

FamLogger: The development of keylogger tools for parental online monitoring

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Abstract— Recent advances in the Internet have brought about many benefits, but they have also created a number of major problems, particularly for children. One of the most pressing issues is the exposure of children to inappropriate content, such as cyberbullying, online grooming, phishing, and explicit material. This problem is exacerbated by the fact that children are often alone and unsupervised while using the Internet, making it difficult for parents to monitor their online activity. In order to address this issue, a developer has proposed the creation of FamLogger, a keylogger system that would allow parents to monitor their children's online activity from anywhere in the home. The system is designed to provide parents with real-time updates on their children's online activity, including the websites they visit, the apps they use, and the messages they send. To ensure that the system meets the needs of parents and children alike, a survey has been conducted to gather feedback and requirements for the system. The survey results are used to improve the quality of the system and make it more user-friendly for parents. FamLogger can help parents monitor their children's activity from anywhere in the home, providing them with peace of mind and giving them the ability to intervene if necessary.

Keywords— keylogger; cyberbullying; online parenting; cybersecurity; children's online activity

I. INTRODUCTION

Recently, the advancement of the internet can cause major problems to children when using it alone without any inspection or supervision from their parents. Significant upwards trend of children engagement to the Internet especially during Covid-19 pandemic had caused them to experience addiction as well as mental issue [15]. Transition of children to adolescent demand safety precaution from parents and it has become a fundamental family issue because the parents do not know to whom their children are talking, meeting, sharing images, videos and many more over the Internet. In Malaysia, the Malaysia Communications and Multimedia Commission (MCMC) found that 56.3% of children surf the internet alone through digital devices [7]. This percentage shown more than half of the children surf the Internet without supervision.

According to the Ministry of Women, Family and Community Development and MCMC [7], the data indicating the children in Malaysia between 5 to 17 years old had been encouraged to explore gadgets and the internet in their early age. Children at this age are having fresh mind and eagerness to learn new things.

Parents must aware the cyber world nowadays is too good to be true to let the child surf the internet on their own. They should be aware their child might be exposed to inappropriate content, cyberbullying and scammer. Due to unavailability of parents while their children using the computer, there is a lot of inappropriate content that might be searched by the children through the internet if not

monitored by parents properly [5]. Children get exposed to cyberbullying on the internet whether they are the victim or wrongdoer.

In facilitating parent to monitor their children online activity, it is proposed to develop a personal computer (PC) software program called keystroke logger or keylogger that specifically records all the keystrokes pressed by the children. This technology is targeted for parents to keep an eye on their children virtually and watch each key that the children pressed on the keyboard [3]. The name of this tool is FamLogger. FamLogger has remote keylogger features where the parents can receive the email if their children pressed any keystrokes and clicks on the computer that has installed a keylogger program. By doing so, even at work, the parents can be informed of all activities done by the children on the computer. Thus, the development of FamLogger aims to mitigate some risks that may occur.

II. LITERATURE REVIEW

The advancement of technology seems to be more harmful to children than good. Children always becoming vulnerable in the online world. Nowadays, this whole life without an internet connection is an outdated myth [14]. Since the enforcement of Movement Control Order (MCO) in Malaysia, the time people spend online has increased very steeply. The concern was getting worse when the issues related to child safety when dealing with the internet showed drastic increase in percentage [7]. Some parents who are very busy with their schedules and daily struggles

tend to spend less time with their children and this can lead to lack of parental control [13].

Some of the issues when letting the children play alone with the devices is watching pornography. Pornography is the material that depicts erotic behaviour and is intended to cause sexual excitement that everyone should avoid, especially children. Malaysia is not exceptional from these things. In 2018, Malaysian Against Pornography (MAP) conducted an alarming survey about children's exposure to pornography between children aged 10 to 17 years old. The result of the survey is very frightening since almost 80% of the children are watching pornography. Not enough with that, MAP also conducted the survey among children aged 13-17 who have been victims of online grooming. Online grooming is a form of cybercrime, where the modus operandi of the perpetrator is by creating a fake social media account then befriending children and adolescents. Besides, they force them to send nude pictures and in worst scenarios, the perpetrator asks the children out to commit sexual crimes. Sad but it is true, 89% majority of them experience being the victims of online grooming in social media. Both surveys showed that children are vulnerable to be exposed to pornography nowadays either they avoid or they want to be involved [4][8].

According to [13], children that had limited time with their parents could lead to any cyber threats in cyberspace. It is because they are not able to properly differentiate between good and bad content. This study mentioned that children nowadays are faced with uncertain circumstances. Even parents cannot understand their children well especially about their children's emotional and behavioural changes. Due to this event, children will rant about anything such as their lives, family, friends and others on any medium like social media to express their feelings and emotions [15]. It is reported that Malaysian teen had commit suicide due to Instagram poll. In the poll, she asked about whether she should take her own life and share it with her followers. Unfortunately, 69% of her followers who participated in the poll chose the "D" option instead of "L". "D" means death while "L" means Life [16].

Preventing the children from not using the internet is not relevant anymore to solve the problem because it can limit their exploration and learning capacity. In combating the issue, parents are advised to increase their internet literacy and constantly monitor their children's activities on social media sites. They also should set up privacy functions to prevent unidentified people from infringing their children's accounts. It is important for parents to take actions and concern about this matter for the well-being not only for their children but also the whole family.

Therefore, with the parental keylogger system, it is believed that parents can track their children, collect and record the children's behaviour and detect the children's activities. By doing so, parents able to know if their children need assistance and protect them from any outside threats

likes suicide attempt. This tool also could facilitate parents in making decision towards their children wellbeing.

III. SYSTEM REVIEW

There were few systems reviewed and analysed based on its advantages and disadvantages. This information is important to design a keylogger system that suitable for parental monitoring.

a. KidLogger

KidLogger is software that monitors children's activities on smartphones and computers. It's compatible with Android, MacOS, Windows, Linux. The advantages using this application is it has a free version and reasonable price for Standard and Professional versions. Main features in the system allow to track how much time is used in the device, view keystrokes and text entered, capture screenshots in real time, keep log of every external hardware, SMS/call logging, location monitoring and email report. Good thing is it allows the user to monitor more than one device at one time [9].

Kidlogger have few disadvantages; it is not supported by iPhone Operating System (iOS), clunky and outdated user interface. Therefore, it does not provide granular controls to prevent children's access to particular websites or applications. This tool only allows parents to monitor without any capacity to make some configuration. Another disadvantages on this system is any installation of Antivirus software inside the computer system need to be disabled due to its features that being detectable as malware in the PC or smartphone.

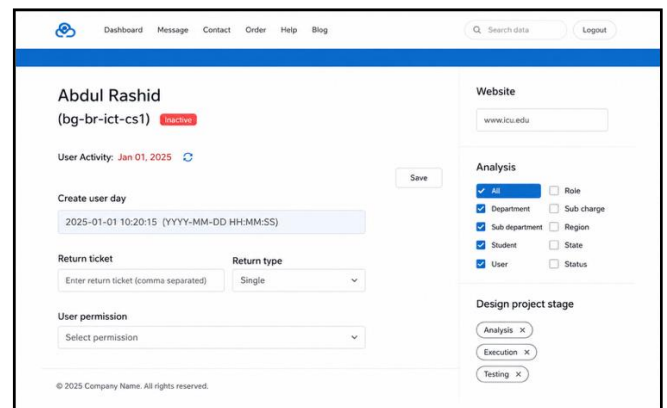


Fig.1 Dashboard view for KidLogger

b. Refog Keylogger

Almost similarly with the proposed system, Refog Keylogger offers a web-based application for Windows and MacOS. The main features of this system can help the parents to know how much time the kids use their computer, who they chat with and who approaches them via social networks. The system will collect and analyse the kids' activities such as chatting, browsing, launching apps or playing games. Moreover, it will take screenshots at specific time intervals. All of this report can be accessed in the machine with installed Refog Keylogger [10].

The disadvantages of Refog Keylogger is that this system somehow can be detected as a virus in certain anti-virus software. So, the user needs to disable the anti-virus first before using it. This can lead to any cyber threats because the firewall is disabled. Talking about the report that was collected, it can be viewed in the same machine with the installed Refog Keylogger only. Meaning that, there is no real-time monitoring or remote monitoring.

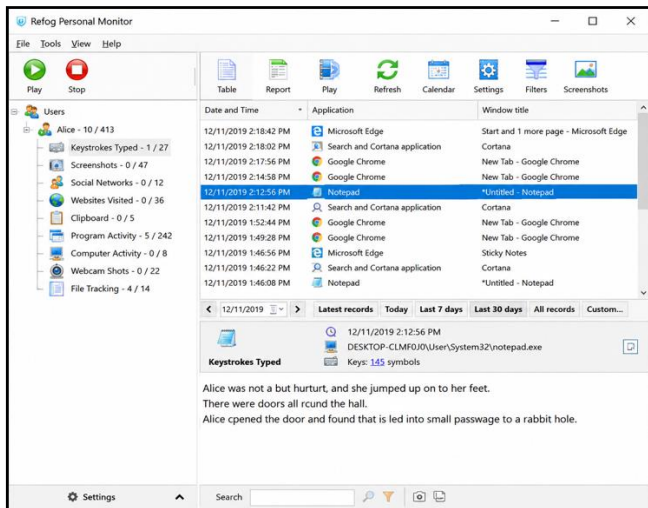


Fig. 2 Dashboard view for Refog Keylogger

c. FlexiSpy

FlexiSpy promotes almost the same user experience as other software KidLogger and FamLogger. FlexiSpy not only offers parental control, the software is also suitable to monitor employees in companies. The advantages of FlexiSpy is it offers real-time dashboard alerts. The software is also designed to give the freedom to monitor children and employees, as well as significant others, spouse, or partner because users have full control over the phone that is connected with this application including remote camera and video [12].

Even though the software has many compliments and advantages, it still has disadvantages to install because it needs to be installed through the web browser only. The subscription price is quite expensive for users who do not have enough income. Finally the hardest part is it requires rooting or jailbreak on the targeted device that the user wants to spy on.

There were three compared applications which are Kid-Logger, Refoq Keylogger and FlexiSpy. The comparisons were made based on their features such as web-based capability, dashboard alert, reporting mechanism, undetectability as virus and either it is having cost or freeware. All these applications were having the web-based capability and dashboard alert function. However, all applications do not enable any personal messaging mechanism. The report can only be generated through the application dashboard. The KidLogger and Refog Keylogger once installed to

devices having a risk to be detected as virus attack thus limit the capacity of installation.

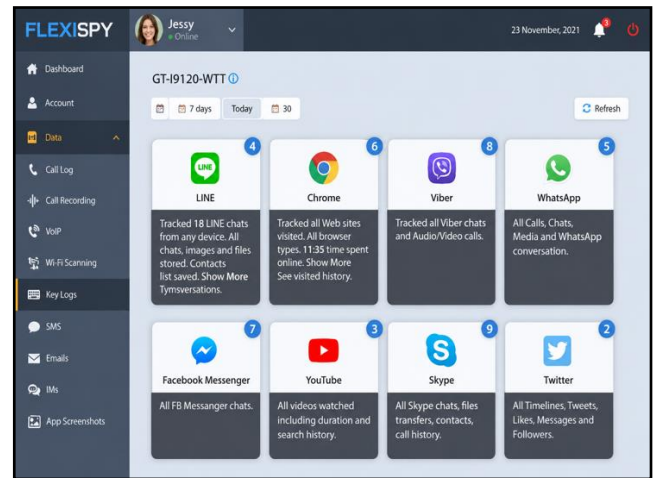


Fig. 3 Keylog Activity for FlexiSpy

Only FlexiSpy is having a privilege to be recognized as a legal software without any virus content detected. The KidLogger and FlexiSpy are paid application however RefogSoftware is a freeware. Consolidating all the features compared from different type of applications, the FamLogger is developed to be a web-based, dashboard alert for information, personal messaging via email, be undetectable as virus attack and no cost to use. This system review had suggested the adaptation features that could assist in developing a keylogger system that better suits the user requirement, environment and improve performance. Table below depicts the comparison of features between applications:

Table 1
Comparison Features between applications

Features	KidLogger	Refog Keylogger	FlexiSpy	FamLogger
Web-based	✓	✓	✓	✓
Dashboard alert	✓	✓	✓	✓
Report via email	✗	✗	✗	✓
Undetectability	✗ Some anti-virus detected Kid-Logger as virus	✗ Some anti-virus detected Refog Keylogger as virus	✓	✓
Freeware	✗ Provide free trial version	✓	✗	✓

FamLogger is a web-based application for Windows. The benefits of this system are it can trace the kids' activities such as chatting and browsing by recording every

keystroke they typed and every hyperlink they clicked. Unlike the existing systems that send the report in dashboard view, FamLogger's user is believed to receive the report in their email every time when the system is activated. The report is based on specific time intervals and it is a real-time monitoring. FamLogger is freeware application.

However, some flaws that can be found in this system are not available yet in Android and iOS. Meaning that, this system can track the keystrokes on personal computer only that uses Windows as the operating system. Furthermore, there is no dashboard alert like other advanced keylogger parental systems. FamLogger also cannot take the screenshot and cannot analyse the report to ease the decision made by its users as for now.

IV. METHODOLOGY

This section presents an overview of the pre-production of the FamLogger system development, specifically the development strategy, user requirements specification, logical design, database design, and prototype design. The main objective of project analysis and design is to suggest alternatives and suggestions for how the system is developed. The development approach provides a framework for system development that aids in the process structure, planning, and mitigation. In addition, the user requirements specification is also important since it helps in defining the users' needs specifically in terms of the features and design of the application, which might vary widely in methods. Furthermore, components of FamLogger's functions are described, along with the relationships that exist between them, using logical and database design, which includes system analysis and design diagrams. Moreover, the prototype design use to guide the developers in understanding the system's features and target audience.

The development approach that is used in FamLogger system development is the Waterfall Methodology. It refers to a sequential development process where each project phase is completed before moving on to the next. It consists of five stages which are requirements, design, implementation, testing and deployment and maintenance. Requirements is a phase where the team gathers all the details needed to develop the system such as literature reviews, problem statements, objectives, risks, dependencies, success metrics, timelines for completion, tools and others. Next, the Design phase is when the developer begins to design a technical solution based on the problems that were found before by using specific hardware and software technologies [2][6]. Then, the Implementation phase is when all the designs are already completed. The Waterfall methodology also has a testing phase to ensure the product gives a good user experience and no errors. Last, when the product is ready to be deployed in the market, this is called deployment and maintenance phase, the last phase in the Waterfall Methodology [1].

There are some reasons behind the choice of this methodology towards this project. Mainly due to the type of

target audience, and its duration. Since the duration of the project is fixed, the developer team can plan effectively their time and can manage their schedule properly. Next, the measurement and observation of each progress can be done easily because the Waterfall Methodology is the structured approach where the developer team cannot move to another phase if the previous phase is not completed yet.

a. Requirements Specification

User requirements are important for developing user-friendly systems that meet user needs. In order to achieve user needs, a survey was conducted to gather some requirements.

b. Data Collection Results and Analysis

As part of the requirement analysis, A survey was conducted to 52 respondents. The respondents were given informed consent about the study's purpose, procedure, voluntary participation, and confidentiality protection. The purpose of this survey is meant for gathering user and technical requirement. It is also meant to understand further about the preference of keylogger system development. Findings indicated that a significant portion of respondents were unfamiliar with keyloggers. However, some had used them to monitor children's online activities and expressed interest in additional features for enhanced child protection.

The technical requirements for FamLogger as suggested by the respondents; to have a system designed to monitor children's computer activities, include user-friendliness, easy installation, and performance efficiency. The system should be free with clear terms and conditions. On the concern over privacy, the system should have encrypted reports sent to user via emails, requiring a password for decryption. The system should have logging activity in a report, pop-up notifications for user awareness, and the ability to identify specific websites or content deemed inappropriate for children.

V. PRESENTATION OF THE RESULT

Based on the input from literature review, system review and survey conducted the following use case diagram was developed. This use case is meant as a guide for the actual development.

There are four types of user who are parents, admin, the FamLogger system and children. It allows multiple functions as depicts in Fig 4. The use case illustrates the processes, outputs and testing done to develop the desktop application.

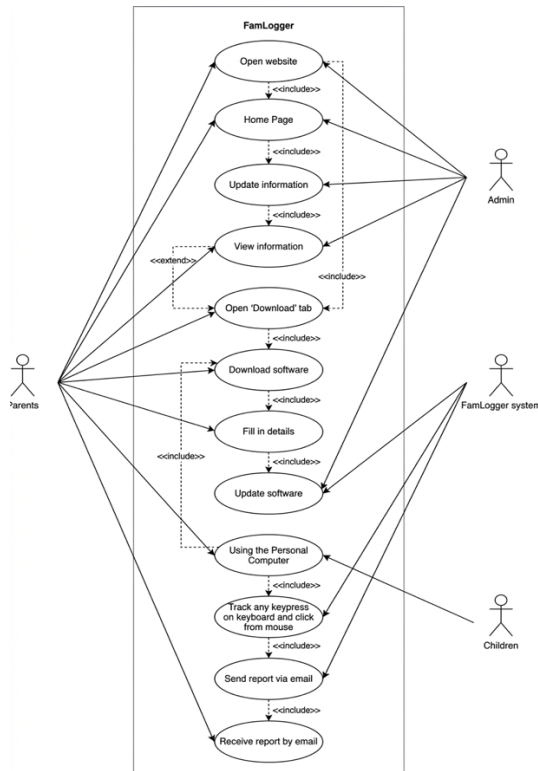


Fig. 4 Use Case Diagram for FamLogger

a. Solution Development

Before downloading the application, users need to visit Famlogger’s website, which is built with HTML, CSS, and JavaScript for the frontend and PHP for the backend. Then, users click the download button displayed on the website and install the application on the targeted machine. After the installation period is finished, a desktop application will appear on the screen. This desktop application, which has a Graphical User Interface (GUI) form, was created using the Python language for both the frontend and backend [11]. This GUI form is the most anticipated form, as it gives users access to the main features of Famlogger. After the authentication and authorization process is complete, users have the privilege to choose features such as Keylogger, Screenlogger, and Web Blocker, and update them. The features then execute and run in the background of the machine and send the report to the email that the user entered during the authorization process.



Fig.5 Home Page

The Homepage is a simple yet effective way for parents to get started with the FamLogger desktop application. From the Homepage parents can click to download and install FamLogger Desktop Application. Once FamLogger is installed, users can create an account or login into FamLogger and use the feature promoted in FamLogger.

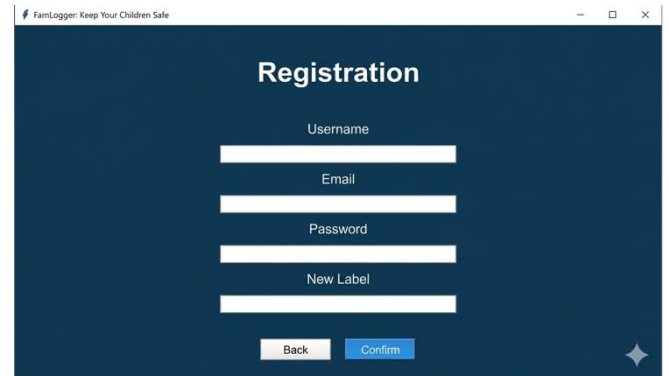


Fig. 6 Registration Page

The first thing users need to do is register themselves in the registration page. Then, they get the privilege to login and activate the features later on. The registration form consists of username, email, password, and pin number. The pin number is required to ensure that no one can modify what the first user set on the machine. If someone who does not have the authority wants to make changes, the system will prompt them for the pin number.

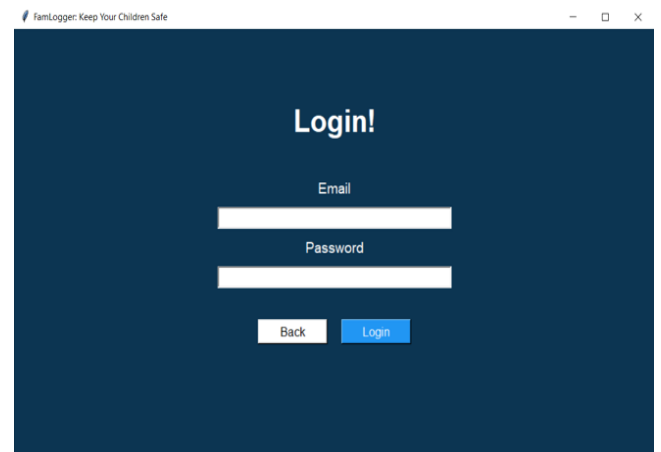


Fig.7 Login Page

The registration and login modules use phpMyAdmin authentication. After a user completes the registration process, their information is saved in phpMyAdmin and can be accessed by the admin, including their username and email. Their password and pin number are not stored.

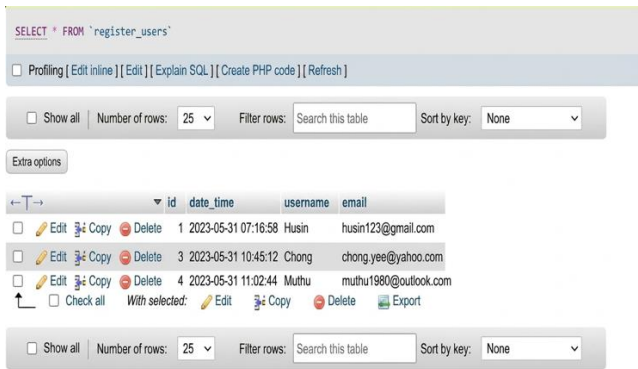


Fig. 8 Database

This page allows users to change the feature they want to implement in their machine. They can choose either to have Keylogger, Screenlogger and Web Blocker features. Once the user is set to one feature, they have the option to change it according to their preferences during that time.

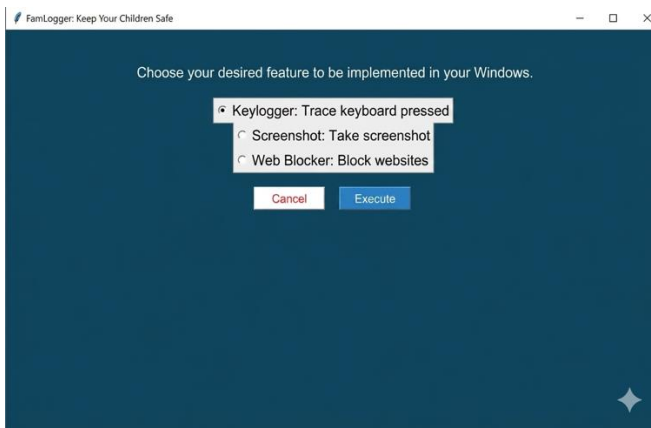


Fig. 9 Option for features

a. Feature 1: Keylogger

The Keylogger feature can record all keystrokes and sends the information to the parent's email. Parents can then use this information to see what websites their child has visited, what emails they have sent and received, what passwords they have used, to whom their children communicate online and many more.



Fig. 10 Generated report via email

b. Feature 2: Screenlogger

Screenlogger feature takes screenshots of the screen and sends the information to the parent's email based on time interval. Parents can then use this information to see what websites their child has visited, what applications they have used, and what they have been doing on their computer. This can be a valuable tool for parents who want to keep an eye on their children's online activity.

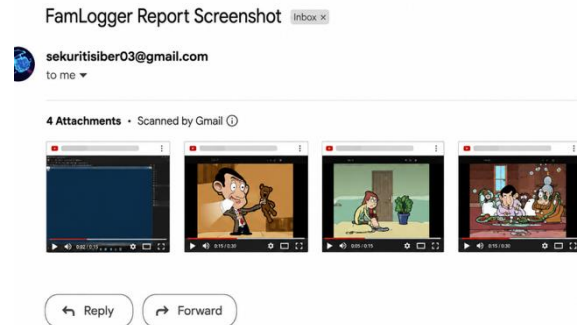


Fig. 11 Generated report (screenshot) via email

c. Feature 3: Web Blocker



Fig. 12 Website Blocker Options

Website Blocker Web options is another additional feature embedded in the Famlogger, this feature is using browser extension to block websites. This tool allows users to set specific time limits for accessing certain websites. It enables parents to block unwanted websites from being accessed by their children on the desktop. This tool enhances the monitoring features by preventing their access. Web Blocker are created for the parents to enhance the safety of their children by preventing them from being exposed to cyberbullying, scam, and other cyber-threat.

VI. IMPLICATION OF THE STUDY

This section discusses the implication of the study in term of its benefits, constraint and potential use. Development of this application has enabled parents to trace and get notification of their children typing and search activity on the Internet. This could facilitate busy parents in their modern parenting. This application also enables parents to

advise their children based on the report generated. Children could be possibly prevented from viewing inappropriate content and further expose to cybercriminal. It is also considered as an awareness platform for parents as well as their children to govern any online activities before it get worse.

Despite of its benefits this application consists of multiple constraints that could be tackled as future enhancement. The current system readiness for FamLogger system should be compatible with a wide range of devices, including computers, tablets, and smartphones. It should be compatible with a variety of operating systems, such as Windows, macOS, and Android.

It should be reliable and should not crash or malfunction often. It should be able to keep track of the children's online activity even if the children try to delete it. FamLogger system should be secured and should protect the child's privacy. Thus, strong encryption to protect the data that it collects is needed.

Among the potential use of FamLogger are embedding it to any devices as a live dashboard. Through this mechanism the real-time information through email into a live dashboard information must be a great future enhancement for FamLogger. Parents could easily have access and analyse the data to learn their children's behaviour in the real-time. Having a dashboard can increase efficiency of the FamLogger thus parents able to save time by not having to sift through emails to find the information they need. The dashboard could be customizable and enable parents to choose which information they want to display. Further to equipped with alert features so that parents are notified when certain events occur. This will help parents to stay on top of their data and make better decisions.

The other potential use of the FamLogger, it could be enhanced to be available on other platforms, such as mobile (Android/iOS), tablet, and smart TV. This is because children nowadays are more exposed to these gadgets, and it is more convenient for parents to monitor them with these platforms. Having multiple platforms can increase accessibility for parents to access FamLogger from anywhere, at any time, as long as they have a device with an internet connection. Overall, making FamLogger available on mobile, tablet, and smart TV platforms is a valuable enhancement that will make it a more powerful and user-friendly tool for parents.

VII. CONCLUSION

FamLogger has been successfully developed through complex programming under Waterfall methodology. The project requirements were all completed and functioning properly, with the exception of a few features that have been modified based on the results of the user acceptance test. All the logical designs which include Use Case, Activity, Sequence and Entity Relationship diagram are successfully implemented during the development of the project.

Unfortunately, two unknown bugs have been found in the app causing crashes, but no resolution has been found.

For future enhancement, several suggestions had been made such as upgrading real-time information through email into a live dashboard information to make it easier for parents to access and analyse the data to learn their children's behaviour. Next, FamLogger will be enhanced to be available on other platforms, such as mobile (Android/iOS), tablet, and smart TV because children nowadays are more exposed to these gadgets, and it is more convenient for parents to monitor them with these platforms. Multiple features selection will be improved to make it available at one time which can allow parents to have a more comprehensive view of their children's online activity.

In conclusion, while recent Internet advancements have undeniably brought numerous benefits, the challenges concerning children's exposure to the online environment without supervision necessitate proactive solutions. The development of FamLogger, a keylogger system could stands as a potential solution to mitigate risk with regard to children's online safety ensuring a safer online environment for children and offering parents the peace of mind. Better management of their children online activities.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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