The Essential Factors and Trend Development of IoT Smart Box

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Abstract. Boxes for drug storage are handy and essential and play a role in helping the healing process and support maintaining patient health regularly for a long time. SmartBox is not a new thing, but because of its importance, it, SmartBox continues to be developed to date according to the needs needed. In previous research, the formation of SmartBox was only for particular things. This study tries to unify the 17 papers obtained with the help of a publish and perish application which is then carried out a literature review and using the VosViewer application to get an overview of trend development and the essential factors or aspects in the formation of SmartBox and its development. In addition to getting the trend of SmartBox development, this research also finds seven essential factors that will be useful for Smartbox development. With this research, it hopes to facilitate the development of SmartBox in the future.

Keywords: essential factor, vos viewer, publish or perish, smartbox development.

1. Introduction

Boxes for drug storage are handy and vital and play a role in helping the healing process and support maintaining patient health regularly for a long time. SmartBox is a concept that has been introduced previously, but because of its importance, SmartBox was developed to meet the market's needs. Previous research has generally stated that the formation of SmartBox is only for particular things, such as using SmartBox with IoT to reduce healthcare costs [1]. For monitoring and controlling drug consumption [2][3], monitoring one's health [4][5][6][7][8], and monitoring the use of appropriate drugs to reduce deaths due to drug use errors [9]. Previous research generally provides solutions for using drug medicine for specific purposes. It found what important factors a Smart Box must have.

Therefore, this study tries to find important factors that a Smart Box must have. The essential factors found are beneficial to become a standard in forming Smart boxes in the future. This study combines the 17 papers obtained with the help of publish and perish applications. A literature review technique was

executed using the VosViewer application to get an overview of the factors or important aspects in forming Smart Box with IoT (Internet of Things) and its development; this study has never been done in previous research. In this study, several important things were found, such as the development of Smart Boxes that are currently used, and mostly used in the health sector, apart from that, six important factors were found in a smart box. The results of this study are expected to facilitate the development of Smart Box with IoT in the future.

2. Definitions

This section will explain the definitions or terms used in this study and an explanation of the applications that support this research.

2.1. Drug SmartBox

Drug SmartBox is a drug storage box with active features that plan (scheduled) for its activation to support the box. The advantage of the box is storing medicine and support other activities, such as serving as a reminder of when to take medication [2][3][9]. The existence of this Drug SmartBox is very important for improving a person's quality of life.

2.2. Publish and Perish and VosViewer

The Publish and Perish application is an application that facilitates the search for articles on several sources, such as the Scopus database, web of science, and crossref [10]. This study used the publish and perish application to search literature.

VosViewer App [11] is an application used in this study to see the relationship between factors or aspects that are important in research that has been done previously, in this case, on 17 papers found. This VosViewer application will describe the results of the relationship between aspects that are important for the development of Drug SmartBox.

2.3. Internet of Things (IoT) on SmartBox

The Internet of Things (IoT) is a technology that unites the internet and equipment or sensors to create value. This value can be helpful to the user [4]. In this study, IoT will integrate with a box for drug storage that will generate benefits for the user, in this case, the patient.

3. Research Method and Data Sources

This section will explain the methodology used in this study and the data sources used.

3.1. Qualitative Method with Literature Review Technique

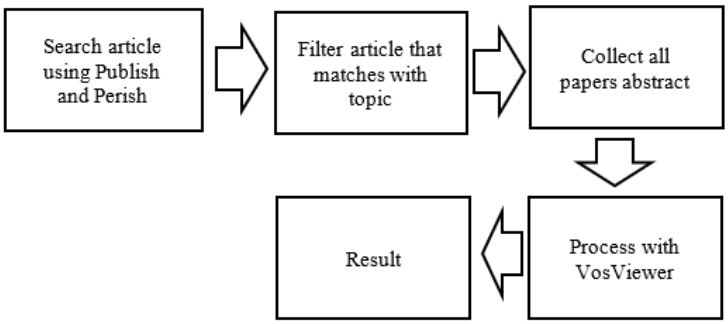

Figure 1. The Research Stages

This study uses a qualitative method with a literature review technique. Seventeen selected papers out of 58 are based on the query process using Publish and Perish application in the Scopus database. SmartBox uses it as a keyword to search the articles. This article uses a qualitative method with a literature review technique by utilizing the Publish and Perish application for article searching, and VosViewer for data processing see Figure 1.

3.2. Research Stages and Research Questions

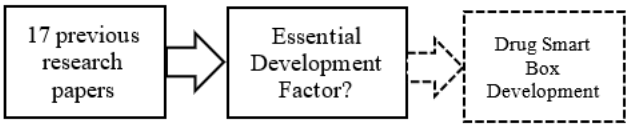

Figure 2. Complete Research Stages

The stages in this research begin with the aim of the researcher to develop a Drug SmartBox. Improve and follow the needs of the patient. The essential aspects or factors are required for the development of a Drug SmartBox to be more in line with the current user's needs. Figure 1 shows the complete stages of the research. This paper has only two initial stages, namely a review of 17 previous papers and finding essential factors for developing the SmartBox drug. See the exhibit in Figure 2.

3.3. The Research Gaps

This section will discuss the gaps in previous studies with this reported research.

- Research conducted by Al-Mahmud [1] in the paper article writes about the benefits of SmartBox Medicine, which will help reduce healthcare costs. With the SmartBox, SmartBox users don't need someone who constantly helps to remind them to take medicine.
- Research conducted by Daou dan Khedkar [2][3] on using SmartBox to monitor and control patients so they can consume drugs on time.
- Research conducted by Gandhi [9] to prevent drug use errors so that SmartBox users can consume drugs more precisely.
- Research conducted by Silvia et al. SmartBox aims to monitor a person's health [4].
- Research conducted by Punit Fulzele at. al; discuss vaccine box temperature limitation [12].

Previous research has not mentioned what important factors or aspects must be possessed by a Drug SmartBox. Therefore, this research conducts to see what essential factors or aspects must be possessed by a Drug SmartBox so that the development of a Drug SmartBox can be carried out in the future.

3.4. Data Resources

Table 1. Data Resources

Year	Types		Total	%
	Conference	Journal		
2020	[13]	[14][15] [12][16]	5	29.42
2019	[4]	[9]	2	11.76

Year	Types		Total	%
	Conference	Journal		
2018	[5][6] [7] [8]	[3][17] [2]	7	41.18
2017	[18] [19]	[20]	3	17.64
2016	-	-	-	
	8 (47.05%)	9 (52.95%)	17	100.00

This section describes the literature that uses every year, the literature takes since 2016, and the total found 17 articles discussing smart boxes for drugs. It consists of 8 conferences (47.05%) and nine journals (52.95%). From the literature, SmartBox research has been ongoing since 2017 until now. Therefore, in 2017, 3 (17.64%) articles discover, 7 (41.18%) articles find in 2018, 2 (11.76%) articles in 2019, and 5 (29.42%) articles in 2020. Detail of the literature exhibits in Table 1.

4. Result and Discussion

This section will explain the paper's results from processing literature using the VosViewer application.

4.1. SmartBox Trend Development

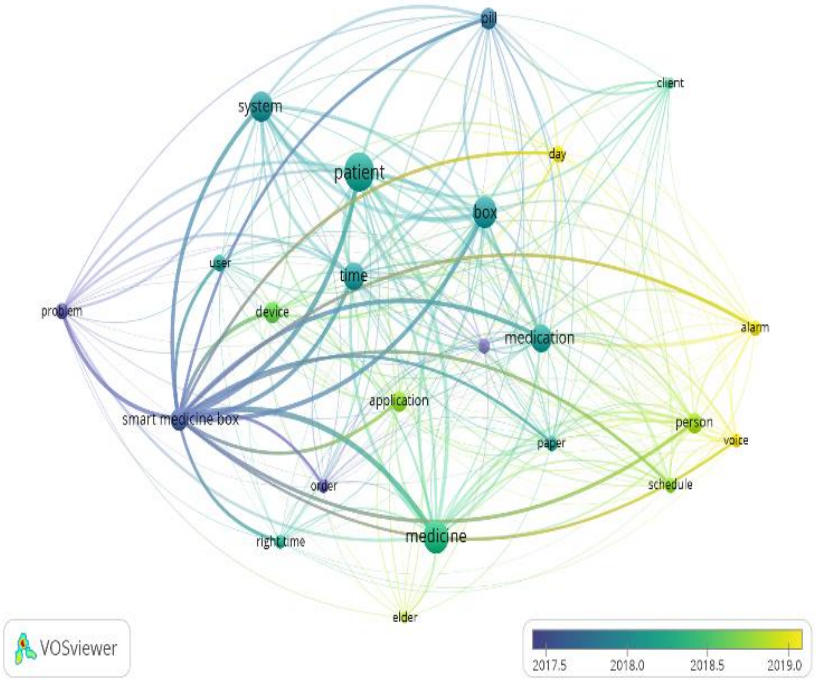

Figure 3. SmartBox Trend Development

Figure 3. In this section, we will discuss the results of processing abstracts from each paper using the VosViewer application to see the relationship between factors or important aspects found and trend development by looking at the lines (relationships) and the color of each connected factor in the figure[21]. For example, the yellow color in the image indicates trends and finds in several aspects, such as applications, alarms, schedules, days, and devices. The figure focuses on the smart medicine box for detailed explanations in the following paragraph.

4.2. Drug SmartBox

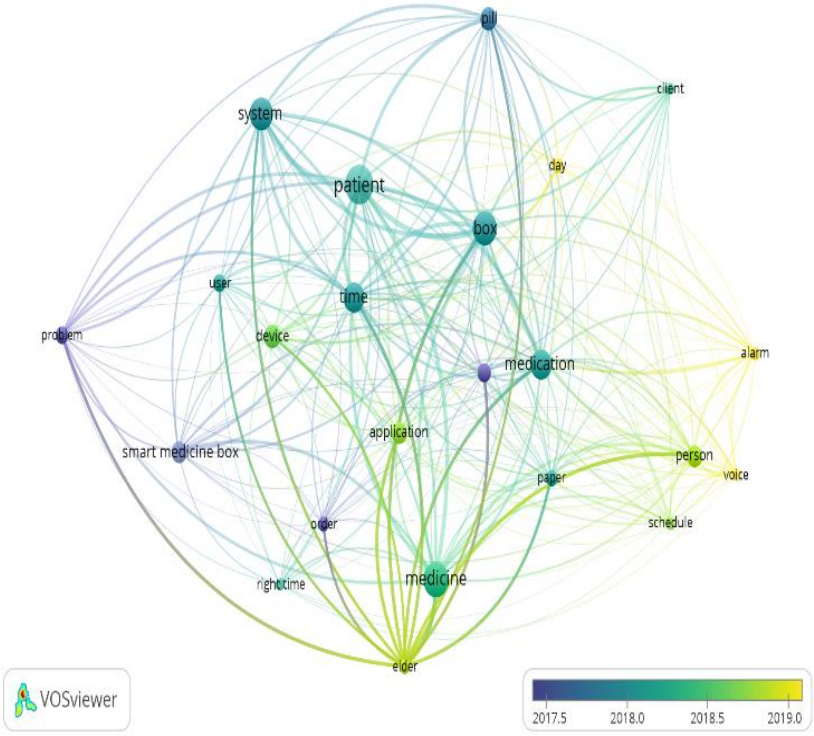

Figure 4. Elderly Drug SmartBox

In Figure 4, it is generally stated that the use of Drug SmartBox (by looking at the yellow color) is a lot for the elderly (the figure focus on the elder user) or patients who need a reminder to schedule taking medication. The SmartBox device feature application, such as voice, alarm, and schedule, is exhibited on the map. Figure 4 shows the current development of the Drug SmartBox for helping the elderly because of problems from the elderly, such as not taking the medication regularly (every day), not being able to remember when the drug took, and what medication to take.

This Drug SmartBox is very helpful and supports the parents' healing so that it can support and help the health of the elderly[16]. The picture also shows that the Drug SmartBox has an application that will help older people take medicine regularly.

4.3. The Device Smart Box

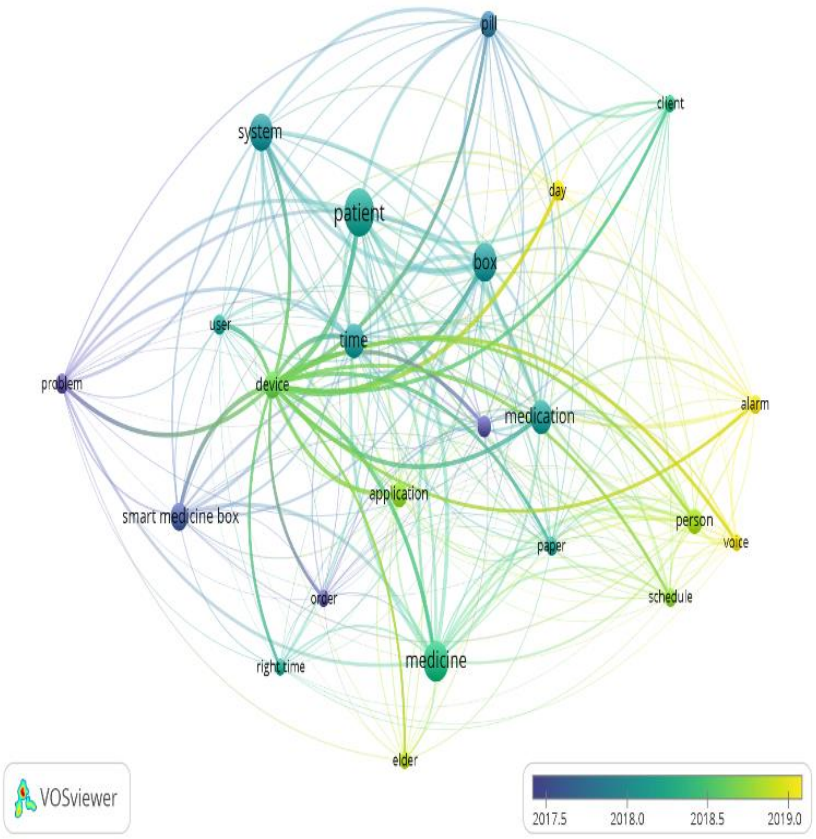

Figure 5. Device SmartBox

Figure 5 shows the development of the Drug SmartBox device (figure 5 focuses on the device) from the equipment side. The drug SmartBox is still in the development stage (from green to yellow color), which is being carried out, such as an additional display on the box. The smart box messages display a consumption schedule of the drug, drug type, or image of the drug that must consume so that it is right (not wrong). Another addition is voice messages. With the voice feature, the patient will be more awake for a scheduled reminder to take his medicine, so the healing rate is faster. The purpose is to make a SmartBox (Smart Medicine Box) device with a system and application to help patients consume drugs regularly and on time. As depicted in Figure 5.

4.4. Drug Smart Box Application Development

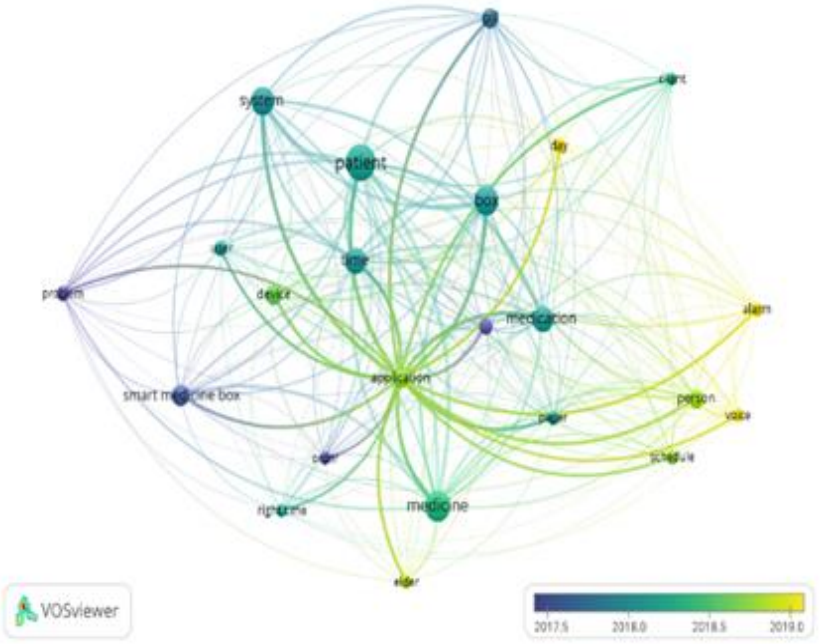

Figure 6. Drug SmartBox Application Development

Figure 6 shows (focus on application). 2019 the application development for the drug Smart Box (see the yellow color). The schedule for drug consumption, the schedule for activating the alarm as a reminder to take medication, and the development of applications for sound to support users to hear reminders from the voice (alarm) [16].

4.5. Essential Factors Found

In this section, we will explain the important factors found from reading in detail the articles used and figures (Figure 3, 4, 5,& 6), such as:

- Time Factor is a factor found in using SmartBox drugs, such as having a calendar and schedule to remind drug consumption. With this feature, SmartBox can remind Smartbox users what activities to do [1][2][3][18][5].
- Schedule Factor is a factor on the SmartBox value as a reminder to users, such as periodically remembering to take medicine by sound or display writing on the screen. With the schedule feature, SmartBox can complete the reminder function for activities that must be done regularly, such as taking medicine [1][2][18].
- Consistency is another important factor in which drugs to take and when to take them. SmartBox continuously or consistently reminds patients when they have to take medicine at the time and type of medicine that must be taken[2][5][20].
- The accuracy factor in a SmartBox continues to regularly maintain patients' ability to take their medicine correctly (with Smart Box's ability as a reminder) while also providing information on the medication the patient should take. So the accuracy factor becomes an important factor [20].

- Reliable information is an essential factor considering that the information provided (such as the type of medicine and when to take it) must be absolute [2].
- The user's safety factor is also important in maintaining security, not only for their health. For example, the SmartBox can routinely remind patients to take medicine and give the right medicine to take so that SmartBox users become safe [2][5].

The cost factor is generated due to the use of Drug SmartBox so that users can recover without needing further treatment (no more cost required) [1].

4.6. Discussion

This research produces development findings or trends from research on smart boxes that see from various research angles, such as users, required features, expected applications, and equipment features that the device should own. Research for smart boxes is generally used to help the elderly, especially as a timely reminder to take medicine.

The features of the smart box can be improved in the future and used for other things, such as logistics [22], where the smart box uses as a medium or place for storing goods to be sent so that it is easy to track and trace. The current smart box already has several features, so development will be easier. Even the combination of Blockchain technology with this smart box will bring a better impact in the future because it has more features such as trust, provenance, real-time, secure, and distributed information [23][24][25].

5. Conclusion

The study about Drug SmartBox is still needed to support patients or parents who need a tool to remind them when to take medicine so that the health of the elderly can be maintained. However, the research found seven important factors in SmartBox, namely time, schedule, consistency, accuracy, reliability, safety, and cost, which are important factors in developing SmartBox, especially to help patients who must take medication regularly.

Another thing found that can develop in the future is the integration of this Drug SmartBox with Blockchain technology so that the Drug SmartBox is not only a drug storage but can be used in the logistics process or drug delivery for the next and several things that can be added to the existing features so as to support the drug SmartBox as media for drug delivery with certain requirements such as a special temperature or special storage (vibration, etc.). Therefore, the success of this research development will greatly help the industry in the future for its use in supply chain management, especially for storing and delivering goods.

6. Acknowledgment

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