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# iRUBWAT: A DISASTER PREPAREDNESS MOBILE APPLICATION

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***Abstract*: Disaster preparedness and risk reduction is one of the critical areas that must be consider in today's changing era because of the climate change. In the recent years, many people have died because of unpreparedness to different disasters and risks particularly related to calamities like typhoon and earthquake. In the Philippines, typhoon is one of the calamities that takes many lives, yearly. One of the main reasons was the lack of the necessary knowledge to reduce the risks and to equip oneself on what to do before, during, and after a calamity. This study focused on developing a mobile application that provides information about disaster and risk reduction which was called *iRubwat* – an Ilocano term for *preparation.* The study utilized a mixed method of quantitative and qualitative research and clustered-sampling was the sampling technique used. The development of the mobile application was based on the phases of the Spiral Model which include Planning Phase, Risk Analysis Phase, Engineering Phase, and Evaluation Phase.**

**The assessment on the technical quality of iRubwat was based on the following criteria: Usability, Effectiveness, Efficiency, Accessibility, and Assistive Technology. On the other hand, the assessment on the quality of using the mobile application was based on the following criteria: Perceived usefulness of the application, Perceived ease of using the application, and the Intention of the users to use the application. Results showed that the technical qualities of iRubwat was proven to possess a high quality based on the assessment made by the Information Technology (IT) professionals and IT students. Also, in terms of the quality of using it, the respondents viewed it as an acceptable tool to provide aid in disaster prepared and risk reduction. Overall, iRubwat was proven to be beneficial and acceptable based on the assessment made.**

***Keywords*: Disaster Preparedness and Risk Reduction Application, Mobile Learning Application, Spiral Model**

## I. INTRODUCTION

Climate change has greatly affected the lives of every human being all over the world. The vast impact of this phenomenon has made a change in the global and regional climate patterns, thus affecting how people live in the 21st century. Evidences has been witnessed throughout the years, and major effects in the natural systems, "threatening environment, social, and economic development" has been observed (IPCC, 2007;

IPCC, 2014). Significant changes happened in the global temperature, wind patterns, and others which occurred decades ago. The National Aeronautic Space Administration (NASA) explained the difference between climate and weather. NASA describes weather as the changes people feel and see outside from a day-to-day basis. On the other hand, the climate is the usual weather in a place. It can be different for different seasons. Basically, a place can be most likely to be warm and dry in the summer, while cool and wet in the winter. Furthermore, a climate may vary from places, and that a country's climate differs from the other due to some factors including the Earth's Climate. The Earth's Climate is the combined climate around the world. (NASA Knows, 2014)

Over the years, the impact of climate change has affected the ways Filipino live. In the last decade, the country has experienced the deadliest typhoons which have caused extreme difficulty and have taken the lives of many Filipinos. Climaterealityproject.org in 2016 have reported that five out of 10 deadliest typhoons hit the Philippines since 2006. *Haiyan, Thelma, Ike, Fengshen, Washi, Durian, Bopha, Trix, Amy,* and *Nina* are the ten deadliest typhoons of the Philippines between 1947 and 2014. The report have also stressed the fact that five out of the ten deadliest typhoons hit the Philippines since 2006. It is an alarming situation as one of the effects of climate change.

Researches have been highlighting that climate change greatly affects the lives of not only Filipinos, but of everyone around the world. Knez, I., Thorsson, S. and Eliasson, I., (2013) reported that among the different group of people involved in the study conducted, group of experts were shown to be the least concerned for and afraid of climate change impact, the youngest participants were found to be the most and the oldest group to be the least concerned for and afraid of the impact of climate change. In the Philippines, the lives of the younger generation have been affected by different calamities and disasters. The National Economic Development Authority (NEDA) has reported that natural disasters significantly affected crops and livestock resulted to severe loss in agricultural production

including human lives (NEDA, 2015) Because of this, due to climate change, the economy of the country can be at risk. Aside from the mentioned effects in the agricultural sector, human lives can also be the main victim of natural disasters, be it extreme difficulty and hardships in the way human life or even death. To mitigate the huge negative impact of climate change in the country, in 2011, the government have developed a dedicated agency that is be committed to helping the Filipinos to lessen the damages caused by different natural disasters.

The Republic Act 10121 is an act which aims to strengthen the Philippine Disaster Risk Reduction and Management System by providing the national disaster risk reduction and management framework and institutionalizing the national disaster risk reduction and management plan with corresponding funds to support the government thrust in protecting the lives of every Filipino. Under the law, the government has more focus in giving the public the necessary information, support, and service in relation to disaster management (i.e typhoon, earthquake) (RA No. 10121, 2010)

Disaster management was the most critical plan that everyone needs to know and should be revisited regularly to ensure complete understanding within the organization (Ferry, 2017). By continuously revisiting the disaster management plan, a huge negative impact can be lessened, if not avoided.

As mentioned, Haiyan (Yolanda) was one of the deadliest typhoons ever entered in the Philippine Area of Responsibility which has caused extreme damage in the country. Yolanda was one of the most disturbing typhoons that came to the country. Yolanda left 6,340 casualties and 1,058 missing and almost $3.0 billion in damage (Luz, 2017). According to the different news agencies, local government officials have been giving advisories to local officials, however, the lack of proper disaster reduction management caused great damage and impact during that time (Luz, 2017). It was also notable that people were not aware of the proper things that must be done when disaster strikes. In the simplest form possible to describe, people during those days' lack of information. Information that could have saved lives. Information that could have help lessened the negative effects of an expected disaster, like typhoon Yolanda.

If people were prepared, causalities may have been smaller. Conceptually, preparedness means the quality or state of being ready or aware of an expected situation or scenario. It is being ready in any situation. Different activities can be done with disaster preparedness. Different Local Government Unit and Agencies have performed drills to different places including public places for information dissemination and at school. A drill is the approved, correct, or usual procedure for accomplishing something. If people have the proper knowledge of what procedure they will do in time of a disaster, it will have a great impact to save lives and to mitigate the number casualties and injuries. Through preparation, one can easily respond to different situations under pressure and with more focus. In disasters, one cannot save other if not familiar to different must-know in relation to disaster response activities. Another reason why preparation is important is because it makes one understand easily what is needed to be done. Basically, to respond properly, one needs to understand the situation first. Assessing and understanding the situation could lead to a more meaningful and correct response to a situation. Lastly, by preparing, the weaknesses and strengths can be easily identified. It is in preparation that one can acknowledge what is lacking and what is needed to be improved. In times of disasters, it is important to prepare. It is in line with the famous dictum, "fail to prepare is preparing to fail". When it comes to a disaster, preparedness is the main key to mitigate the number of casualties and injuries. It is in preparation that people will be able to cut the negative impact of a disaster like a typhoon.

Nowadays, technology has provided people with lots of benefits and advantages. These advancements in technology can cause new innovations. In relation to disaster preparedness, the use of technology can be used to lessen the negative impact of a disaster, thus the proponents of this study would like to focus on the mentioned aspect. Information Technology gives a lot of advantages in the community, thus in this project, the proponents attempted to developed a disaster preparedness application. This application focused on the dissemination of vital information, and measures to aid communities to lessen the negative impact and effects when disaster strikes. Information like things to do before, during and after a calamity and emergency contact information when disaster happens are included in the application. This application was called *iRubwat*. Rubwat is an Ilocano term for preparation.

This application was named after an Ilocano term because the proponents of this study were located in Central Luzon, and Ilocano is one of the major dialects being spoken in the area, thus it makes the application unique to name it after an Ilocano term.

### *A. Research Objectives*

This study aimed to develop an application called iRubwat, a disaster preparedness application. Specifically, it sought to describe the following:

1. The activities undertaken based on the following phases of the Spiral Model:
    a. Planning Phase;
    b. Risk Analysis Phase;
    c. Engineering Phase;
    d. Evaluation Phase;
2. Assessment on the technical qualities of the developed application based on the following software quality criteria:
    a. Usability;
    b. Effectiveness;
    c. Efficiency;
    d. Accessibility;
    e. Assistive Technology;
3. Evaluation on the quality of using the application based on the following criteria:

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a. Perceived usefulness of the application;
b. Perceived ease of use;
c. Intention of the user to use the application;

## II. METHODOLOGY

The study utilized a mixed method research, covering quantitative and qualitative approaches. The qualitative approach focus on describing the activities undertaken by the researcher to developed the application, while the quantitative approach covers the assessment done to evaluate the technical quality and the quality of use of the developed application. Using purposive sampling, total number of 30 respondents composed of 10 residents, 5 barangay chairperson, 5 Information Technology students, 5 IT professionals, and 5 Municipal Disaster and Risk Reduction Personnel participated in this study

### *A. Research Instrument*

Two sets of instruments were used in this study. The first instrument was used to assess the technical quality of the application by the IT professionals and the IT students, while the other instrument was used to assess the quality of using the application by the prospective end-users composed of residents, barangay officials, and municipal disaster and risk reduction personnel.

The items in the questionnaire were answered using a five-point likert scale with the following description: 5 - Excellent, 4 -Very Good, 3 – Good, 2 - Fair, 1 – Poor. The instruments were administered to the respondents after the application was developed.

### *B. Procedure of the Study*

The study underwent two stages: the development stage and the assessment stage. In the development stage, the researchers used the Spiral Model as a basis for developing the application. Software models contribute to the over-all success of a project, thus it is important to consider utilizing a model as a guide in developing an application (Pericherla, 2013). The phases of the Spiral Model in this study includes Planning, Risk Analysis, Engineering, and Evaluation Phase.

The assessment phase of the application covered the evaluation on the technical qualities and the quality of using the application. In this phase, the researchers allowed the respondents to use the application to check its features and to gather additional comments and feedback which were used to enhance the application.

The assessment of the application made by the respondents were analyzed using a rubric as scoring guide. The mean rating was the basis in giving the qualitative rating. High mean rating means that the application possess positive quality, while low mean rating implied negative or poor characteristics.

The rubric that was used to assess the application is shown in Table 1.

Table 1. iRubwat: A Disaster Preparedness Application Rubric

| Numeral Rating | Verbal Description |
|---|---|
| 4.20 – 5.00 | Excellent |
| 3.40 – 4.19 | Very Good |
| 2.60 – 3.39 | Good |
| 1.80 – 2.59 | Fair |
| 1.00 – 1.79 | Poor |

## III. RESULTS AND DISCUSSION

### *1) The activities undertaken based on the following phases of the Spiral Model*

The application underwent the following phases of the Spiral Model.

#### *Planning Phase*

The main objective of this phase was to create a solid foundation plan for the development of the application. The researchers identified how the application was developed, the scope and how it would worked. Requirements are gathered during this phase to fully understand how to develop the application. In this phase, the researchers came up with Gantt chart to serve as a guide in developing the application. Gantt chart is an effective tool in software and application development projects to identify the activities, tasks or events, with corresponding intended time and date to complete and finish the activities

#### *Risk Analysis Phase*

This phase of the Spiral Model guided the researchers to analyze the potential risks and the possible alternatives to different problems that may occur relating to the developed application. WhatIs.com (2018) defined risk analysis as the "process of identifying and analyzing potential issues that could negatively impact key business initiatives or critical projects in order to help organizations avoid or mitigate those risks". In this phase, the researchers developed a Use-Case diagram to identify the roles of the different actors to different processes. Also, flow chart was constructed to see how the processes of the application went on. This guided the researches to modify features and identify the possible problems that may occur in the application.

#### *Engineering Phase*

The actual development of the application based on the gathered requirements, and the results of the previous phases of the Spiral Model was done in this phase. The developed application was constructed using Node.js which supports Javascipt programming language. This is done in the Visual Studio Integrated Development Environment. A Graphical User Interface (GUI) "enables a person to communicate with a computer through the use of symbols, visual metaphors, and pointing devices" (Levy, S., 2019). The researchers build a user-friendly graphical user environment for the application because it is important that the users are satisfied and comfortable using the application to ensure high quality of acceptance and use.

To ensure quality, the application underwent testing activities. Different testing techniques was done such as Exploratory Testing, Graphical User Interface Testing, and Usability Testing. Exploratory Testing enabled the researchers to explore the application and to look for defects that exists. It is an informal testing technique performed to know the possible

defects of the application. The researchers also conducted Graphical User Interface Testing to validate the GUI as per the objective of developing the application. Lastly, Usability Testing was conducted to check if the users can easily understand the application or not.

These activities are done in the Engineering phase of the Spiral Model. The researchers were able to develop the application using the activities mentioned above.

*Evaluation Phase*

The evaluation phase of the Spiral Model allowed the researchers to conduct an assessment to the respondents to check the technical qualities and the quality of using the application. The results of the evaluation phase were the basis for enhancement and improvement of the application.

*2) The Assessment on the Technical Qualities of the Developed Application by IT Professionals and IT Students*

Table 2 shows the result of the assessment made by the IT professionals and IT students on the technical qualities of the application. Application characteristics which include usability, effectiveness, efficiency, accessibility and assistive technology are the criteria used in assessing the application.

Table 2: Summary of the assessment made by IT Professional and IT Students on the technical qualities of the application

| **Criteria** | **Mean Rating** | **Verbal Description** |
|---|---|---|
| Usability | 3.93 | Very Good |
| Effectiveness | 3.97 | Very Good |
| Efficiency | 4.03 | Very Good |
| Accessibility | 3.84 | Very Good |
| Assistive Technology | 3.95 | Very Good |
| **Over-All Grand Mean** | **3.94** | **Very Good** |

Usability is the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context to use" (ISO 9241-11). Results on the technical quality assessment made by the IT Professionals and IT students suggest that the developed application possessed a "Very Good" ($\mu = 3.93$) quality in terms of Usability. Further, the respondents observed that the user-friendly environment adds to the overall usability trait of the application. It was also noted that the IT Professionals and IT Students perceived that the application was easy to use and pleasing to the eyes of the users. Coombs, S. (2000) suggests that a better user-friendly environment aids in an easier way to understand and learn how an application works, thus it is important to develop a high-quality graphical user interface to enhance the usability of an application. To develop a high-quality GUI, developers must consider that the interface must be simple, clean, intuitive, and reliable (Christensson, P., 2014).

In terms of effectiveness, the IT professionals and IT students rated the application with a mean rating of 3.97, with a verbal rating of "Very Good". Effectiveness is the capability of the application to accurately and completely achieve a particular specified goals in which an application is expected to perform or produce in a specified context (ISO 9241-11). The developed application was perceived to be effective by the IT professionals and IT students based on the assessment made. Specifically, the respondents observed that the application has the ability to inform the users about disaster preparedness through modules with necessary information that would help residents to become fully aware and informed. Also, the respondents understood that the application has the capability to educate the respondents with the proper information on what to do before, during, and after a disaster. Lastly, the application has the capacity to communicate and convey necessary records and information about disaster reduction and preparedness such as emergency contact information, details about how to seek help to authorities and emergency response information. It is necessary for applications to be an effective tool producing the necessary output, and that the application produce the required information. This is supported by Guinness (2018) by asserting that effectiveness is all about "doing the right tasks regardless of the time it takes".

On the other hand, efficiency talks about the "resources expended in relation to the accuracy and completeness of goals achieved" (ISO 9241-11). The application was rated "Very Good" ($\mu = 4.03$) by the IT Professionals and IT Students because they viewed the application as an efficient means to inform the residents about disaster risk reduction and information drive campaign. The application was able to produce the information about disaster preparedness through a module about disaster reduction. Also, the application was able to respond according to the user's requests (e.g providing information on what to do before, during, and after a calamity like a typhoon). Lastly, the application has the ability to withstand the duration of use in performing its functions. However, it was observed that the application must be continuously enhanced and developed further to achieve a higher degree of quality in relation to efficiency.

Accessibility is the ability of the application to accommodate different types of users, with different conditions. In the developed application, the accessibility feature was achieved in terms of developing interfaces that can easily adopt to changing platform or environment (e.g web browsers view, mobile view). Usually, accessibility covers hardware and software features which accommodates specific persons or simple an accessory to help individuals with special or different conditions (Christensson, P., 2007). The developed application achieved a "Very Good" rating because the respondents viewed it as an application that has an ability to be executed in different platforms, ability to accommodate different types of users, and the ability to be used in different types of working environment. As a recommendation in terms of accessibility, it was suggested that the application should be further enhanced and developed so that the accessibility feature will cover wider range of users with different needs.

The Assistive Technology was a separate criteria to assess how the application possess features that can accommodate people with learning disabilities. Specifically, it covered features in relation to learning and understanding the

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information being provided in the application. In general, the application was rated with a mean rating of 3.95, corresponding to a verbal interpretation of "Very Good". This means that the application possess features to support learning disabilities, like adaptive GUI and clear text and graphics. However, the respondents viewed the assistive technology characteristics needing additional improvement and further enhancement so that users can be assisted and guided properly.

In general, the software criteria set to assess the technical quality of the developed application garnered an overall weighted mean of 3.94, with a verbal rating of "Very Good". This result implies that the application can provide the needed information, can serve its purpose, and can be used to inform residents about the necessary information regarding disaster preparedness. However, the result also show that the application needs continuous quality improvement in terms of its technicalities and further development must take place to achieve a higher level of quality.

*3) The assessment on the quality of using the application by the respondents*

Table 3 shows the summary of the assessment made by the respondents on the quality of using the application.

| Criteria | Mean Rating | Verbal Description |
|---|---|---|
| Perceived usefulness of the application | 4.01 | Very Good |
| Perceived ease of using the application | 4.25 | Excellent |
| Intention of the users to use the application | 4.36 | Excellent |
| **Over-All Grand Mean** | **4.22** | **Excellent** |

The perceived usefulness was based on how the users see an application aid them in performing different processes or operations. This idea was from Davis (1989) stating that usefulness is "the degree to which a person believes that using a particular system would enhance his or her job". On the assessment made, the respondents perceived that the application has the capability to inform the people about disaster preparedness, what to do before, during, and after the disaster, and the essential information needed to prevent and lessen the negative impact of disasters. It was also noted that the respondents viewed the application having the capability to retrieve information easily. Also, in terms of looking for necessary information, the application was able to aid the users to save time in looking for contact information relating to disaster response. On the other end, while the over-all mean rating of the perceived usefulness of the application was 4.01, with a verbal rating of very good, it is suggested that the application be continuously enhanced to further develop and refine its features so that the usefulness of the application will be maximized.

The perception in terms of the ease of using the application was defined by Davis (1989) as "the degree to which a person believes that using a particular system would be free from effort". The developed application aims to provide an easier means to look for necessary information related to disaster preparedness. As a result of the assessment made by the respondents, the application got a mean rating of 4.25 with a mean rating of "excellent". This means that the application was perceived by the respondents to have a high quality in terms of its ease of use. The respondents observed that the application can be easily learned, it possessed features that has clear instructions and easy to understand, and the application has flexible features, thus the ease of using the application was excellent. On the other hand, even if the application got an "excellent" rating, it was still suggested, based from the feedback of the users to be improved and enhanced further. It was important that the application is continuously developed to achieve a better performance and quality.

The last criteria in assessing the ease of using the application focused on the intention of the users to use the application. The intention of using the application was the belief that the users considered to use the application to aid them in different operations and processes. The assessment got a mean rating of 4.36 with a verbal description of "excellent". This implies that the users has positive view on the intention to use the application. More specifically, the users thought that the application has the features that made them feel satisfied, comfortable, and informed.

Over-all, the assessment made by the respondents on the quality of using the application got a mean rating of 4.22 with a verbal description of "excellent". This result implies that the application was viewed to be beneficial and acceptable for the users. The assessment on the quality of using the application allowed the researcher to see the possible improvements that can still be done in the application for further enhancement.

## IV. CONCLUSION

Based on the results of the analysis on the activities undertaken by the researchers to develop the application named *iRubwat*, and the assessment on the technical quality and the quality of using the application, the following conclusions are drawn:

1. The application was developed following the phases of the Spiral Model which include Planning Phase, Risk Analysis Phase, Engineering Phase, and Evaluation Phase;
2. The *iRubwat* used different application development tools and diagrams which guided the researchers to develop the application. These tools and diagrams were essential to successfully carried out the development phase;
3. The developed application was assessed based on the technical qualities by the selected IT professionals and IT students which include Usability, Effectiveness, Efficiency, Accessibility, and Assistive Technology;
4. The application was also assessed by the selected respondents in terms of the quality of using it based the

respondents perception on usefulness, ease of use and the intention to use the application.

5. The application was proven to possessed acceptable technical qualities and can provide benefits for the respondents in terms of learning about disaster preparedness and reduction

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## VI. REFERENCES

[1] IPCC. (2007). "*Climate Change 2007. The Physical Science Basis. Contributing of Working Group I.*" In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquiz, M., Averyt, K.B., Tignor, M. and Miller, H.L., Eds., The Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, 296.

[2] IPCC. (2014). "*Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*", Cambridge University Press, Cambridge, United Kingdom and New York, NY, 1173.

[3] May, S. (2017). *"What is Climate Change?"* Retrieved from https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html

[4] Climaterealityproject.org (2016). *"How is climate change affecting the Philippines?"* Retrieved from https://www.climaterealityproject.org/blog/how-climate-change-affecting-philippines

[5] Knez, I., Thorsson, S. and Eliasson, I., (2013) "*Climate Change: Concerns, Beliefs and Emotions in Residents, Experts, Decision Makers, Tourists, and Tourist Industry*," American Journal of Climate Change, Vol. 2 No. 4, 2013, pp. 254-269. doi: 10.4236/ajcc.2013.24025.

[6] NEDA (2015). *"Addressing the Impacts of Climate Change in the Philippine Agricultural Sector"*. Retrieved from http://www.neda.gov.ph/addressing-impacts-climate-change-philippine-agriculture-sector/

[7] RA No. 10121 (2010). *"Philippine Disaster Risk Reduction and Management Act of 2010"* Retrieved from https://www.lawphil.net/statutes/repacts/ra2010/ra_10121_2010.html

[8] Ferry, A. (2017). *"The Importance of Being Prepared Before a Disaster Strikes".* Galaxy Digital. Retrieved from https://medium.com/galaxy-digital/the-importance-of-being-prepared-before-a-disaster-strikes-75c55b69267

[9] Luz, G. (2017). "*Why disaster preparedness is important*". Inquirer.Net. Retrieved from https://opinion.inquirer.net/104497/disaster-preparedness-important

[10] Pericherla, S. (2013). "*Importance of Modeling*". Retrieved at https://www.startertutorials.com/uml/importance-of-modeling.html

[11] WhatIs.Com (2018). "*Risk Analysis*". Retrieved at https://searchsecurity.techtarget.com/definition/risk-analysis

[12] Levy, S. (2018). "*Graphical User Interface*". Encyclopedia Britannica, Inc., at https://britannica.com/technology/graphical-user-interface

[13] ISO 9241-11 (2002). "*Usability Definition*". Retrieved at https://www.w3.org/2002/Talks/0104-usabilityprocess/slide3-0.html

[14] Coombs, S. (2000). "*The Psychology of User-Friendliness: The use of Information Technology as a Reflective Learning Medium*". Korean Journal of Thinking & Problem Solving Vol.10, no.2 2000 pp19-31

[15] Christensson, P. (2014). "*User-Friendly Definition"*. Retrieved 2019, Oct 30, from https://techterms.com

[16] Guinness, H. (2018). *"Effectiveness vs. Efficiency: Which is more important (+why)?"* Retrieved from https://business.tutsplus.com/tutorials/effectiveness-vs-efficiency-which-is-more-important--cms-32037

[17] Christensson, P. (2017). "*Accessibility Definition.*" Retrieved 2019, Nov 6, from https://techterms.com

[18] Davis, F. D (1989*). "Perceived usefullness, perceived ease of use, and user accpetance of information technology"*. MIS Quarterly, 13 (3): 319-340, doi:10.2307/249008, JSTOR 249008

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