



INTERNATIONAL EXHIBITION & SYMPOSIUM ON PRODUCTIVITY, INNOVATION, KNOWLEDGE & EDUCATION

**“Optimizing Innovation in Knowledge, Education and Design”**

## ***EXTENDED ABSTRACT***



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*“Optimizing Innovation in Knowledge, Education and Design”*

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Assalamualaikum warahmatullahi wabarakatuh,



First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality. I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services. By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality. I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

*Professor Dr. Roshima Haji Said*  
RECTOR  
UiTM KEDAH BRANCH



## WELCOME MESSAGE (i-SPIKE 2023 CHAIR)



We are looking forward to welcoming you to the 3<sup>rd</sup> International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPIKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPIKE 2023; your dedication and hard work are greatly appreciated.

*Dr. Junaida Ismail*

Chair

3<sup>rd</sup> International Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023)





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### ABSTRACT

In the world today, various types of innovations are seen to have benefited the world so much for a better future. It is crucial for an innovation to be aligned with the context and level of development within a country especially for developing countries such as Malaysia. Up to 90% of people in developing countries own traditional key and lock systems and many of those are unable to manage the physical key bunch effectively. The importance of effective key organizations could avoid potential issues thus providing better security and affordable costs. An analysis is done on the statistics of poverty and the capability of households in absorbing the surging living cost obtained from the Department of Statistics Malaysia (DOSM) and the Congress of Unions of Employees in the Public and Civil Services (CUEPACS). From the observation, the transition from the use of traditional key and lock systems to the use of smart access door systems might be too much for the developing country. This study of effective key management has led to the innovation of the automatic key holder which is realistic with



the development of the developing country, as well as improving individual efficiency. The automatic key holder is innovated from the manual key organizer with the adoption of the current automatic car key concept. This simple yet meaningful innovation is an effective solution for key management in developing countries.

**Keywords:** key management, automatic, innovation, quick-release

## INTRODUCTION

Physical key management has been an issue for many individuals, families, and organizations ever since. Key loss, misplacement, unauthorized duplication, lack of key tracking accountability, security breaches, and difficulty in key differentiation has been amongst the key management challenges the involved bodies need to resolve. According to Fossey (2018), UK drivers spend almost 180 million pounds replacing lost car keys and Inc (2018) has issued replacement costs of U.S. households 2.7 billion dollars annually for the lost item with keys being the most common loss item from the lists (Lossings, 2023). This led to the product innovation of the automatic key holder which has been developed based on several concerns including the high cost of the automated access system, security-related concerns pertaining to the timely door opening and locking in an efficient manner and forming realistic innovation transition for developing country especially due to inefficient key management of traditional physical key bunch.

## PROBLEM STATEMENT

Individual weaknesses in key organizations could lead to security issues due to various factors. This includes the potential of key loss which would become difficult to locate when misplaced leading to unauthorized access if fallen on the wrong hand. Additionally, poor organization of keys could give opportunities for criminals to attack individuals in a short time especially when someone spends a long time searching for a door key and opening the entrance door. There have been several cases reported regarding an assault in which an individual has been attacked at the front door (Dale, 2023). Worryingly, 29% of women have an experience of being followed and feeling unsafe. Knott (2023) discloses the crime rate will mostly occur within these three common times including 12 midnight, 12 noon and 5 pm, thus requiring an individual to be more precautious within this time when opening the entrance door. A solution is needed in the mitigation of attackers at the entrance door especially for the safety of the community.

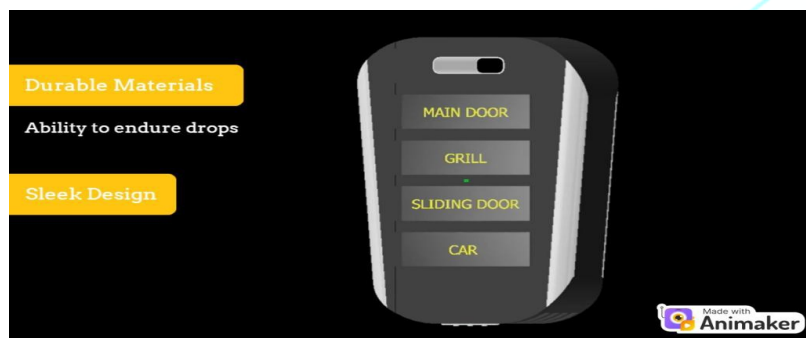
Technology needs to be in line with the flow of a country's development. Malaysia, being a developing country, currently embracing technology advancements, and has a growing market for smart home and security systems still has to go through changes at the appropriate speed of transition a country is able to achieve. The transition from a traditional key and lock system directly to the use of an access door system might be less appropriate for developing countries mainly due to the readiness of one's income, living cost, habit, knowledge, and availability of infrastructure. DOSM (2021) indicate that the poverty rate has increased from 5.6% in 2019 to 8.4% in 2020. CUEPACS analysis stated more than 50% of Malaysian households are unable to absorb the surging living cost (Saari, 2023). Thus more convenient approaches are required to encourage innovation which would help in minimizing poverty, supporting a better creation of a prosperous environment (Anggraini, 2021).

Doruk (2014) confirms that costs are the main obstacle to innovation in the developing countries. Additionally, from the research on the cost of a smart access door system, the average quoted price is more than double the cost of the traditional key and lock system. The high cost of smart access doors is one of the main reasons why the developing countries are not ready for the changes especially when the poverty rate and cost of living in relation to the average income in Malaysia are not aligned with the country's development which goes the same for the other developing country. This forced the nations to spend on necessities rather than comforts for survival. This condition will delay the transition process of “too-fast- forward” innovative product usage affecting the economic growth and technological advancement of developing countries.

The objective for the innovation of automatic key holders is to offer an appropriate approach to the key stakeholder, especially the users of traditional key and lock systems in terms of cost, security, key management, and progress to the development of the nation. The result expectation upon commercializing the automatic key holder is to offer affordable product prices, increased security with the proof of reduction in the criminal rate of assault, effective key management which eases the owner to locate the key, and positive realistic innovation progress in the key management. The users of traditional key and lock systems are targeted at the age of 18 and above due to the capability of making their own decision according to the appropriate needs with full autonomy.

## FUNCTIONAL SPECIFICATIONS

The automatic key holder will provide benefits for effective key management to the users with the advantage of the user efficiency. It is equipped with seven focused product specifications which include sleek and durable product material, four one-click button key organizers, a customizable easy-click button, a quick-release pin, a device tracker, a flashlight and a warning alarm. The main function of this product is the one-click button key organizer which will slot out the key attached to the automatic key holder once pressed by the users, saving them time to search for the required keys.



**Figure 1:** Durable material and sleek design

Figure 1 illustrates the durable material and sleek design. The products revolve around 70% to 80% of rubber material with high durability, capable of enduring drops of average at 2- meter height. With the sleek design, it simply gives a sense of elegance, and sophistication in flow with the current modern and contemporary styles. Note that user handling plays a role in preventing unnecessary drops and ensuring the longevity of the product. Proper care, secure storage, and avoiding accidental drops can help maintain the product’s durability.



**Figure 2: One-Click Button Key Organizer**

Figure 2 illustrates the one-click button key organizer. The automatic key holder is equipped with four one-click button key organizers. With four one-click button key organizers, four keys are allowed to be slotted in for each use. With just one click on the specific button, the key holder will straight slot out the indicated keys.



**Figure 3: Customizable easy-click button**

Figure 3 illustrates the customizable easy-click button. Easy-click buttons can be adjusted according to the different needs or usage. The devices could be connected to the mobile phone for the adjustment of easy-click button names according to the users. For home use, the easy-click button could be adjusted by the user to different button names such as “main door” for the first button, “grille” for the second button, “sliding door” for the third button, and “car” for the fourth button.



**Figure 4: Quick-release pin**

Figure 4 illustrates the quick-release pin. The presence of a quick-release pin facilitates key exchange in less than a second. Keys can be simply replaced with the quick-release pin for



key removal and insertion. By clicking the specific button three times, the key will be ejected for the key replacement. The devices are compatible with various types of keys due to the diameter of the quick-release pin of 0.1cm and key space of 8cm length, 3cm width, and 1cm height which fits most of the key chain hole diameter, height, width, and length.



**Figure 5: Device tracker**

Figure 5 illustrates the device tracker. Device tracker is significant to locate the automatic key holder in case of loss or misplaced. It is able to connect with mobile devices and alert alarms to track devices. These devices feature real-time tracking, utilizing GPS technology for accurate positioning and up-to-date location data. With the added values of geo-fencing, the paired mobile devices will alert when the devices are out of 10 meters range. The mobile phone will record the last location of the devices once it went out of range. Additionally, the paired mobile device could activate the alarm sound of the automatic key holder for the ease of device search in the event of loss or misplaced within the geo-fencing distance range.



**Figure 6: Flashlight intensity**



**Figure 7: Different flashlight intensity**

Figure 6 illustrates the flashlight intensity and Figure 7 illustrates different flashlight intensity. Device flashlights are equipped with LED light to flash key lock for dark surrounding use. This will help the user increase vision and lighting on the keyhole upon opening the door. Three intensity options from low-intensity to high-intensity are available starting from intensity 1,

intensity 2, and finally, intensity 3 are available to facilitate the needs of the user. LED lights are shock-resistant, minimizing the risk of damage.



**Figure 8:** Warning alarm

As shown in Figure 8, warning alarm is a complementary product for the automatic key holder. The automatic key holder is equipped with an alarm button in the case of an emergency and it is activated once the warning alarm is connected. The alarm is a battery- powered device, allowing portability according to the user's needs. Warning alarms can scare criminals, and alert the attention of nearby individuals which could disrupt the criminal's plan with the high-decibel alarm buzzer.

## COMMERCIALIZATION

The commercialization of automatic key holders involves the process of bringing an innovative product related to key storage and retrieval to the market for commercial purposes. An automatic key holder is a device that provides a convenient and secure way to store and retrieve keys without the need for manual intervention. The level of commercialization for the automatic key holder is high, especially for its market size, price competitive advantage, and scalability and growth potential.

Market size and opportunity of the product to be commercialized hold onto the number of users of key and lock systems in which there are up to 90% of existing users and its ease of use by people of all ages due to its simplicity. Thus, the opportunity capability of the automatic key holder in capturing a significant portion of the market, allowing a substantiation revenue. Additionally, with the scalability and growth potential in which the product can be promoted globally, especially to the developing country, the commercialization of the product is greater when the product offered are at a lower price. It is important to note that the specific commercialization process may vary depending on factors such as the nature of the product, the target market, available resources, and the business strategy of the company driving the innovation.

## APPLICATION AND BENEFITS

The level of benefit for the automatic key holder and application of the automatic key holder is highlighted based on the product affordability, low manufacturing complexity, and ability to be used by a wide age range of users.

The application of automatic key holders is beneficial to whole nations especially to the developing countries due to the high use of the traditional key-lock system, enabling the improvisation of key management within the whole wide community and nations. The affordability of automatic key holders will increase accessibility to all users with various incomes thus accelerating the development of a country's innovation. Additionally, it allows greater adoption and integration of technology into various aspects of life, bridging the gap between advanced technology and everyday consumers. Additionally, the security will further be improved with the increasing efficiency due to effective key management and the added security features of the automatic key holder.

The presence of automatic key holders and the capability for the market expansion to the wide market of users with the innovation of the devices from manual key organizer to the automatic key holder are beneficial for the support of physical key manufacturer continuity and market penetration with the new product invention. Without innovation, an organization will not thrive for a long period. Thus, with this new innovation, the key manufacturer organization could come up with a new product line for a new revenue generation. This innovation will further allow continuous improvisation for many organizations involved in the line of production, operation, and sales of the product.

## NOVELTY

The product is an innovation from the existing product of manual key holders. The idea of an automatic key holder is extracted from the concept of the current automatic car keys model. There is no existing model equipped with the automatic key holder functions which proves the novelty and originality of this product concept. The novelty of an automatic key holder lies in its innovative features and functionality that differentiate it from traditional keystore methods. Some aspect that can contribute to the novelty of an automatic key holder is automation. An automatic key holder eliminates the need for manual handling and retrieval of keys. It incorporates mechanisms such as motorized systems, sensors, or smart technologies to automate the process of storing and retrieving keys. This automation saves time and enhances convenience for users.

The security feature is an automatic key holder that often incorporates advanced security measures. These may include biometric authentication. For example, fingerprint or facial recognition, encrypted access codes, or integration with security systems to ensure that only authorized individuals can access the stored keys. The novelty of an automatic key holder innovation lies in the unique combination of these features, providing a distinct advantage over traditional key storage methods. These innovative elements contribute to improved efficiency, convenience, security, and user experience, making the automatic key holder an appealing solution in the market.

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