# Hybrid Method for Mobile learning Cooperative: Study of Timor Leste

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**Abstract.** In the modern world today the decision support system is very useful to help in solving a problem, so this study discusses the learning process of savings and loan cooperatives in Timor Leste. The purpose of the observation is that the people of Timor Leste are still in the process of learning the use DSS for good saving and loan cooperative process. Based on existing research on the Timor Leste community on credit cooperatives, a mobile application will be built that will help the cooperative learning process in East Timorese society. The methods used for decision making are AHP (Analytical Hierarchy Process) and SAW (simple additive Weighting) method to see the result of each criterion and the weight of the value. The result of this research is mobile leaning cooperative in decision support system by using SAW and AHP method. Originality Value: Changed the two methods of mobile application development using AHP and SAW methods to help the decision support system process of a savings and credit cooperative in Timor Leste.

## 1 Introduction

In today's modern world, cooperatives are well-known in various countries, with the aim of helping to process fast and good savings and loans. As we have seen, cooperatives are an organization that has a business owned and operated by a person for the sake of the common good. Seeing that the people of Timor Leste have not understood well the process of a cooperative system with good savings and loans, the community still lends money and interest with manual processes without good administrative processes [1].

Community activities in Timor Leste's country in credit unions were not well understood by the newly independent Timor-Leste state in 2002, and the lending process that existed to the community was still through a manual process, and without going through better processes, resulting in a lack of community understanding Timor Leste in the use of cooperatives. So in this study, the author uses the merger of two methods such as SAW and AHP in the calculation process to get a decision on who will get the loan in the cooperative and cooperative learning contained in the mobile application [2]. Already we know that credit cooperatives are non-bank groups in various developed countries and together with the fact that credit cooperatives are an important part of the financial system in Timor Leste [3].

Based on an analysis of the simplified savings and loan cooperative business activities in Timor Leste, this research is how to change the understanding of the people of Timor Leste in the learning process of financial cooperatives with a credit decision support system with the help of combining methods such as

SAW and AHP to decide a person Can receive loans in the cooperative [4][5][6]. Movement of cooperative learning changes from applications that will be run from the merger methods SAW and AHP is one of the means for the community can be well understood process of learning good savings and loan cooperatives. In this study the author also uses decision support system to decide who will receive the loan.

The results of the decision of this WEB application will help the process of inputting data of new cooperative members, and the results of its decisions through mobile applications in which in the form of information transactions and cooperative learning. Learning is an aid provided by educators to occur the process of acquiring knowledge and knowledge and mastery of skills and the formation of attitudes and beliefs in learners. In other words learning aims to help learners to learn well. So cooperative learning with mobile is assisted by decision support system using SAW and AHP method [7]. To make the learning process of credit cooperatives in Timor Leste, the results of the application using decision support system with SAW and AHP method, then the results of the calculation of both methods are included in web and mobile applications for cooperative learning process.

## 2 Literature Review

Previously there have been several studies conducted and cannot be separated from the results of earlier research from the topic of research on credit cooperatives:

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There are several studies that have been conducted to discuss the impact of computerization on the efficiency of cooperatives [8], Using learning analysis to make changes to credit cooperative knowledge and this study also shows that the application of technology such as computers that encourage the efficiency of credit cooperatives and see the results of the implementation of the important community and efficiency.

Research conducted by David P. Ely and Kenneth J. Robinson is the banking industry is the chance that credit union is engaged in the loan business related to the activity and demand for small business loans in the local market [9]. In developing countries credit cooperatives and credit cooperatives are thriving with laws and branched cooperatives, so in the same way as the country's advanced experience, research conducted by Ryland A. Taylor on the role to be played by Community responsibility to the rapid economic development of credit cooperatives [10].

In this paper, the credit learning system in the proposed multi-stage stage for credit risk evaluation issues according to Yu and others discusses that the results obtained show that the proposed learning model can give promising solutions to the problem of credit risk evaluation that multi-type learning techniques Which are proposed to be of great potential use in the application of problem classification and so forth [11]. Research conducted by Begoña Gutiérrez-Nieto, Carlos Serrano-Cinca which says that In a bank system, a microfinance institution or a particular credit cooperative provides socially responsible loans, it can present a credit score system and model check the social and financial aspects of the borrower as well The loan proceeds will be managed through a system that is very advanced and accessible anywhere through the system that has been made [12].

In learning to consider person and group credit, research conducted by Erin Carrol, Robert L. Williams's in 2010 discusses cooperative learning in a State to increasing academic engagement and achievement, any cooperative learning procedure may be a special incollegecourses Very importantly related in the same way [13].

The SAW (Simple additive weighting) and AHP (analytical hierarchy Process) methods in decision-making are very helpful for the process of calculating the weighting of the value of the cucumber in the results of the credit decision, then the research conducted by Rizka ella Setyani in 2016 and Seyit Ali Erdogan in 2017 Discusses the aid of the SAW method that can see the summation of the criteria and the greatest value for the crediting decision [14] [15].

In a study [16] conducted by Idris and Bunyamin in 2013 said that the need to learn mobile learning is increasingly important. Its use is very easy and access from mobile makes them more important than ever, this study has benefited greatly in expanding the mobile learning needs and meeting new learning conditions.

# 3 Theoretical Basis

## 3.1 Mobile app

Mobile app is a system of application development process for handheld devices like PDA, which is also a company's digital system or mobile phone. In this application system is located on the fellow phone manufacturing and then downloaded by customers from the application and distribution tools of a mobile software [17].

In a faster mobile app development system there is the idea that the speed of mobile devices is said to be fast or slow depending on the comparison of development efforts from other applications. By using mobile applications, people can do various activities that can help their work, because viewing from the results of 70% presentation by phone users, with the features of games, music player to video player. From the application system contained in the phone proves that the use of mobile applications easy to use anytime and anywhere.

## 3.2 Learning Credit Cooperative

Learning credit itself is a process that must be followed by the community with the aim for the good of society. From this the author will do research to see that the people of Timor Leste today still need cooperative learning to make a good savings and loan process. This Web and Mobile application was created to help the East Timorese community about the credit cooperative [18].

## 3.3 Decision Support System

Decision support systems are part of computer-based information systems used to support decision-making within an organization or company. In this study we discussed the calculations shown to represent the thinking processes of decision-making often occur with multi objective decision support tools, and these calculations most often use weighting factors for each want or goal to combine utility values into a scale to allow alternative rankings. And illustrate how the choice of weighting factors is meant to be of equal value or weight [19].

# 4 Methodology and Implementation

## 4.1 Method

This research will have a concept to understand the learning process of credit cooperative through credit decision support system by using SAW (Simple Additive Weighting) and AHP (Analytical Hierarchy Process) method with the result of mobile application process on lending information process and learning process that exist in the system The. At this stage it is necessary to build a system with collaborative learning concepts that can help the community with the help of SAW and AHP methods. Introduction to credit cooperative learning

system will be built in several stages in the form of Web system for cooperative and mobile cooperative part. In a study [20] [21] [22], which discusses that now this smartphone a good friend is preferred for users of the desktop or notebook because it sees that by using smartphones more easily understood and run by mobile users very well by the community especially in the learning process to be more effective? In a cooperative system only use the database on the web to input data cooperative members who make loans in the cooperative. The role of this system is how to introduce a mobile system that will be diverted to aid members of the cooperative process, which can be used by consumers to retrieve information about the cooperative's lending and learning. The system used with the aid of both methods in the information process of the mobile aims to find information from lending and cooperative learning.
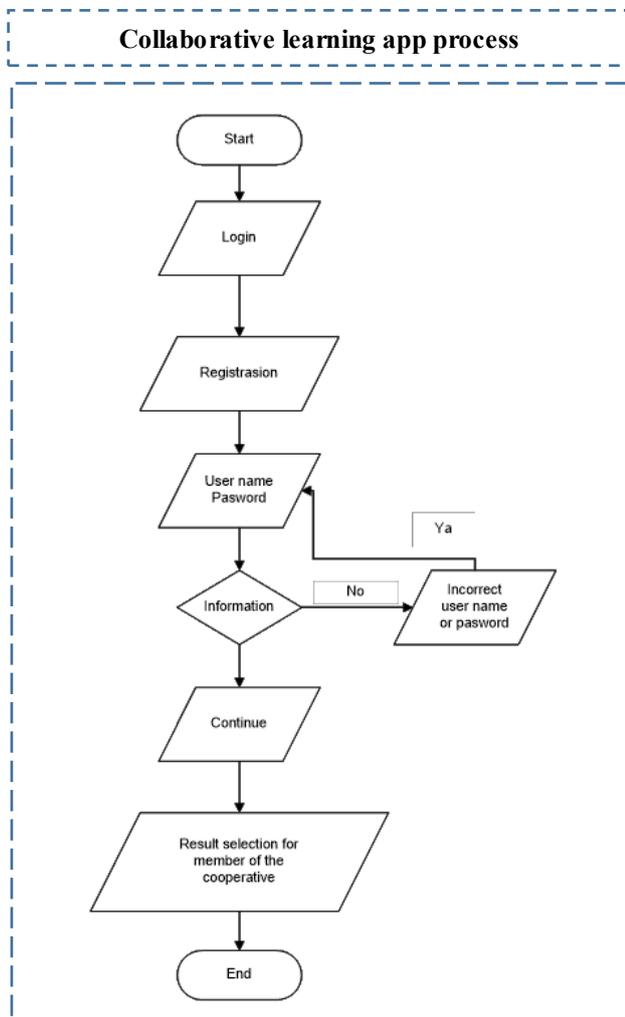


**Fig. 1.** Collaborative Learning app Process

The system used with the aid of both methods in the information process of the mobile aims to find information from lending and cooperative learning, so that consumers do lending (credit) but there is also cooperative credit learning as the best means of lending money and each consumer can use the calculation of existing methods on the system for decision-making of credit, and information that can be accessed through the

phone of each user To be able to see the results of transactional information and cooperative learning, and thus the system to be used for decision-making is proposed for a good cooperative learning process for East Timor people.

Originality Value: Changed the two methods of mobile application development using AHP and SAW methods to help the decision support system process of a savings and credit cooperative in Timor Leste.

### 4.1 Decision Support System

In the decision support system that use to run on the learning process is a member of the cooperative that can make money or not, then the credit decision support system using AHP (Analytical Hierarchy Process) and SAW (Simple Additive Weighting) which is also a method that can solve complex situation that unstructured, determines which variable has the highest priority to influence the outcome of the situation [23], And look for the sum of weighted ratings on each alternative across all attributes and must the process of normalizing the decision matrix to a Scale that is comparable to all existing alternative ratings [24] [25] [26]. To process the calculation can be done through the existing criteria.

$$CI = \frac{\lambda maks - n}{n - 1}$$

Information:
n = the number of criteria or sub criteria
CI = consistent Index
RI = Random Index

$$CR = \frac{CI}{RI}$$

*(AHP method)*

$$Vi = \sum_{j+1}^{n} (Wj_x r_{ij})$$

*(SAW methods)*

## 5 Results and Implementation

### 5.1 The process of calculating SAW and AHP methods

In this process will show how one can receive credit results from cooperatives in Timor Leste. In this case some people will apply for credit in a cooperative, and the results of the calculation will decide someone will first receive a credit loan.

**Table 1.** Warranty Criteria

| Warranty Ci | Value |
|---|---|
| $ 100.00 | 0.25 |
| $ 1000.00 | 0.5 |
| $ 2000.00 | 0.75 |
| $ 3000.00 | 1 |

**Table 2.** Loans Criteria

| Loans C2 | Value |
|---|---|
| $ 10.00 | 0.25 |
| $ 500.00 | 0.5 |
| $ 2000.00 | 0.75 |
| $ 5000.00 | 1 |

**Table 3.** Instalment Criteria

| Instalments C3 | Value |
|---|---|
| $ 10.00 | 0.25 |
| $ 50.00 | 0.5 |
| $ 150.00 | 0.75 |
| $ 300.00 | 1 |

**Table 4.** Timeframe criterion

| Time period C4 | Value |
|---|---|
| 3 Months | 0.25 |
| 12 Months | 0.5 |
| 24 Months | 0.75 |
| 30 Months | 1 |

**Table 5.** Age Criteria

| Age C4 | Value |
|---|---|
| > 15 years | 0.25 |
| > 20 years | 0.5 |
| > 30 years | 0.75 |
| > 40 years | 1 |

Example Calculation
There are data of cooperative members who will take credit.
**Francisco:**
Warranty = $ 1000.00
Loans = $ 400.00
Instalment = $ 40.00
Time Period = 10 Months
Age = 25 Years

**Efigenia:**
Warranty = $ 1500.00
Loans = $ 600.00
Instalment = $ 60.00
Time Period = 12 Months
Age = 30 Years

**Maria:**
Warranty = $ 2000.00
Loans = $ 500.00
Instalment = $ 400.00
Time Period = 15 Months
Age = 20 Years

In this process will (table 1 – table 5) show how one can receive credit results from cooperative in Timor Leste.

**Table 6.** Table of credit applicants

| alternative | Criteria | | | | |
|---|---|---|---|---|---|
| | C1 | C2 | C3 | C4 | C5 |
| Francisco | 0.25 | 0.25 | 0.25 | 0.25 | 0.5 |
| Efigenia | 0.25 | 0.5 | 0.5 | 0.25 | 0.5 |
| Maria | 0.25 | 0.25 | 0.25 | 0.5 | 0.25 |

Calculation
$V11 = 0.25/Max\{0.25;0.25;0.25\}= 0.25/0.25 =1$
$V12 = 0.25/Max\{0.25;0.5;0.25\} = 0.25/0.5=0.5$
$V13=0,25/Max\{0,25;0,5;0,25\} = 0,25/0,5 =0,5$
$V14=0,25/Max\{0,25;0,25;0, = 0,25/0,5 =0,25$
$V15=PP0,5/Max\{0,5:0,5;0,25\} = 0,5/0,5 =1$
$V21=0,25/Max\{0,25:0,25;0,25\} = 0,25/0,25 =1$
$V22=0,5/Max\{0,5:0,25;0,25\} = 0,5/0,25 =2$
$V23=0,5/Max\{0,25;0,5;0,25\} = 0,5/0,5 =1$
$V24=0,25/Max\{0,25;0,25;0,5\} = 0,25/0,5 =0,5$
$V25=0,5/Max\{0,5:0,5;0,25\} = 0,5/0,5 =1$
$V31=0,25/Max\{0,25:0,25;0,25\} = 0,25/0,25 =1$
$V32=0,25/Max\{0,25:0,5;0,25 = 0,25/0,5 =0,5$
$V33=0,25/Max\{0,25;0,5;0,25\} = 0,25/0,5 =0,5$
$V34=0,5/Max\{0,25;0,25;0,5\} = 0,5/0,5 =1$
$V35=0,25/Max\{0,5:0,5;0,25\} = 0,25/0,5 =0,5$

From the above calculation can be formed matrix R
$R=((1\&0.5\&0,5\&0,25\&1@1\&2\&1\&0,5\&1@1\&0,5\&0,5\&1\&0,5))$
$W=((0,4\&0,25\&0,2\&0,1\&0,05))$

Perform Process Ranking

**V1** $=(0,4)(1) + (0,25)(0,5) + (0,2)(0,5) + (0,1)(0,25) + (0,05)(1) = 0,4 + 0,125 + 0,1 + 0,025 + 0,05 = 0,7$
**V2** $= (0,4)(1) + (0,25)(2) + (0,2)(1) + (0,1)(0,5) + (0,05)(1) = 0,4 + 0,5+ 0,2 + 0,05 + 0,05 = 1,2$
**V3** $= (0,4)(1) + (0,25)(0,5) + (0,2)(0,5) + (0,1)(1) + (0,05)(0,5) = 0,4 + 0,125 + 0,1 + 0,1 + 0,025 = 0,75$
The Greatest Value falls on V2 (Efigenia) is the alternative chosen as the best alternative.

From the alternative values that have been determined by the method then the credit granting process will be given to the results that have been determined.

Value of Originality: Change the two methods of mobile application development using AHP and SAW methods to aid the decision-making process of saving and loan cooperative system in Timor Leste.

## 5.2 The result of application implementation

As discussed earlier, at this stage is the system process used to register cooperative members through cooperative management for new cooperative member data. From members of the cooperative management in determining the calculation of SW and AHP methods so that it can be implemented.

**Fig. 2.** Main Menu.

On the main page (Figure 2), this web application will discuss the form of filling to become a member of the cooperative and is entitled to get a cooperative loan. Prospective members of the cooperative will click the register button and will perform the registration process
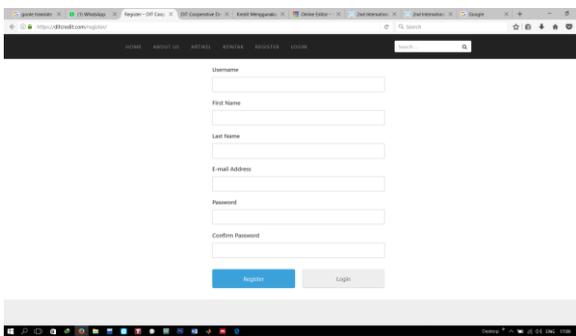


**Fig.3.** New cooperative member registration.

Ina Figure 3 shows new cooperative member registration. It discusses how a person wants to be a new member in a cooperative, at a stage someone will click on the register button and fill out the form provided by the cooperative management and create their own user name and password, for the form there are two languages, English and Tetun from Timor Leste. Fill out the form to see if the new member can apply for the cooperative ask.



**Fig. 4.** Login in Mobile for Result of Cooperative Notification.

On this page (Figure 4), hold this new members will be informed about the credit application results from each

criterion that has been applied by the cooperative. In this stage will decide the results of each criteria that has been automatically on the system executed to decide who is entitled to get the credit application first. So the results can be seen on the mobile application.



**Fig. 5.** Result Selection for member of the Cooperative.

In Figure 5 shows the final result of for member of the cooperative. This will discuss about the selection of criteria that have been determined by the cooperative with the calculation using two methods namely SAW method and AHP method to decide who is entitled to receive credit applications in a savings and loan cooperatives. The members of the cooperative will see the results are mobile applications with each user name and password.
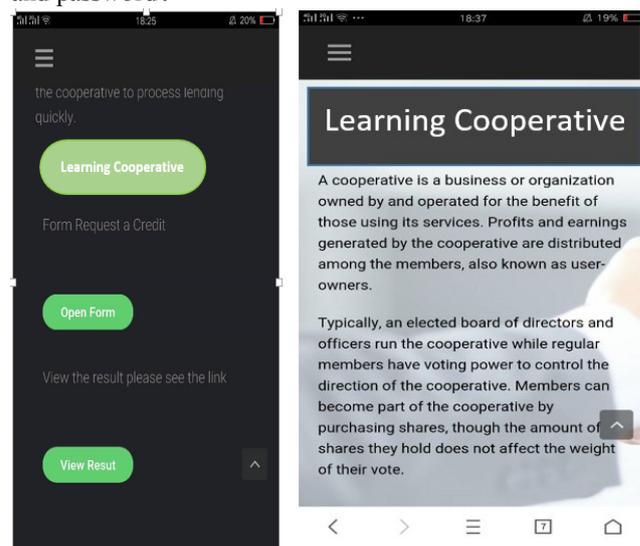


**Fig. 6.** Cooperative Learning.

On the third page (Figure 6) of the mobile app, This will showcase the cooperative learning process in mobile

applications for all members of the cooperative, with the aim that each member is not only to lend to a cooperative but the people of Timor Leste can also understand well how a cooperative is in good savings and loan process Takes a long time, so that the learning process will change the changes in East Timorese society not to lend without proper administrative process.

## 6 Conclusions And Recommendation

In this paper, a lesson for the people of Timor-Leste to get a good lending process, such as credit cooperatives that use mobile apps for the transformation of East Timorese society, the transformation of East Timorese society to a safe and comfortable savings and loan process. There are learning methods that can help the decision support system process, and the method is a hybrid method consisting of SAW and AHP methods. This paper is assisted by applications that will be used by cooperative boards and members of the cooperative, so that the data included an analysis that can produce a review of the problems being faced by the people of Timor Leste on cooperative learning, the authors concluded by using information technology using decision support system Which is very supportive Helping the use of a good cooperative. With the expansion of cooperatives that have expanded with 60% presentation, learning cooperative savings and loan by using mobile applications. In cooperative learning with the help of SAW and AHP methods will make a change of understanding of cooperatives for the people of Timor Leste. In today's modern, with the view that smart phone is very used by the society around the world, the writer took the initiative to help the learning process of the people of East Timor by using mobile application well and virtual.

## 7 Contribution

In improving the quality of society in addition to improving the welfare of the quality of life of the people of Timor Leste. So the main contribution is to change the first mindset that comes to mind or the model of society about good saving and lending process. With these problems, the authors compose information communication technology is a cooperative learning process assisted by decision support system with SAW and AHP method for the process of calculating the assessment of the provision of cooperatives. Decision support systems also consist of computer systems designed to aid or affect the needs of nominal workers in the savings and loan sections of a cooperative, so that the people of East Timor will also experience major changes in cooperative learning as well.

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