the app's logo. The screen will be displayed only for eight seconds and then disappears automatically when the app's Main menu appears. The Main menu as shown in Figure 2b consists of four buttons namely; Introduction, Cigarette content, Harms of cigarette smoke and Quit Smoking Calculator. The Introduction screen as shown in Figure 2c provides general information pertaining to the widespread use of tobacco worldwide and its impact on the tobacco users. It consists of texts,

images and videos explaining about smoking as well as useful information pertaining to stop smoking. Figure 2d shows the Cigarette Content screen where information regarding to the chemicals that are poisonous and some are carcinogenic that exist in the cigarette as well as the cigarette’s smoke.

Once the Harm of Cigarette Smoke is selected, the screen as shown in Figure 3a appears displaying three buttons namely; Human Health and Lives, Secondhand Smoke, and Environment. The Human Health and Lives button as shown in Figure 3b provides information pertaining to the hazards of cigarette smoking to human health and lives. The information is provided in the form of gruesome images of patients suffering from various kinds of cancer due to smoking as well as texts and videos. User is able to retrieve information in the form of texts, images and videos about secondhand smoke by selecting the Secondhand Smoke button as shown in Figure 3c. Meanwhile Figure 3d shows the effect of smoking on the environment which involves cigarette butt litter, pollution, effect on pets, deforestation and production waste. The information is also in the form of texts, images and videos. Finally, the Quit Smoking Calculator screen as shown in Figure 3e provides convenience for the app users to calculate in the form of financial savings if the person stops smoking. The user has to enter the information pertaining to the number of cigarettes smoked per day, the price per pack of twenty cigarettes and the number of years he/she has been smoking. The calculator will inform the user of the saving per year as well as the total saving if he/she decides to stop smoking.



Figure 2. (a) Splash screen, (b) Main menu, (c) Introduction Screen, and (e) Cigarette Content screen



Figure 3. (a) Harm of Cigarette Smoke screen, (b) Human Health and Lives screen, (c) Secondhand Smoke Screen, (d) Environment screen, and (e) Quit Smoking Calculator screen

### III. User Evaluation

User evaluation was conducted to determine the users’ perception after using the HoS app. It is also a way for developers to receive feedbacks pertaining to the usability aspect of the app from the user. The following subsections discuss on the demographic data, the instrumenting, the reliability of the measurements and the descriptive statistics.

## A. Demographic Data

The evaluation was conducted among 40 users who have been selected based on the convenience sampling technique. The respondents consist of youngsters whereby 18 males (45%) and 22 females (55%). In terms of age, 15 (37.5%) of the respondents were less than or equal to 20 years and 25 (62.5%) were between the ages of 21-25 years.

## B. Instrument

The instrument used in this evaluation was a set of questionnaire where the measurements were adapted from several previous studies. Altogether there are five measurements involved namely; Perceived Usefulness, Perceived Ease of use, Effects on Motivation, Outcome /Future Use, and Satisfaction. Perceived Usefulness is defined as the extent to which a user believes by using a specific application would raise the user's performance level [14]. Perceived Ease of Use is defined as the degree a user believes that using a particular system would be free of effort [15], and [16]. Effects on Motivation is defined as the influence of an individual's needs and desires both have a strong impact on the direction of their behavior [17]. Outcome/Future Use is defined as the degree a user is expecting to use the application [15], and [16]. Finally, Satisfaction is defined as the level of satisfaction of the user with the whole application and contents [18]. A 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" was used [19].

## C. Reliability of Measurements

The Cronbach alpha values were calculated to ensure the reliability of all the dimensions as shown in Table 1. Perceived Usefulness has a Cronbach alpha of 0.744, Perceived Ease of Use has a Cronbach alpha of 0.725, Effects on Motivation has a Cronbach alpha of 0.718, Outcome /Future Use has a Cronbach alpha of 0.744, and lastly Satisfaction has a Cronbach alpha of 0.792. Since all the measurements' Cronbach Alpha values are greater than 0.7, all of them satisfy the internal reliability criterion [20], and [21].

Table 1. Cronbach Alpha Values for All Measurements

Measurement	Number of items	Cronbach Alpha
Perceived Usefulness	6	0.744
Perceived Ease of Use	5	0.725
Effects on Motivation	3	0.718
Outcome /Future Use	4	0.744
Satisfaction	3	0.792

## D. Descriptive Statistics

In user evaluation, it is important to obtain the users' perception towards the use of the HoS app. As such, the descriptive statistics were conducted. Table 2 presents the descriptive statistics for all the five measurements including all the items. Items that are marked with a hash (#) have mean values of more than 4.5 which mean that these items were highly agreed by the users.

Table 2. Descriptive statistics for all items

Measurement	Mean	S. D.
<b>Perceived Usefulness</b>	4.3250	
1. Using the HoS app would enable me to know about the hazards of smoking more quickly. #	4.5250	.59861
2. Using the HoS app would make it easier for me to know about the hazards of smoking.	3.9750	.97369
3. I find the HoS app useful in informing about the hazards of smoking. #	4.5000	.75107
4. HoS app is suitable in informing about the hazards of smoking.	4.3500	.73554
5. I find the HoS app is adequate as needed.	4.3000	.75786
6. Overall, I find that the HoS app is very useful.	4.3000	.64847
<b>Perceived Ease of Use</b>	4.2300	
1. Learning the HoS app is easy for me.	3.8250	.90263
2. I find the HoS app is clear and understandable.	4.3000	.64847
3. I find the HoS app is flexible to use. #	4.5250	.64001
4. I find the HoS app is satisfying to use.	4.3250	.79703
5. Overall, I find the HoS app is easy to use.	4.1750	1.03497

<b>Effects on Motivation</b>	4.3083	
1. I find that using the HoS on my mobile device was fun and appealing to me.	4.1500	1.00128
2. Determining the hazards of smoking through the HoS app motivated me more than the common methods (humans and advertisements).	4.4500	.74936
3. I would recommend other individuals to also use the HoS app.	4.3250	.76418
<b>Outcome/Future Use</b>	4.4375	
1. I could effectively know about the hazards of smoking using the HoS app. #	4.5000	.50637
2. I was able to efficiently know about the hazards of smoking using the HoS app.	4.2250	.47972
3. From my current experience using the HoS app, I think I would use it regularly.	4.4500	.50383
4. I would recommend to others the HoS app. #	4.5750	.50064
<b>Satisfaction</b>	4.3500	
1. I felt comfortable using the HoS app.	4.4250	.50064
2. I enjoyed using the HoS app.	4.4250	.50064
3. Overall, I am satisfied with HoS app.	4.2000	.60764

#### IV. Discussion

Table 2 shows that five items have means of more than 4.5 which indicate that the users highly agreed on these items. Perceived Usefulness has two items, Perceived Ease of Use has one item, and Outcome/Future use has three items with means of more than 4.5.

The results of the user evaluation indicated that the user agreed on all the measurements which include Perceived Usefulness, Perceived Ease of use, Effects on Motivation, Outcome/Future use and Satisfaction. From the results, the following key strengths are apparent in terms of searching for information related to the hazards of smoking using the HoS app. The users think that the HoS app would enable them to know about the hazards of smoking more quickly and the app is useful in informing about the hazards of smoking. They also think that the HoS app is flexible to use and they could effectively know about the hazards of smoking using the HoS app. Lastly based on their current experience using the app, they would recommend the HoS app to others.

#### V. Conclusion

This paper has looked into the possibility of introducing the HoS app to promote the hazards of smoking among the young generation as well as current smokers. It started with brief explanation on the casualties due to smoking from The World Health Organization. Then it proceeds to elaborate on the poisonous substances inside the cigarette smoke and their adverse effects. It also highlights on the impact of smoking on the economic and social perspectives. It continues to elaborate on the smoking issues in Malaysia, especially on the awareness amongst Malaysians.

This paper has also elaborated on the design and development of the HoS app. Nowadays mobile phone has been one's closest companion, thus the idea of developing the app coincides with the efforts of the health authorities to further reduce smoking. Users require an app that is straightforward, easy to use, interactive, trendy, easily available anywhere and anytime tool. The HoS app is able to provide users with comprehensive information about the hazards of smoking and also help users to calculate how much they can save if they quit smoking.

This paper also presented the results of user evaluation related to the usability of the app. The results indicated that the users agreed on all the measurements which include Perceived Usefulness, Perceived Ease of use, Effects on Motivation, Outcome/future use and Satisfaction. From the results, the following key strengths are apparent in terms of searching for information related to the hazards of smoking. The users think that the HoS app would enable them to know about the hazards of smoking more quickly, useful in informing about the hazards of smoking, flexible to use, effectively know about the hazards of smoking, and recommend to others. In sum, this paper helps users to enhance their understanding about the hazards of smoking. It is hoped that the findings of this study will encourage more youngsters as well as smokers to use the HoS app.

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