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The use of User-centered Design Canvas For Rapid Prototyping

Irwan Alnarus Kautsar, M. Ruslianor Maika

Universitas Muhammadiyah Sidoarjo

Abstract

This paper presents the use of User-centered Design Canvas to help students design the user experience (UX) on the designated Collaborative Projects. The Collaborative Project itself has been conducted by students with multi-discipline backgrounds. The User-centered design itself was widely used as an approach to software development in order to achieve better alignment between the user experience and the business goal. Adopting Business Model Canvas, the User-centered Design Canvas was introduced as an acceleration tool for rapid prototyping and ensures the effectiveness and efficient manner for the sake of user satisfaction. As the results from the questionnaire, more than 78% of users express the benefits of the current adaptation of User-centered Design Canvas. Also from the Log Metric Analysis, users have completed a designated task under 5 minutes with minimum repetition. This indicates that the use of proposed adaptation is easy to use and shows the effectiveness of the User-Centered Design Canvas for rapid prototyping. **(Approx. 156 words)**

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Four-scroll chaotic attractor and four-scroll hyperchaotic attractor generated from a new four-dimensional dynamical system

Khaled Benkouider[1*], Toufik Bouden[1], Mustak E. Yalcin[2], Aceng Sambas[3], Mujiarto[3], Muhamad Ali Pahmi[4], Akhmad Sutoni[5] and Widjajani[6]

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Abstract. In this paper, a new 4-D hyperchaotic system with one equilibrium point is first introduced. It contains ten terms with three quadratic nonlinearities. Of particular interest is that this novel system can generate periodic attractor, quasi-periodic attractor, four-scroll chaotic attractor and four-scroll hyperchaotic attractor with the variation of one of its parameters. Major dynamical properties of the new system are investigated such as sensitivity to the initial conditions, dissipativity, equilibrium point stability, Kaplan-Yorke dimension, Lyapunov exponents spectrum and bifurcation diagram. In addition, an equivalent electronic circuit schematic is implemented using Multisim software; the obtained results confirm the feasibility of the proposed system.
Keywords: Chaos, hyperchaos, chaotic system, four-scroll attractor, Lyapunov exponent, bifurcation, electronic circuits

1. Introduction

In the past 60 years, research on chaotic systems has a great intention from scientific communities, especially after the famous work of the American meteorologist Edward Lorenz in 1963 [1]. He identified the main property of the chaotic systems, which is the high sensitivity to the initial conditions. A little variation in the initial values of the chaotic system lead to a very different and unpredictable behaviours. The high complex behaviour of this kind of systems make them very useful in many field of sciences such as secure communication [2-5].

The main tool to characterize a chaotic behaviour of a dynamical system is the Lyapunov exponents. More clearly, a Lyapunov exponent is calculated by considering two adjacent initial values of a dynamical system. If this system exhibit a chaotic behaviour, the trajectories generating from those initial values will diverge exponentially, the parameter that characterize the rate of that divergence is a Lyapunov exponent. In fact, for each of the state-space dimensions there is a

Computer Modelling of the Information Properties of Hyper Chaotic Lorenz System and Its Application in Secure Communication System

Volodymyr Rusyn[1], Mujiarto[2*], Mustafa Mamat[3], Firmansyah Azharul[4] and W. S. Mada Sanjaya[5], Aceng Sambas[2], Estiyan Dwipriyoko[6] and Akhmad Sutoni[7]

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Abstract. This paper presents computer modeling, analysis and research of the hyper-chaotic Lorenz system based on programming interface that has been developed in LabView software environment. This study allows for generating and research of the main information properties of hyper-chaotic Lorenz system, focusing on time distribution of the four chaotic coordinates, phase portraits and Lyapunov exponents. The programming interface demonstrates the algorithm of masking and decrypt of the information carrier.

Keywords: Nonlinear, hyper-chaotic, Lorenz, LabView

1. Introduction

The generation and application of chaotic attractors have been studied with increasing interest and have become a central topic in research due to its great potential in chaos communication technology [1]-[5]. Chaos theory has been established since the 1970's due to its applications in many different research areas, such as electronic circuits [6]-[7], secure communication systems [8]-[9], robotics [10]-[11], optics [12]-[13], economy [14]-[15], biology [16]-[17], etc.

In order to obtain hyper-chaos, two important requisites are as follows:

A New 4-D Multistable Hyperchaotic Two-Scroll System, its Bifurcation Analysis, Synchronization and Circuit Simulation

Sundarapandian Vaidyanathan[1*], Aceng Sambas[2], Mujiarto[2], Mustafa Mamat[3], Wilarso[4], Mada Sanjaya W.S.[5], Akhmad Sutoni[6] and I Gunawan[7]

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Abstract. A new 4-D hyperchaotic two-scroll system with three quadratic nonlinearities and a cubic nonlinearity is proposed in this paper. The dynamical properties of the new hyperchaotic system are described in terms of phase portraits, Lyapunov exponents, Kaplan-Yorke dimension, symmetry, dissipativity, etc. We also establish that the new hyperchaotic system has multistability with coexisting attractors. As a control application, we use integral sliding mode control for active self-synchronization of the new hyperchaotic systems as master-slave systems. As an engineering application, an electronic circuit design of the new hyperchaotic two-scroll system is developed in MultiSIM, which confirms the feasibility of the system.

Keywords: Chaos, hyperchaos, hyperchaotic systems, sliding mode control, synchronization, etc.

1. Introduction

Chaos theory deals with nonlinear dynamical systems exhibiting high sensitivity to small changes in initial conditions [1-2]. Mathematically, chaotic systems are characterized by the presence of at least one positive Lyapunov exponent. Chaotic systems have applications in several engineering areas such as chemical reactors [3-4], neuron systems [5-6], mechanical systems [7-8], circuits [9-11], oscillators [12-13], neural networks [14-15], etc.

Hyperchaotic systems are defined as chaotic systems having two or more positive Lyapunov exponents. The trajectories of hyperchaotic systems can expand in two different directions corresponding to the two positive Lyapunov exponents. Hyperchaotic systems have important engineering applications such as cryptosystems [16-17], secure communication systems [18-19], etc.

In this work, we report a new 4-D hyperchaotic two-scroll system with three quadratic nonlinearities and a cubic nonlinearity. The dynamical properties of the new hyperchaotic system are described in terms of MATLAB phase portraits, Lyapunov exponents, Kaplan-Yorke dimension,

The use of User-centered Design Canvas for Rapid Prototyping

Irwan Alnarus Kautsar[1*] **and M. Ruslianor Maika**[2]
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Abstract. This paper presents the use of User-Centered Design Canvas to help students design the user experience (UX) on the designated Collaborative Projects. The Collaborative Project itself has been conducted by students with multi-discipline backgrounds. The User-Centered design itself was widely used as an approach to software development in order to achieve better alignment between the user experience and the business goal. Adopting Business Model Canvas, the User-Centered Design Canvas was introduced as an acceleration tool for rapid prototyping and ensures the effectiveness and efficient manner for the sake of user satisfaction. As the results from the questionnaire, more than 78% of users express the benefits of the current adaptation of User-Centered Design Canvas. Also from the Log Metric Analysis, users2 have completed a designated task under 5 minutes with minimum repetition. This indicates that the use of proposed adaptation is easy to use and shows the effectiveness of the User-Centered Design Canvas for rapid prototyping.

1. Introduction

In the year of Covid-19 pandemic in Indonesia, distance learning is a most suitable learning model for implementing a social distance and a self-quarantine [1], [2]. On other hand, Prototyping is one of the software development stages that deliver the early product [3]–[5]. For learning experience, prototyping is the most suitable option to give students to help implement their idea [6], [7]. Prototyping in software development is needed to know if the problem was visible to solve technically or not [8], [9]. Moreover, prototyping in the development of user interaction (UI) and user experience (UX). In this paper, we briefly discuss the use of User Centered Design Canvas to help students to explore, plan and develop the user experience with proposed ideas. Also, how to implement the prototyping process using User Centered Design among students while conducting distance learning.

2. Proposed Method

In this paper we propose the use of User Centered Design Canvas to helps student develop the user experience in their developed application as course assignment. Also we developed and extra feature from our developed supportive tool to help students adapt the User Centered Design Canvas while implementing distance learning. The proposed method is illustrated in Figure 1.

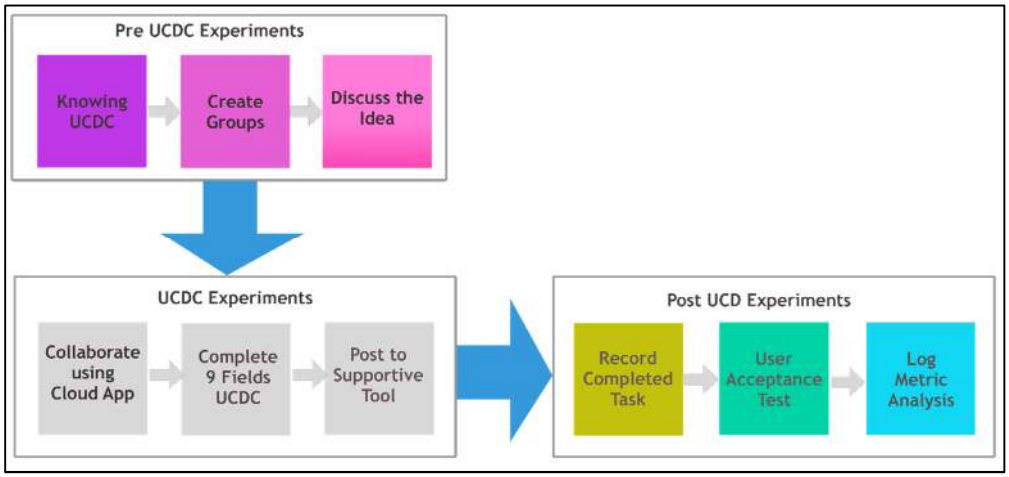

Figure 1. UCDC Experiments Method

2.1. User Centered Design Canvas

User Centered Design Canvas is a framework that is inspired from Business Model Canvas [10]. Therefore, it was claimed the UX Tool combining user needs with the business goals [11]. By using UCDC, it will help UX designer to:

1. Understand the targeted user and market needs.
2. Make a definition of product/market fit.
3. Aligning the business goal for the competitive advantages.
4. Define Unique Value Proposition as the brand communication strategy.

Adapting with Business Model Canvas, UCDC is divided into 9 fields. Start with the user-centered approach until summarizing the Unique Value Proposition. Those field are detailed in Table 1.

Table 1. UCDC Fields

Field	Name	Description
1	Business	Define Brand/Product name.
2	Users	Define the potential/targeted users
3	Problems	Define the problem and how the proposed app solve the problems
4	Motives	Define user motivation that is willing to use the proposed app.
5	Fears	Define user fears that would not use the proposed app.
6	Solutions	Define existing solution from field 3.
7	Alternatives	Define the possible alternative app/solution that might be chosen by users instead of the proposed app.
8	Competitive Advantage	Define the features or the characteristics that differentiate the proposed app and competitors
9	Unique Value Proposition	Define the phrase that describes the value of the proposed app.

2.2. Cloud application and Supportive Tool Extended Features

As part of this research, we developed extended features that will be used by students to collaborate designing the UX. For the collaboration, we use Cloud Application for the collaboration process. Figure 2 shows the cloud application (Google Spreadsheet).

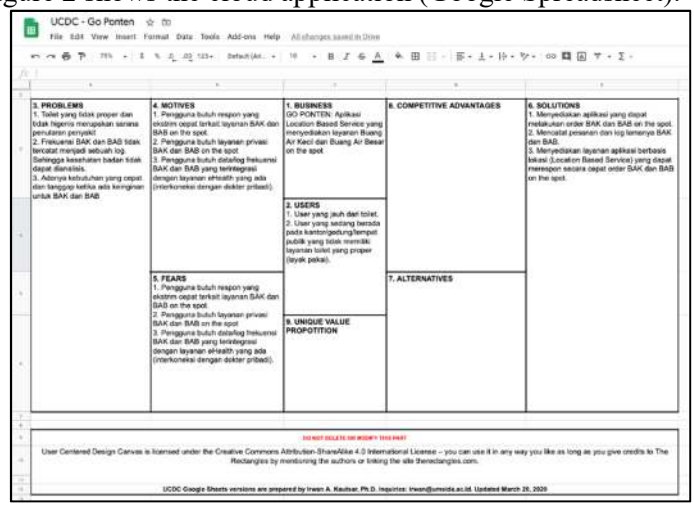

Figure 2. UCDC collaboration using cloud application

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After each group completes the UCDC template at Google Sheet, each group is requested to post the final results to our current development Supportive Tools [12]. Figure 3 shows the UCDC entry on the Supportive Tool.

2.3. User Responses

After explaining the use of UCDC at the beginning of the academic semester, Students have been given the assignment to develop some apps that might be needed by higher education students. Also, Students were requested to design the user experience of the proposed app using UCDC. We conduct questionnaires about the use of UCDC in several classrooms that consist of 168 students as participants. The aim of the questionnaire was: #1) to determine the effectiveness of the proposed method for rapid prototyping, and #2) to evaluate our current development supportive tools. The students as participants vary from 1st until 4th year bachelor degree.

3. Results and Discussions

This section will briefly discuss the questionnaire result about the use of UCDC for rapid prototyping.

3.1. Results

Before using or learning UCDC, all participants have been requested to fill the designated questionnaire. Table 2 shows the questions for the questionnaire.

Table 2. Questionnaire for participants

Questions	Response and Percentage (%)
Have students ever created software?	Yes (98), No(2)
Are students familiar with some prototyping tools?	Yes (82), No(18)

Are students familiar with some UX specifically prototyping tools?	Yes (74) , No(36)
Do students ever design UX generally?	Yes (12) , No(88)
Do student ever learn or use UCDC?	Yes (6), No (94)

Next, Likert scale had been used to measure the perception from all participants about the use of UCDC for their prototyping process with following formulas *[13], [14]*:

$$P = \frac{N\ x\ R}{I} x\ 100\%$$

Where:
P = The percentage value each questions
N = The value of each answer at each instruments
R = Answered Value Frequency
I = The highest answered value multiplied with number of participant (5 x 168 = 840)

The user perception results are shown in Table 3.

Table 3. Beta testing of the proposed method

Questions	Percentage (%)
Is the UCDC easy to use?	81.5
Is the use of UCDC way more reasonable to define the UX Problems?	77.4
Does it help define the bussioness value propotition ?	82.1
Does it help define the problem solving?	79.8
Would students like to use UCDC for their next project?	88.1
Is UCDC Does it help rapid prototyping?	79.2
Is the cloud application and supportive tool helps collaboration in online conditions?	82.7
Is the UCDC Instruction given easy to follow?	83.9
Average Percentage	81.3

Next, we record the accomplished time each group (from 168 students formed into 48 groups) for how long it takes to finish each field in the UCDC. We had categorized each groups into 3 conditions. Which are less than 5 minutes, 5 to 10 minutes, and more than 5 minutes. The result are shown in Figure 4.

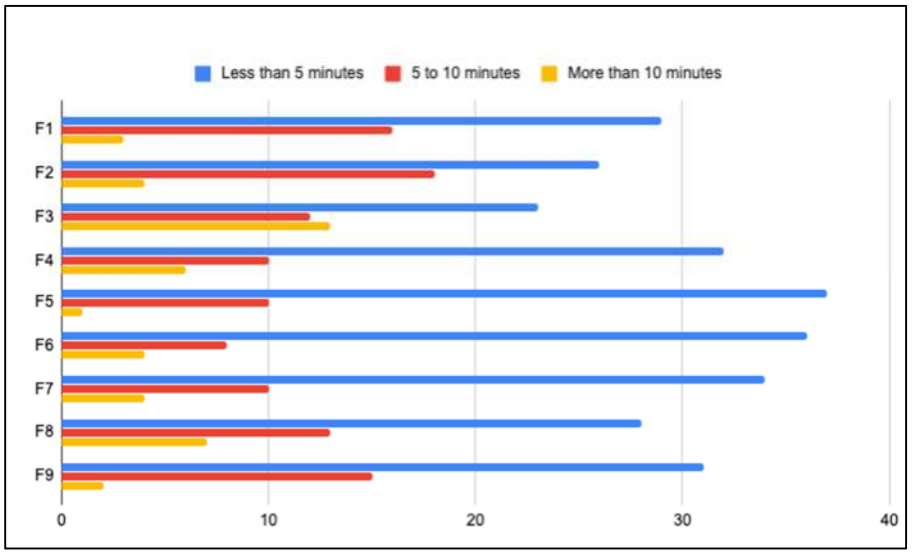

Figure 4. Accomplished Time The use of UCDC

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Based on acceptance result, UCDC helps student to do rapidly prototyping. Furthermore, the use of existing cloud applications and supportive tools enable students to do collaboration in online condition. This learning models are suitable in pandemic crisis. Which physical distancing are needed. From this point of view, the use UCDC is way more practical to transform idea into real application. As part of the learning process, collaboration among each group member that had been conducted in fully online condition will create new culture of creative process as positive affect when pandemic happened.

4. Conclusions and Future Works

User Centered Design Canvas (UCDC) helps do more rapidly at prototyping and define more in depth understanding about the basic need while designing User Experiences. Also, the use of cloud application and supportive tools enable collaboration among students that implement distance learning while at pandemic era. For future works, it needs to study to integrate the UCDC (for design UX) with other prototyping tools for UI design.

References

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The use of User-centered Design Canvas for Rapid Prototyping

The use of User-centered Design Canvas for Rapid Prototyping

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[2]Program Studi Perbankan Syariah, Fakultas Agama Islam, Universitas Muhammadiyah Sidoarjo

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Abstract. This paper presents the use of User-Centered Design Canvas to help students design the user experience (UX) on the designated Collaborative Projects. The Collaborative Project itself has been conducted by students with multi-discipline backgrounds. The User-Centered design itself was widely used as an approach to software development in order to achieve better alignment between the user experience and the business goal. Adopting Business Model Canvas, the User-Centered Design Canvas was introduced as an acceleration tool for rapid prototyping and ensures the effectiveness and efficient manner for the sake of user satisfaction. As the results from the questionnaire, more than 78% of users express the benefits of the current adaptation of User-Centered Design Canvas. Also from the Log Metric Analysis, users2 have completed a designated task under 5 minutes with minimum repetition. This indicates that the use of proposed adaptation is easy to use and shows the effectiveness of the User-Centered Design Canvas for rapid prototyping.

1. Introduction

In the year of Covid-19 pandemic in Indonesia, distance learning is a most suitable learning model for implementing a social distance and a self-quarantine [1], [2]. On other hand, Prototyping is one of the software development stages that deliver the early product [3]–[5]. For learning experience, prototyping is the most suitable option to give students to help implement their idea [6], [7]. Prototyping in software development is needed to know if the problem was visible to solve technically or not [8], [9]. Moreover, prototyping in the development of user interaction (UI) and user experience (UX). In this paper, we briefly discuss the use of User Centered Design Canvas to help students to explore, plan and develop the user experience with proposed ideas. Also, how to implement the prototyping process using User Centered Design among students while conducting distance learning.

2. Proposed Method

In this paper we propose the use of User Centered Design Canvas to helps student develop the user experience in their developed application as course assignment. Also we developed and extra feature from our developed supportive tool to help students adapt the User Centered Design Canvas while implementing distance learning. The proposed method is illustrated in Figure 1.

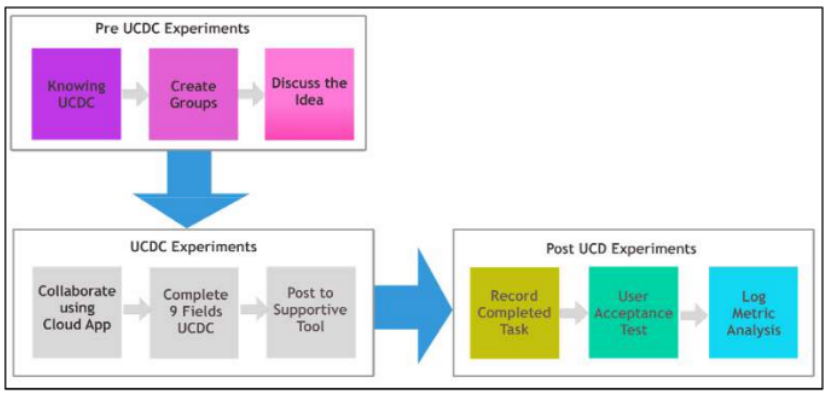

Figure 1. UCDC Experiments Method

2.1. User Centered Design Canvas

User Centered Design Canvas is a framework that is inspired from Business Model Canvas [10]. Therefore, it was claimed the UX Tool combining user needs with the business goals [11]. By using UCDC, it will help UX designer to:

1. Understand the targeted user and market needs.
2. Make a definition of product/market fit.
3. Aligning the business goal for the competitive advantages.
4. Define Unique Value Proposition as the brand communication strategy.

Adapting with Business Model Canvas, UCDC is divided into 9 fields. Start with the user-centered approach until summarizing the Unique Value Proposition. Those field are detailed in Table 1.

Table 1. UCDC Fields

Field	Name	Description
1	Business	Define Brand/Product name.
2	Users	Define the potential/targeted users
3	Problems	Define the problem and how the proposed app solve the problems
4	Motives	Define user motivation that is willing to use the proposed app.
5	Fears	Define user fears that would not use the proposed app.
6	Solutions	Define existing solution from field 3.
7	Alternatives	Define the possible alternative app/solution that might be chosen by users instead of the proposed app.
8	Competitive Advantage	Define the features or the characteristics that differentiate the proposed app and competitors
9	Unique Value Proposition	Define the phrase that describes the value of the proposed app.

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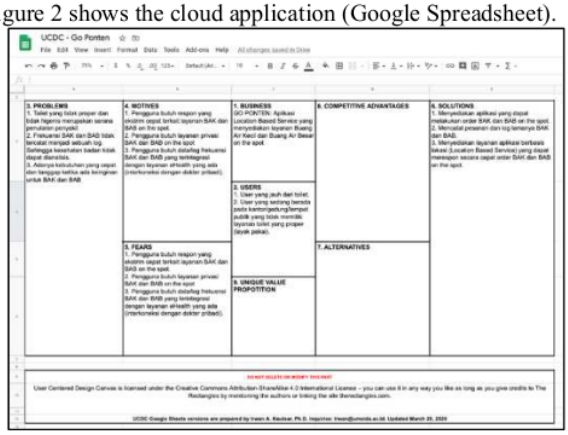

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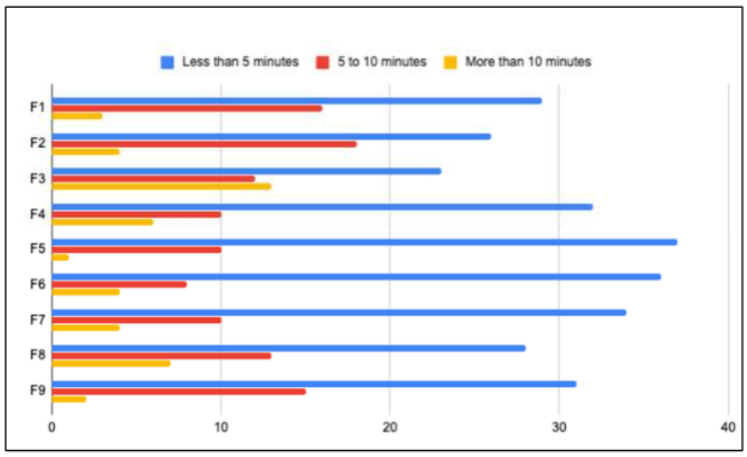

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Total = 100%	**30**			**28,7**
Nilai Pengusul (Penulis Utama) 60%				**17,2**

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2. Tentang ruang lingkup & kedalaman pembahasan:
Pembahasan User Design Canvas cukup dalam

3. Kecukupan dan kemutakhiran data/informasi serta metodologi:
Implementasi Rapid Prototyping cukup informatif dan mutakhir

4. Kelengkapan unsur dan sistematika penulisan:
Memenuhi unsur IMRAD dan ditulis secara sistematis

5. Indikasi plagiasi:
Tidak terindikasi plagiasi. Simlaritas: 16%

6. Kesesuaian bidang ilmu:
Sesuai kepakaran pengusul

Sidoarjo, November 2022
Reviewer 2

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