IDENTIFYING FOOTBALL CONFLICT USING SOFT-SET THEORY IN INDONESIA SUPER LEAGUE

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CENTRE FOR SPORT AND EXERCISE SCIENCES

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IDENTIFYING FOOTBALL CONFLICT USING SOFT-SET THEORY IN INDONESIA SUPER LEAGUE

ABSTRACT

There are several mathematical formal models that handle conflict situations and the most popular one is a rough set theory. With the ability to handle vagueness from the conflict data set, rough set theory has been successfully used in many research. This research used an alternative approach as a method to handle conflict situation in Indonesia Super League. This method was implemented on the respondents or agents who were involved with football club management, match inspector, organizing committee, referees, supporters and players. The novelty of the proposed approach is discussed in rough set theory that include decision rules. It is based on the concept of co-occurrence of parameters in soft set theory.

Back in 2015, Indonesia has no an official football competition for almost a year when FIFA banned the Football Association of Indonesia for competing in any international competitions until the internal conflict among their agents were resolved. In managing the conflict situation and identifying the uncertainties, this research proposes a new approach of Computation Intelligence in handling football conflict using Soft Set Theory. Motivated from the fact that every rough set is a soft set, this research derived an alternative algorithm to identify conflict situations from the point of view of soft set theory. We then delineated the proposed algorithm for an instructional example of Indonesian football conflict situation concerning the Indonesia Football Super League. The results showed that the proposed algorithm has been successful in handling conflict and finally making recommendation to the Indonesian football agents involved.

MENGENALPASTI KONFLIK BOLASEPAK MENGGUNAKAN TEORI SOFT-SET DI LIGA SUPER INDONESIA

ABSTRAK

Terdapat beberapa model formal matematik yang menangani situasi konflik. Salah satu yang paling popular adalah teori rough set. Teori rough set banyak digunakan kerana kemampuannya menentukan kepastian, liputan, dan kekuatan situasi konflik. Penyelidikan ini menggunakan pendekatan alternatif sebagai kaedah untuk menangani situasi konflik di Liga Super Indonesia, berdasarkan beberapa idea yang menggunakan teori soft set. Kaedah ini dilaksanakan keatas responden atau ejen yang terlibat dalam pengurusan kelab bola sepak, koordinator perlawanan, jawatankuasa penganjur, pengadil, penyokong, dan pemain. Pendekatan yang dicadangkan adalah berdasarkan pada konsep bersamaan parameter dalam teori soft set, tidak seperti teori rough set yang menggunakan peraturan keputusan.

Pada tahun 2015, Indonesia terpaksa menghentikan pertandingan rasmi bola sepak selama hampir setahun. Ketika itu FIFA melarang Persatuan Bola Sepak Indonesia untuk terlibat dalam pertandingan antarabangsa sehingga konflik di antara ejen dalaman mereka selesai. Dalam menguruskan situasi ini dan mengenal pasti ketidakpastian, penyelidikan ini mengusulkan pendekatan baru menggunakan Perisikan Pengiraan berdasarkan Teori Soft Set. Bertolak dari fakta bahawa setiap rough set adalah satu soft set, penyelidikan ini menggunakan algoritma alternatif untuk mengenal pasti situasi konflik dari sudut teori soft set. Penyelidik kemudian mengaplikasikan algoritma yang dicadangkan dalam pengajaran situasi konflik bola sepak di Indonesia. Hasil kajian menunjukkan bahawa algoritma yang dicadangkan telah berjaya menangani konflik dan akhirnya memberikan cadangan kepada ejen bola sepak Indonesia yang terlibat.

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LIST OF SYMBOLS AND ABBREVIATIONS

DLs	Description Logics
BFP	Business Failure Prediction
IFSS	Intuitionistic Fuzzy Soft Set
IFNs	Intuitionistic Fuzzy Numbers
GDM	Group Decision Making
GIFSS	Generalized Intuitionistic Fuzzy Soft Set
NSM-decision making	Neutrosophic soft matrices for decision making
IVN-soft set	Interval-Valued Neutrosophic sets and a soft set
FP-soft sets	Fuzzy Parameterized Soft Sets
GMCR	Graph Model for Conflict Resolution
MAS	Multi-Agent System
AI	Artificial Intelligence
supp	support
card	cardinality
cer	certainty
cov	coverage
PSSI	Indonesia Football Association

CHAPTER I

INTRODUCTION

1.1 Introduction

Football is a famous sport and competition in the world (Sener and Karapolatgil: 2015). This sport can touch interest in all segments of society. The greatness of football is also directly proportional to the problems that occur as a result of football itself which leads to conflict. Conflicts in football can occur inside of the field or even outside of the field. In addition, conflicts can occur before the match, during the match, and even after the match.

The conflict in football has become more widespread, such as conflict in the management, associations and even the government. With the growing conflict, a method that is able to analyze deeper and elaborate in more detail is needed. This study will discover the conflict more comprehensive using soft set theory (Li, X. *et al*: 2005). Problem description, classification, relationship, and degree of conflict among agents will be explained systematically.

1.2 Background Study

Conflict analysis using computational intelligence model plays an important role in a sport competition. Computational intelligence model such as rough set theory has been explored to solve the conflict situation which has ability to handle uncertainty (Pawlak, Z. and Skowron, A., 2007). Another new method for handling uncertain data is based on soft set theory (Xiao, Z., Gong, K., Xia, S. and Zou, Y., 2010). Soft set theory is the simplest method that has significant result to give recommendation for handling conflict. From soft set theory, researchers can analyze which agents who are in alliance, conflict, and agents which are neutral. In addition, soft set theory can be

able to compute the matrix discernibility among agents, conflict function, and degree of conflict.

In conflict situation, unpredictability about three types of binary relations is exist i.e. coalition (alliance/favorable), neutrality, and conflict (against) among agents. How to figure out a way to model unpredictability in conflict situations is the primary issue (Pawlak, Z., 1984; 1998). Relationship between two agents is declared an alliance if both have the same view on an issue. This view can be expressed in the rejection of the issue or support for the issue. Alliance can also be interpreted as a formal agreement between two or more agent for mutual support in a case. Alliances arise from agents' attempts to maintain a balance of power with each other. Contemporary alliances provide for combined action on the part of two or more agents and are generally defensive in nature, obligating allies to join forces if one or more of them is attacked by another agent or coalition. Although alliances may be informal, they are typically formalized by a treaty of alliance, the most critical clauses of which are those that define circumstances under which the treaty obligates an ally to aid a fellow member (Deja, R. and Ślęak, D., 2001).

Another unpredictability from three types of binary relations is neutrality. An agent is declared neutral if the agent is not in conflict, disagreement, alliance, etc. Example of impartiality: during the football conflict in Indonesia, FIFA maintained its neutrality. Another definition of neutrality is the absence of decided views, expressions, or strong feelings: the clinical neutrality of the description (Jiang, Y., Tang, Y., Chen, Q., Wang, J. and Tang, S., 2010). In fact, from this neutral view there is a program that has the purpose of not worsening the conflict situation. This program is a resource through which work related disputes can be resolved at the lowest and least invasive level. This program uses a mediation framework to help participants develop and create a meaningful outcome. Such outcomes support the agent's strategic

goal of civility and its commitment to diversity and inclusiveness. The objectives of this program are as follows; helping preserve, repair, and or improve work relationships, helping to facilitate the understanding and appreciation of other perspectives, allowing for parties to have a positive relationship with each other equal say in establishing their settlement/ agreement terms (Feng, F. and Li, Y., 2013).

Then the last perspective on binary relationship is conflict (against). Relationship conflict is a conflict resulting from either personality clashes or negative emotional interactions between two or more people. An agent is stated as a conflict if the agent rejects the existence of an issue and the agent has clear disagreements with other agents. A conflict model consists of a behavioral component, a cognitive component, and an affect component, or psychological feelings. The behavioral component involves one agent interfering with another agent's objective. The cognitive component reflects the disagreement between two agents due to discrepancy between their interests, needs, and goals. The affect component is negative emotions generated from the conflict. Generally, anyone who has interactions with other people is going to experience conflict. It is an inevitable aspect of human relations. However, the type of conflict experienced in a relationship and how it is handled are among the determining factors in a relationship's strength and promise. Relationship conflicts can occur in all types of relationships, including parent/child, friendships and romantic relationships (Xu, W., Ma, J., Wang, S. and Hao, G., 2010).

Conflict situations can be described in detail by calculating the matrix discernibility among agents, conflict functions, and degree of conflict. The matrix discernibility among agents is how much the difference of opinion occurs in the agent involved in the conflict. While the conflict function and the degree of conflict illustrate how much these agents are involved in conflict. Through this calculation, conflict and agent can be classified, the most dominant agent for conflict can be detected, and

recommendations given can be adjusted according to the portion (Arockiarani, I. and Lancy, A.A., 2013).

Recently, conflict situation in football become major issue since involved the management team, the governing body of football, and even the government. The widespread global development of football, played at recreational, amateur or professional Levels invariably led to more games being played and correspondingly resulting in occurring of a diversity conflicts and disputes in the game. The development of football is increasingly rapid, it is directly proportional to the conflict which damage the reputation of the world of football itself. The discovery of a conflict in the world of football is increasingly diverse. First of all, the conflict in the game, starting from the fight among players in the same team, the fight among players with different teams, players attacking supporters, supporters attacking players, players attacked the referee, supporter attacked the referee, until quarrels between coaches (Armstrong, G., & Giulianotti, R., 2001). Other possibilities include conflicts outside of the game, such as fights between supporters, mismatches legality of the team, the player's salary arrears, tax arrears by the team, team facilities, early childhood development, corruption, match-fixing, violation of competition law and others (Lea-Howarth, J., 2006).

Recently, Sutoyo,*et al*. (2016) presented the idea of handling conflict situation using soft set theory. They presented the notions of alliance (coalition), neutrality, and conflict (against) among agents in a conflict situation using the model of constraints co-occurrence in multi soft sets (Herawan, T. and Deris, M.M., 2009). Motivated by the work of soft set based association rule mining and multi-soft sets construction in information systems, this study presents an alternative approach based on soft set theory to handle conflict situation. To sum up, the contributions of this study are given as follows:

1. Conflict analysis in view of soft set theory is proposed.
2. The novelty of the proposed method is that, unlike in the existing soft set-based method that based on parameter co-occurrence, it is based on the concepts of conflict function and degree of conflict.
3. We demonstrate the proposed approach by method of a tutorial example of a football conflict situation.
4. We elucidate the proposed approach on real world conflict situation i.e. in Indonesia football super league problems. We show that, the proposed method can be used to handle conflict and finally make recommendation to the Indonesia football agents involved.

1.3 Conceptual Framework

In this research, a framework for identifying football conflict using soft set theory proposed. The framework is used to elaborate and compute the method into the conflict. The Proposed framework for identifying football conflict using soft set theory is shown in figure 1.1 followed by the brief descriptions of each step in the framework.

a. Demand investigation: Concern on understanding the nature of football conflict, how the scope of the issue, how the issues come up, and how many agents involved.
b. Data Selection: In this research, data is taken from the Football Association of Indonesia in Yogyakarta Province branches. The database keeps the record of 5 issues come up in football conflict and 6 agents involved.

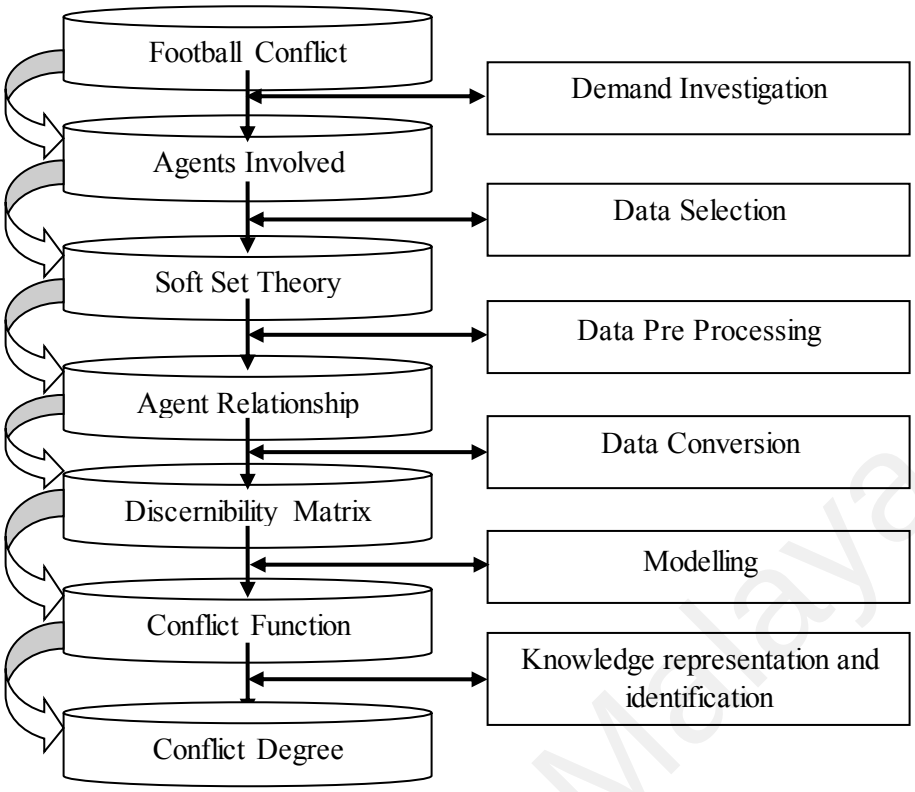

Figure 1.1: Proposed Identifying Football Conflict Framework

c. Data Processing and conversion: Perform data cleansing on data stored in the football conflict information system. Unnecessary information will be deleted. Data conversion changes the data into a unified data format.

d. Modelling: constructs the identifying football conflict using soft set theory.

e. Knowledge representation and assessment: data from the football conflict information system together with the knowledge from the classification application are displayed.

1.4 Statement of The Problem

In this study, there are several parties or agents involved in football conflict in Indonesia, including club management, match inspector, organizing committee, referee, supporter, and player. They are facing a number of problems that generally occurred on a football, including: player's unsupportive behavior, fans riot, lack of

appropriate facilities and infrastructure, unfair referees, management of the amateur competition.

In some cases that occur in football, referees and supporters are those who are considered to be the trigger as well as those who become scapegoats in that case (Majaro-Majesty, H. O., 2011). Referee decisions are often protested by players because they are considered unfair and denounced by the supporters because they are considered unsatisfactory for their favorite team. On the issue of referee's performance, the Football Association of Indonesia has implemented several programs to improve referee's performance including bringing in referee instructors from FIFA. Then, In the case of the behavior of the supporters, the government and club management have not made a significant step that can prevent the occurrence of rioting. In addition, Club managements are facing the quality of the football infrastructures which does not support the running of the match such as the quality of grass and light. Players are facing the issue of unsupportive behavior such as fighting and spitting to the opponent and referee, provocation to supporters and opponent, and not accepting the referee's decision by excessive protest. The organizing committee faces the problem of managing amateur competitions such as match fixing, bribery, and even tickets for spectators (Merkel, U., 2012).

To face the conflict, the agents who are involved need something to consistently extract and elaborate the source of the problem. This study through soft set theory will discover and give the recommendation for solving football conflict in Indonesia with mathematical model.

1.5 Objectives

Based on the background and statement of the problem, this study has several objectives as follows:

1. To propose soft set theory as an alternative method in analyzing conflict of football league.
2. To discover and explain the relationship among agents involved of the conflict of football league.
3. To identify the degree of the conflict among the agents of football league.

1.6 Research Question

Based on the research objective, this study has several research question as follows:

1. Is the soft set theory can provide significant method in analyzing football conflict using mathematical model?
2. Is the soft set theory can elaborate both the issue and agents involved in football conflict?
3. Is the soft set theory can identify the relationship among agents involved the conflict?
4. Is the soft set theory can classify both issue and agent in football conflict?
5. Is the soft set theory can analyze the degree of the conflict on the football league?
6. Is the soft set theory can calculate the degree of the football conflict?

1.7 Significance of The Study

For PSSI (Football Association of Indonesia), this study can be used as a reference in handling football conflict by analyzing the source of the problem using mathematical model. The Ministry of Youth and Sport of Indonesia can use this study become an alternative method in solving and preventing the conflict and the possibility of conflict in all kind of sports in Indonesia. For Researchers, This study can be used as reference in developing study on the area of sport management and computational intelligent.

1.8 Limitation

There are several limitations of this study. First of all, while involving all the Football Association in each province in Indonesia for identifying football conflict is desirable, it is not possible considering the large number of member and its procedures as there are time, cost, and manpower constraints. Thus, the data used of Football Association of Indonesia in Yogyakarta province deemed appropriate to get the data set of football conflict.

Moreover, while involving all the big issues on football conflict such as bribery cases, match fixing, and the government intervention is desirable, it is not possible considering the big number of agents and the complicated procedure. Thus, the common issues used in this study such as player's unsupportive behavior, fans riot, lack of appropriate facilities and infrastructure, unfair referees, management of the amateur competition deemed appropriate to get the data set of football conflict.

Lastly, in this study, analyzing football conflict using soft set theory is the first time used. Thus, constructive advice is needed for the development of the application of this method to analyze football conflict.

1.9 Operational Definition of Term

Football Conflict: All problems that arise in football competitions that lead to differences of opinion on the agents involved.

Soft Set Theory: A generalization of fuzzy set theory that was proposed by Molodtsov in 1999 to deal with uncertainty in a parametric manner.

Alliance: A formal agreement between two or more agent for mutual support in a case.

Neutral: The absence of decided views, expressions, or strong feelings.

Conflict: Rejects the existence of an issue and have clear disagreements with other agents.

Discernibility Matrix: The number of disagreements that occur in the agent involved in the conflict.

Conflict Function: The conversion of matrix discernibility is presented using numbers.

Degree of Conflict: How severe is the conflict that occurs with the agent involved.

1.10 Summary

Analysis is a process to examine and understand the reality of conflict from various diverse perspectives. On the other hand conflict analysis can be used as a foundation for developing strategies and action plans. If it is likened to an illness, it takes 3 processes to study it, namely: prognosis, diagnosis, and treatment. Conflict analysis is a comprehensive picture of the situation, intensity patterns, and character of society, including the strength of relations between stakeholders that affect the achievement of development goals and efforts to build peace. The study of conflict dynamics is a series of community data collection, processing and formulation activities that include understanding the context, interaction, intervention, actors, problems in the formulation of development programs.

This chapter gives a big picture this study. The deeper analyzing of this study will be elaborated in next chapter 2.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter describes and reviews related literature on the topic, which includes soft set theory, the existing researches that are related to conflict analysis, particularly conflict analysis in rough set theory. It is worth noting that the soft set approach seems to be of fundamental significance approach, especially in the area of imprecise or uncertain data, parameter reduction, and decision-making. Afterwards, the concept of conflict analysis in general, followed by the fundamental conflict analysis in rough set theory are outlined.

Soft Set Theory which is a new approach to deal with things that contain uncertainty or obscurity. *Sutoyo* (2016) has been implemented the soft set theory to analyze the conflict of political party in Indonesia and now we implemented in football.

Researchers in the field of soft set theory have raised a lot of attention in recent years. Maji *et al.* (2003) first introduced soft set theory in the problem of decision making. Then Maji *et al.* (2013) introduced the concept of fuzzy soft sets which is a combination of soft sets and fuzzy sets. Maji *et al.* (2002) also discusses some of its properties and applications. Jiang Y. *et al.* (2013) continued the concept of the soft fuzzy set. Continued by Jiang Y. et al. (2010) which examines the fuzzy set of intuitionistic and its applications in decision making.

2.2 Soft Set Theory

The soft set was first introduced by Molodstov (1999), then by Mali. at all is combined with fuzzy sets in 2001. So it becomes a fuzzy set. In general, the soft set relates between the set of universes with a set of parameters through a mapping from

the set of parameters into the set of powers from the set of universes. For example someone would buy a car in a car showroom, each car has parameters, such as price, model, color, fuel saving and others, where all the parameters for each car are firm (crisp). Whereas the fuzzy soft set is expanding the soft set, where all parameters for each car are fuzzy, with membership values between 0 and 1.

Let U be an initial non-empty universe set and let E be non-empty set of parameters in relation to object in U. The set $P(U)$ denotes the power set of U. The notion of soft set theory is given in the following definition.

Description 1: (See [Broumi, S. and Smarandache, F. (2013)]) *a pair* (F,E) *is called a soft set over U where F is a mapping given by* $F: E \to P(U)$. From Definition 1, the soft set is clearly a parameterized family of subsets of the set U. Let us consider the following example of soft set.

Example 1 Let be a soft set (F,E) define the "attractiveness of sport shoes" that Mr. X is going to buy. Assume that $U = \{c_1, c_2, c_3, c_4, c_5, c_6\}$ and $E = \{e_1, e_2, e_3, e_4, e_5\}$, where there are six sport shoes in the universe U and E is a set of parameters, e_i for $i = 1,2,3,4,5$ standing for the criterions "costly", "safety", "style", "performance", and "comfort" respectively. In this example, we deliberate a mapping $F: E \to P(U)$ which is given by "sport shoes (.)", where (.) is to be filled in by one of criterions $e \in E$. We assume to have the following mapping values i.e.

$$F(e_1) = \{c_2, c_4\}, F(e_2) = \{c_1, c_3\}, F(e_3) = \{c_3, c_4, c_5\}, F(e_4) = \{c_1, c_3, c_5\}, \text{ and}$$

$$F(e_5) = \{c_1, c_6\}.$$

From the values above, the mapping $F(e_4)$ means sport shoes with performance character, where the mapping value is $\{c_1, c_3, c_5\}$. Thus, we can illustrate the soft set (F,E) as collection of approximation as follows:

$$(F,E)=\{e_1=\{c_2,c_4\}, e_2=\{c_1,c_3\}, e_3=\{c_3,c_4,c_5\}, e_4=\{c_1,c_3,c_5\}, e_5=\{c_1,c_6\}\}.$$

In previous studies [Broumi, S., Deli, I. and Smarandache, F. (2014)], it has been presented that a "standard" soft set (F,E) can be characterized as a Boolean-valued information system $(U,A,V_{[0,1]},f)$. Therefore, the above soft set can be characterized as a Boolean-valued information system (see Table 1) below:

Table 2.1: Tabular Representation of Soft set (F,E)

U/E	e_1	e_2	e_3	e_4	e_5
c_1	0	1	0	1	1
c_2	1	0	0	0	0
c_3	0	1	1	1	0
c_4	1	0	1	0	0
c_5	0	0	1	1	0
c_6	0	0	0	0	1

Soft set theory can also be used to handle multi-valued information systems. Herawan and Deris proposed the idea of multi soft sets for representing multi-valued information systems (Herawan, T. and Deris, M.M., 2011). The idea arises from the decomposition of a multi-valued information system $S=(U,A,V,f)$ to $|A|$ number of Boolean-valued information systems which is based on decomposition of $A=\{a_1,a_2,\ldots,a_{|A|}\}$ into a single attribute $\{a_1\},\{a_2\},\ldots,\{a_{|A|}\}$. The following sub-section, we present the proposed method.

2.3 Soft Set and Fuzzy Soft Set

The definition of a soft set has been introduced by Molodtsov, D. (2016), then used in defining the fuzzy set by (Maji, P.K., *et al.*, 2003), and was developed by (Yang, X., et al., (2007) for a generalization of soft set theory from crisp to fuzzy case.

Finally, (Çağman, N. and Enginoğlu, S., 2010) presented soft sets and apply it to abstract algebra i.e. soft groups.

Description 1. Soft Set. Suppose that X is the set of universes and E is the set of parameters. The pair (F,E) is called the soft set of X if (F) is the mapping of (E) into $P(X)$, $P(X)$ the power set of X) (Herawan, T. and Deris, M.M., 2011).

Description 2. Fuzzy Set. Suppose that X is the set and μ_A is the function of X into the interval [0.1], then A is called the fuzzy set of X with the μ_A membership function. Suppose that $\tilde{P}(X)$ is the set of all fuzzy sets of X, then $\tilde{P}(X)$ is called the fuzzy set of X (Maeda, Y. *et al., (2016)*.

Description 3. Fuzzy Soft. Suppose X is the set of universes, (E) is the set of parameters and $\tilde{P}(X)$ is the set of power blurring. The pair (F,E) is called the fuzzy set of X if (F) is the mapping from (E) into $\tilde{P}(X)$ (Ma, X. *et al.,* (2014).

Example 1. X = {a, b, c,d }, $E=\{e_1,e_2,e_3,e_4\}$, $A=\{e_1,e_2,e_4\}\subseteq E$, so

$(F,A)=\{F(e_1)=\{(a,0.3),(b,0.6),(c,0),(d,0.7)\},F(e_2)=\{(a,0.4),(b,0),(c,0.5),(d,0)\},$
$F(e_4)=\{(a,0.4),(b,0.1),(c,0.5),(d,0.3)\}\}$

is a fuzzy soft of X.

Description 4. If X is a set of universes and (E) is a set of parameters, the collection of all fuzzy soft sets of X is denoted (X,E)

Description 5. If $A\subseteq E$ and F_A is a mapping from (E) into $\tilde{P}(X)$ defined $F_A(e)=\mu^e{}_{F_A}$, $\mu^e{}_{F_A}\neq 0$, if $e\in A$ and $\mu^e{}_{F_A}=0$ if $e\in E-A$. F_A called the fuzzy soft set of (X,E). Collection of all fuzzy soft sets of (X,E) denoted $K(X,E)$

Description 6. The blank sets and the universes of fuzzy soft $F_\phi\in K(X,E)$ called the fuzzy soft blank sets if $F(e)=\tilde{0}$ for every $e\in E$ and symbolized as $\tilde{\phi}$.

$\boldsymbol{F_E \in K(X,E)}$ called the universe of fuzzy soft set if $F(e)=\tilde{1}$ for every $\boldsymbol{e \in E}$ and symbolized $\tilde{\boldsymbol{E}}$.

Description 7. The complement of fuzzy soft set, if F_A fuzzy soft set in $K(X,E)$ so the complement of F_A is fuzzy soft set G_A where $\boldsymbol{G(e)=1-F(e)}$ for every $\boldsymbol{e \in A}$.

Theorem 1. If $\boldsymbol{F_A \in K(X,E)}$ and $\boldsymbol{0<F(e)<1}$ for a $\boldsymbol{e \in A}$ so $\boldsymbol{F_A \tilde{\cap} F_A^c \neq \tilde{\phi}}$. Evidence: if $H_A = F_A \tilde{\cap} F_A^c$, because known $0<F(e)<1$ for a $\boldsymbol{e \in A}$, so $\boldsymbol{1-F(e)>0}$. Then $\boldsymbol{H(e)=F(e) \wedge F^c(e)>0}$, so $\boldsymbol{H_A = F_A \tilde{\cap} F_A^c \neq \tilde{\phi}}$.

Description 8. The fuzzy soft subset. If F_A and $\boldsymbol{G_B}$ is a fuzzy soft set in $K(X,E)$, F_A called subset of $\boldsymbol{G_B}$ symbolized $\boldsymbol{F_A \tilde{\subseteq} G_B}$, if $\boldsymbol{A \subseteq B}$ and $\boldsymbol{F(e) \leq G(e)}$, for every $e \in A$.

Theorem 2. If F_A and $\boldsymbol{G_B}$ is a fuzzy soft set in $K(X,E)$, if $\boldsymbol{0<F(e)+G(e) \leq 1}$ for every $\boldsymbol{e \in E}$, so $\boldsymbol{F_A \tilde{\subseteq} G_B^c}$ and $\boldsymbol{G_B \tilde{\subseteq} F_A^c}$, easy evidence to show, as a result: if $\boldsymbol{F_A \tilde{\subseteq} G_B}$ and $\boldsymbol{0<F(e)+G(e) \leq 1}$ for every $\boldsymbol{e \in E}$, so $\boldsymbol{F_A \tilde{\subseteq} G_B \tilde{\cap} G_B^c}$ and $\boldsymbol{G_B \tilde{\subseteq} F_A \tilde{\cap} F_A^c}$.

2.4 Alliance, Neutral, and Conflict

In conflict situation, at least there are two parties in a conflict, named agents, are in controvert some issues. Tables 2 as following presents the concept of conflict *information systems*.

Table 2.2: A conflict table

U/E	e_1	e_2	...	e_n
u_1	$F(e_1,u_1)$	$F(e_2,u_1)$		$F(e_n,u_1)$
u_2	$F(e_1,u_2)$	$F(e_2,u_2)$		$F(e_n,u_2)$
$\vdots$	$\ddots$	$\ddots$	$\ddots$	$\ddots$
u_m	$F(e_1,u_m)$	$F(e_2,u_m)$	...	$F(e_n,u_m)$

A conflict information system as in table 2.2 above is a table rows of which are considered by *objects (agents)*, columns-by *characteristics (issues)* and entries of the table are *values of characteristics (opinions, beliefs, views, votes, and etc.)*, which are exclusively assigned to each agent and an characteristic, i.e. each entry corresponding to row x and column a symbolizes opinion of agent x about issue a. This sub-section presents our proposed method for handling conflict including the notions of alliance, neutral and conflict.

Officially, an *information system* can be explained as an ordered pair $S = (U, A)$, where U a nonempty, determinate set is called the *universe*; elements of U will be named *objects (agents)*, and A is a nonempty, determinate set of *characteristics (issues)*. Each characteristic $a \in A$ is a total function $a : U \to V_a$, where V_a, is the established of *values of a*, named the *domain* of a; elements of V_a will be mentioned to as opinions, and $a(x)$ is opinion of agent x about issue a. The explanation given on the above is general, but for conflict analysis, we will need its simplified version, where only three values restrict the domain of each characteristic, i.e. $V_a = \{-1,0,1\}$, for every a, *meaning in contradiction of, neutral and favorable*, respectively. For the sake of simplicity we will undertake $V_a = \{-,0,+\}$. Every information system with the above said constraint will be mentioned to as a situation. Sutoyo *et al.,* (2016) explain the conflict situation into alliance, neutral and conflict as follow.

Description 2 (Alliance): *Let* (F, E) *be multi-soft sets representing a conflict table, two agents* $x, y \in U$, *and* $e \in E$. *The alliance between x and y if and only if* $F_E(x, y) = 1$, *where*

$$F_e(x, y) = 1, \text{ for } F(e, x)F(e, y) = 1 \text{ or } x = y. \quad (1)$$

This means that, for $F_e(x,y)=1$ agents *x* and *y* have the same view about issue *e* (are associated on issue *e*).

Description 3 (Neutral): *Let* (F,E) *be multi-soft sets representing a conflict table, two agents* $x,y \in U$, *and* $e \in E$. *The neutrality between x and y if and only if* $F_E(x,y)=0$, *where*

$$F_e(x,y)=0, \text{ for } F(e,x)F(e,y)=0 \text{ and } x \neq y. \quad (2)$$

For $F_e(x,y)=0$, means that at least one agent *x* or *y* has neutral method to issue *e* (is neutral on issue *e*),

Description 4 (Conflict): *Let* (F,E) *be multi-soft sets representing a conflict table, two agents* $x,y \in U$, *and* $e \in E$. *The conflict between x and y if and only if* $F_E(x,y)=-1$, *where*

$$F_e(x,y)=-1, \text{ for } F(e,x)F(e,y)=-1. \quad (3)$$

For $F_e(x,y)=-1$, means that both agents have different views about issue *e* (are in conflict on *e*).

2.5 Matrix Discernibility Among Agents

Let (F,E) be multi-soft sets representing a conflict table. By a discernibility matrix of *D* in $D \subseteq E$, denoted $M(D)$ is a $n \times n$ sized matrix, where $n=|U|$ and defined as

$$e(x,y)=\{d \in D : d(x) \neq d(y)\}. \quad (4)$$

Thus entry of matrix $M(D)$ i.e. is the set of all attributes which discern agents x and y. Any entry of the matrix corresponding to agents x and y provides for those degree of conflict between agents x and y (Sutoyo *et al.,* 2016).

2.6 Conflict Function

We will additionally require the assessment about views between two agents x and y with admiration to the situated from claiming issues $D \subseteq E$. To this end, we characterize a work known $\rho_D(x, y)$ as a *clash intersection* defined as follow:

$$\rho_D(x, y) = \frac{|\delta_D(x, y)|}{|D|}. \tag{5}$$

Clearly $0 \leq \rho_D(x, y) \leq 1$. If $\rho_D(x, y) \neq 0$ we will say that x and y are clinched along side clash in D in a degree $\rho_D(x, y)$, and obviously if $\rho_D(x, y) = 0$, x and y are in coalition over D (Sutoyo *et al.,* 2016).

2.7 Degree of Conflict

Let (F, E) be multi-soft sets representing a conflict table and $D \subseteq E$. As opposed to function ρ we can define function ρ^*, which characterizes separation between agents more accurately, by accepting that separation between agents continuously Previously, conflict will be more terrific over separation between agents which need aid unbiased, i.e.

$$\rho_D^*(x, y) = \frac{\sum d \in D \phi_d^*(x, y)}{|D|}. \tag{6}$$

where

$$\phi_d^*(x,y)=\frac{1-\phi_d(x,y)}{2}=\begin{cases}0 & \text{if } d(x)d(y)=1 \text{ or } x=y\\ 0.5 & \text{if } d(x)d(y)=0\\ 1 & \text{if } d(x)d(y)=-1 \text{ and } x\neq y\end{cases}. \quad (7)$$

The $\rho(x,y)$ will be called a degree of conflict between x and y. A pair (x,y) is said to be:

a. Allied, if $\rho(x,y)<0.5$

b. In conflict, if $\rho(x,y)>0.5$

c. Neutral, if $\rho(x,y)=0$. (8)

From sub-sections 2.1-2.6, we derive an algorithm of soft set method for handling conflict (Sutoyo *et al.,* 2016).

Algorithm: Soft set for handling conflict Input: Conflict data Output: Conflict Graph
a. Compute multi-soft sets representing a conflict table b. Compute alliance between two agents in multi soft sets c. Compute neutrality between two agents in multi soft sets d. Compute conflict between two agents in multi soft sets e. Draw conflict f. Compute the Matrix Discernibility Among Agents g. Compute the Conflict Function h. Compute the Degree of conflict or distance function i. Give the recommendation

Figure 2.1: Algorithm for soft set based conflict analysis

From Figure 2.1 above, the algorithm starts by inputting conflict data, then the data in converted to multi soft sets. Then the next steps are computing alliance,

neutrality, and conflict based on multi soft sets. Finally the algorithm stops by drawing conflict graph and decision making.

The following section presents a tutorial example to show how the proposed algorithm in Figure 1 works to handle conflict situation in football game.

2.8 Conflict

Conflict is one of the most characteristics of human nature, hence the study of conflict is important, both in practical and theoretical aspects (Pawlak, 1998a; Sun & Ma, 2015). Everyone encounters conflicts in everyday life. People are different and so long as differences exist, conflicts will arise (Lacey, 2000; Lacey, 2012) and is inevitable as each party has its own history, character, gender, culture, values, beliefs, and behaviors that influence its actions and motivation (Randeree & El Faramawy, 2011). Conflict analysis provides two important functions (Fraser & Hipel, 1984).

First, the particular conflict being considered is modeled by putting the available information pertaining to the dispute into proper perspective and systematically structuring the problem. Second, a conflict model is utilized to predict possible solutions to the dispute. Conflict analysis and resolution play as an important role in economy, business, governmental and political disputes, military operations, labor-management negotiations and etc. The term of conflict can be interpreted as any intervene in the party's activities, the needs or goals of the parties, caused by the activities of other parties. Conflict can be characterized as a disagreement between the initiator of the regulations (problem owners) and this disagreement could lead to inconsistencies in the condition. However, differences of opinion do not always lead to inconsistencies and inconsistencies do not necessarily represent a conflict.

2.9 Sources of Conflict

Conflict is a piece of the way of an organization (Robbins, 1991). Specifically, it is both a source of and reaction to hierarchical changes. Two sources of conflict are conflict among the participant's point of views of the issues, and conflict between the many different of goals. Others sources of conflict are including conflict among segments of the recommended arrangements; conflict between the specified constraints; conflict between the perceived needs; conflict in the utilization of resources; and the difference among the evaluation of priorities. In many cases, there will be a dispute among the agents (Dobson, 1993). This can be overcome by limiting the scope of the problems so that only one of goal is addressed.

Therefore, requirements analysis must recognize and deal with the presence of several conflicting perspectives. In addition, the occurrence of conflicting perspectives may not always be distinguished from cases where agents describe basically the same concept, but use different terms. Even the formal representation scheme allows variation in style so there may be many different ways of saying the same thing.

2.10 Conflict Resolution

Conflict resolution is a method and process involved in facilitating a settlement of the conflict. If there is no means to express the conflict in a method, in which conflicts happen, they tend to get pressed. If they remain pressed, it will lead to dissatisfaction with the process requirements. If the conflict was finally resolved, the resolution must be done outside the framework of the method, it may be at the right time, using the means that are not desirable. Resolution that is achieved is untraceable, making decisions irreproducible and information rationale invalid.

Conflict can cause damage to the requirements process, or withdrawal of agents. Failure to recognize the conflict between the perspectives of the agents would cause

confusion throughout the life cycle. The agents' understanding of the specifications will be different, which leads to further misunderstanding during solving the issue.

2.11 Conflict Analysis

Conflict analysis is one important area that it is increasing nowadays as a distributed computer system started to play an important role in society (Deja, 2000). Common analysis methods tend to repress conflict, creating any resolution undetectable and adding to the communication problems. Conflict analysis is one of the part of decision making that it's very important to study, because the aims are in order to identify further and resolve the conflict situations, and decrease the needless escalation of conflict and preserve the normal process and also development of the system (Liu, Lin, & Liu, 2014).

In recent years, many scholars have presented various mathematical approaches, i.e. Graph Model for Conflict Resolution (GMCR) (Fang, Hipel, & Kilgour, 1993; Kilgouret al., 1987; Kilgour & Hipel, 2005; Kinsara, Petersons, Hipel, & Kilgour, 2015), Game Theory (Neumann & Morgenstern, 1947; Rapoport, 2012; Schelling, 1958) and RoughSet Theory (Pawlak, 1984, 1998a, 2003, 2005a; Skowron et al., 2006a).

2.12 Agents Involved of The Football Conflict

In a conflict there must be at least 2 parties in dispute. Then in football, in general there are 6 parties involved in the conflict as follows:

1. Club Management

   The professionalism of managing a football club is a challenge that must be faced by all managers of football clubs in Indonesia if each club aims to perform optimally. The AFC (Asian Football Confederation) carried out a project to professionalize club management and competition in Asian countries who wished

to appear in the Asian Champions League starting in 2012. The project began to be socialized in 2008. The results of the AFC assessment state that competitions and clubs in Indonesia does not yet meet the minimum standard score for professional football management. Changes in management towards professionals should be guided by the standardization of management of professional clubs issued by the AFC. Amateur clubs, especially division I clubs, should be prepared to make changes to the management model that has been carried out so far, the changes that should have been made include: the source of club funding, organizational status, and the professionalism of all organizational staff. The above is done because the division I club is a club that has the opportunity and must change the management model if it passes to the level of the Main division. Club funding sources can be explored through sponsorship, merchandise sales, media contracts, optimizing the government's role in supporting infrastructure, especially in relation to public access.

Clubs are the main means for development and coaching. The club is a place where players, referees and coaches carry out a regular and continuous coaching process to obtain quality human resources ready to be used for the national interests of players, referees, managers or coaches. Parent sports organizations such as PSSI (football association of Indonesia) are coordinators at their respective levels, from the central (national) level to the district or city level. The player who is currently a professional status is a product of amateur club club coaching. Clubs that want to be professional should go through levels from amateur clubs to becoming professional clubs.

2. Match Inspector

According to FIFA's terms, the assigned Match inspector is the highest representative of the National Football Association in a match. With the authority possessed, match inspectors have the responsibility for organizing the competition, starting from preparation, during, until after the match. In addition, match inspectors are also authorized to take all decisions deemed necessary based on the applicable provisions. And in the end the match inspector is also obliged to report everything related to the match.

As stipulated in the General Rules of the Match by PSSI, match inspectors are set by the PSSI Management according to their level of authority, must come the day before the match or two days before the match according to FIFA provisions, to carry out tasks that cover three aspects, namely all matters relating to competition preparation holding matches and making a full report on the implementation of the match. The Match Inspector has an obligation with the Referee to check all facilities and the field to be used for the match the next day. Leading Technical Meetings attended by both Official Officials, Referees and Implementing Committees (including Security, Health and Media affairs), and making news by all interested parties.

3. Organizing Committee

Organizing committee is a group that has the task of organizing matches. To be able to hold a football match, the organizing committee must meet the following requirements: a) have or can borrow / rent a stadium that meets the standards. b) able to prepare security officers inside and outside the stadium with a number tailored to the needs and appoint security guards in each match. c) implementing stadium security guidelines as stipulated by PSSI and cooperating with coordinators of each team of supporters to create an orderly atmosphere inside and outside the

stadium environment. d) not allowed to sell tickets beyond the capacity of the stadium, supervise ticket sales and separate groups / supporters of their respective teams. e) there are hotels that meet the health requirements in the city for organizing matches. f) participate in safeguarding the quality of referees and contributing to the spirit of fair play between players, officials and spectators. g) must prepare the room and hold a press conference at the stadium.

4. Referee

In football, the referee is the match manager in the field. The referee has full rights during the match to all players and coaches and officials of a team. The referee also has full protection from the International Football Federation (FIFA) as the highest institution of world football or from a football institution in a country. The role of the referee is very important for the regular implementation of a soccer match.

At the level of a professional soccer match, the referee consists of a main referee on the playing field and two assistant referees who both judge along one half of the field line. The job of the assistant referee is generally to observe the ball that has left the playing field including the team that has the right to get a direct free kick in the game area, give a signal when an offside case occurs, and help the main referee objectively determine the violation found. The assistant referee can replace the main referee if he cannot continue to lead the match.

At a higher level than a referee on the field, there is a fourth official match. The fourth official task is generally as an administrative referee on duty on the field side to assist the main referee's duties including technical management, player change, recording the number of scores and yellow cards / red cards received by players, counting the length of time wasted in stopping the match due to various incidents (violations, throw-in, player care, preparation for free kicks) in

determining the time to then inform the audience about injury time. In addition, a fourth court official is tasked with assessing the suitability of the clothing and equipment of players in the field based on the principle of LOTG, and mediating the main referee in giving information during the match to club officials, match committees and authorities in the event of an incident. In rules at the national level, the fourth court can replace the referee or one of the assistant referees if they cannot proceed to try the match.

5. Supporter

Supporters are people who provide support in a match. This understanding does not refer to specific matches, but the existence of supporters in fact is very close to sports matches. Daniel L. Wann called supporters who watched sports competitions as individuals who were physically, politically and socially active. Therefore the existence of supporters is not only a matter of support. Supporters make matches more memorable and dynamic. In fact, the presence of supporters is even more prominent and attracts attention than the competition itself.

Football as the most popular sport, has attracted so many people to become its supporters with very thick fanaticism. This fanaticism then encouraged soccer fans to organize themselves and perform various striking actions as manifestations of this fanaticism. Fan riots are the most obvious form of fanaticism. This problem does not occur partially in certain regions of the world, but has become global, even from developing countries to developed countries. Even the behavior of supporters in developed countries such as England and Italy is a mecca for developing country supporters like Indonesia. This fanaticism is expressed in the behavior of supporting clubs and aggressiveness in attacking other communities of different clubs. These aggressions are driven by many factors. One of them is social problems that exist outside of football itself.

6. Player

The number of each player from the formation of a team is 11 people. That consists of a goalkeeper, and ten players who are divided into various positions in the field and of course with their respective duties. Maybe some of us know a number of positions in soccer. Starting from goalkeepers, defenders, midfielders, and attackers. Where the task of a goalkeeper is as a person who maintains a goal, a defender or defender is one who assists the keeper in maintaining a team's defense, a midfielder as a liaison between defenders and defenders, and an attacker whose job is to score.

In football, it is quite difficult to find players who have a high level of intelligence. Most of the players have extraordinary physical abilities, such as a tall, muscular body and fast speed, but not infrequently, the player's brain is not honed because they might consider what is important is their physical ability. Educational background is certainly very influential here. Especially in Indonesia, footballers often prioritize their basic education, for a career in football. Indeed, most football players in Indonesia are born to poor families, so they have to choose one, education, or soccer. However, that is a decision that is actually not true.

Why? Without exploring basic education, their logic will not be well honed and the results will be seen when they play on the green field. This logic is key, when footballers make decisions in the field. Do I have to pass or shoot? Where do I have to pass the ball? How much energy should I spend on kicking? Do I have to tackle or wait? A player who is able to think logically will surely make the right decision and the wrong decision will certainly harm him as a player and his own team. The culture of appreciation that exists is also a problem. Often, players who are able to run faster get more praise than players who are the brain of the team. Indeed, in plain view, it's certainly easier to realize and distinguish which players

are faster and which players are smarter. This appreciation becomes a barrier, because fast players are above the wind and do not want to sharpen their intelligence. Indeed, not all are like that, but if appreciation is given equally, or even more given to the intelligent, it is not impossible that the strong will be motivated and the intelligence side will be better. Imagine, what might happen if the ability to run fast, combined with the precision and accuracy for positioning? Perfection.

2.13 Issues of The Football Conflict

In football leagues in Indonesia, there are 5 problems that cause conflict in Indonesian football as follows:

1. Player's unsupportive behavior

Player attacking referee, player attacking teammates, and player attacking opponents are several phenomena in football. The main problem of current sports at all levels is the increase in unsportsmanlike and fraudulent behavior and negative character. Fraud scandals, drugs, violence, mutual disrespect and other unsportsmanlike behaviors. Positive sports values, such as sportsmanship, cooperation, discipline, leadership, honesty, responsibility and mutual respect should be able to bring sportsmen towards the formation of positive character in sports and in daily life. Football is one sport that is played on a team basis. Football is the most popular sport in all corners of the world. From time to time good football games are recreational. Educative and prestige have been held in various places and opportunities from the level of children to adults in the form of amateurs and professionals. Through the game of football, someone will get the opportunity and advantage in actualizing themselves in the midst of society. Football games not only provide benefits for the physical and mental, but also can provide sociological benefits for the perpetrators. Football games can be a vehicle for developing various

aspects of human life, including the development of character values, fair play, and sportsmanship.

Efforts to instill character, fair play and sportsmanship require a very long process, so that the awareness of the athlete must also be a strong reference if you want to become a successful athlete. Through sports people find joy and satisfaction and experience personality maturity through experience in sports. Sports games such as football provide space for socializing with other people because the sport is played in teams. Football as one of the most popular games in the world also has some character values contained in it. Through soccer games, character values are obtained as a valuable enough stock that can be used in carrying out roles in the midst of society. As an effort towards the success of instilling character values, fair play, and sportsmanship, a trainer and sports practitioner must understand how to train these things to the child to train them. If the three concepts above have been ingrained in someone, then in the fight or later life in the midst of society the problems that exist will be easily overcome and can live life in harmony.

2. Fans riot

Violence between supporters of soccer clubs continues to occur because they are in a public mode, where the usual values and social norms are no longer considered to be something that must be obeyed. Another reason is because supporters are assets that continue to be capitalized by the club. Another reason why violence continues is fanaticism towards unions (clubs). This union then developed into a business. Supporters and spectators are part of assets that are capitalized for business purposes. Sports is no longer only interpreted as physical exercise, causing blind fanaticism so that people who come from different club supporters are considered enemies, and therefore it is legitimate to exclude them.

3. Lack of appropriate facilities and infrastructure

There are four major problems regarding football facilities in Indonesia as follows:

1. Indonesia does not have many A level stadiums
2. Quality of grass that is easily damaged if it rains
3. Poor lamp quality is an obstacle if the match is done at night.
4. There are no seat numbering which triggers the mess of the spectators.

4. Unfair referees

Referee is one of the devices of the competition often making conversation, the mass media often preach the news about the referee who led the course of a match, even in the news often cornered the referee himself. Referees are often targeted by players, officials, even dissatisfaction even when the parties are dissatisfied with the performance of the referee, especially when they are in a condition of being left behind or losing. Moreover, the referee is often accused of accepting bribes to win one of the teams that compete.

The referee is often regarded as a trigger unrest in Indonesian football. The decision that is often controversial and siding with one team makes the image of the Indonesian referee even worse. As a result of the quality of the referees who were not good, Indonesian football players became accustomed to the decision of the referee who was not strict. Excessive fouls and protests are often left to the referee. As a result Indonesian football players are used to this for matches at the national level. Until now the pattern of improving the quality of referees has not run optimally. Indonesia needs to structure and develop good planning for referees. Having a coach will be good for the referee to learn to determine right and wrong.

5. Management of the amateur competition

Competition in football is a situation where there is one goal to be achieved by many individuals or teams, thus motivating the individual or team to exceed others by increasing performance or performance of either individuals or teams. PSSI (Indonesian Football Association) as an organization that has the authority to foster football sports to date has not found the right model of competition according to the potential and constraints that exist in football in Indonesia. The history of the implementation of football competitions in Indonesia from the inception of the PSSI to the present, has three models of competition, namely: competitions conducted for professional clubs, semiprofessionals, and amateur clubs. Amateur soccer competitions have been held since PSSI was established until 1979. In the development of PSSI, there were two semiprofessional and amateur competition models with the concept of each competition model standing parallel under the coordination of a body or field of competition. The first is the union competition which manages amateurs and Galatama whose management is semi-professional.

The merger between the Galatama competition and the Union competition was a product of the competition held since 1994 2008 with the title of the Indonesian League competition and always changing titles according to the main sponsors who supported the competition that year. In this period the management of the club and competition was still semi-professional. PSSI declared starting in 2008 the two highest caste competitions in Indonesia were managed professionally. Professional competition with the title of the Indonesian Super League and the Main Division League as the highest caste of football competition in Indonesia. The clubs competing in the divisions I, II, III as competitions are leveled below with the assumption that the club is managed by an amateur.

The phenomenon that occurs in Indonesia is that the branch of football is the most popular sport, not only because of the beauty of a team's game, but also the controversies that occur in club management or competition management. During the period of PSSI management led by general chairman Nurdin Halid in 2007-2011 there was a conflict between the LSI (Indonesian Super League) competition and LPI (Indonesian Premier League) estuary conflict was LPI club dissatisfaction who felt that LSI was an unprofessional competition and had a negative impact on national team achievements. The latest conflict is the conflict between the IPL (Indonesian Premier League) competition held by PSSI under general chairman Djohar Arifin, with ISL competition. Conflict involving various clubs with the root of the problem of club dissatisfaction with PSSI's policies in declaring clubs entitled to participate in professional competitions in Indonesia.

The AFC on its website www.afc.com states that competitions and clubs in Indonesia are not yet at the professional level and with the results of the assessment and in fact Indonesian clubs have not been allowed to send representatives to be able to appear in the Asian Champions League competition in 2012. The term professionalism in sports especially football needs to be studied by all sports people.

2.14 Summary

The conflict that arises is sometimes caused by several things, namely: 1) Differences in interests between stakeholder football in the country so that it can ignite conflict, 2) Uneven allocation of power and authority, thus making stakeholder football in the country fight for power, 3). The emergence of strong people who are outside the system, which often affects the owner of authority in decision making and policy making, so that decisions and policies taken are segmented oriented. That condition often makes footballing the country unstable, so we need to take steps to resolve conflict through a persuasive approach through actors who have the authority

to sit together and discuss conflict resolution, as the Minister of Youth and Sport of Indonesia has attempted, Settlement of conflict through roads cessation of football activity in total, then forming and projecting football with new people and professional workers from abroad, so that neutrality can be maintained, Settlement of conflict through the country's football revolution, by changing the system of managing football in the country and stopping government interference, and restore fully to the community, by principle: from the people, by the people and for the people.

The first step to overcome the conflict in football, author made a survey for the agent involved with the defined criteria. This survey is using questionnaire and interview. The detail of the questionnaire will be explained in chapter 3.

CHAPTER III

METHODOLOGY

3.1 Introduction

Research methods can be interpreted as a scientific way to obtain valid data with the aim of being able to be found, developed, and proven, a certain knowledge so that it can be used to understand, solve, and anticipate problems.

This chapter describes steps as a scientific way to obtain data with rational, empirical, and systematic goals. This chapter also includes research methods, procedures and research techniques. Research methods are an important step in solving research problems. By mastering the research methods, not only can solve various research problems, but also can develop the scientific field in which they are involved. In addition, increasing new discoveries that benefit the wider community and the world of education.

In this chapter, it is explained how descriptive research is chosen as the right method. Then the research design approach and its framework will guide processing. Descriptions of operational definition, population and sample research, instruments and data collection research techniques will complement the studies. And the last Activities in data analysis include: grouping data based on variables and types of respondents, tabulating data based on variables and all respondents, presenting data for each variable under study, performing calculations to answer the problem statement will close this chapter.

3.2 Overview

Most of real life problems in engineering, social and medical science, economics, environment and even in sport involve imprecise data. To handle such situations, consider the mathematical principles based on uncertainty, such as probability theory, fuzzy sets theory, rough sets theory. All these theories can

successfully be used to extract useful information in imprecise data, however each of them has its inherent limitations. Therefore, Molodtsov proposed soft sets theory as a completely new mathematical tool for dealing with uncertainties, which is free from the limitations affecting the existing methods (Molodtsov, 1999).

Soft set is a generalization of fuzzy set theory, uses parameterization definition as its main vehicle. A soft set is a collection of approximate descriptions of an object. Soft sets are called (binary or basic or elementary) neighborhood systems. A standard soft set can be redefined as the classification of objects in two different classes, thus confirming that soft sets can handle a Boolean-valued information system. Soft set theory has successfully applied in some directions, such as smoothness of functions, game theory, operations research, Riemann integration, Perron integration, probability, theory of measurement, and etc. (Molodtsov, 1999).

3.3 Methodology

This research is descriptive research using quantitative data analysis. Mely G. Tan (in Soejono, 2004: 22) says that descriptive research aims to describe precisely the properties of an individual, circumstances, symptoms or a particular group.

This research method is using Sense-Making that widely used by researchers in the field of communication and information. According to Storm (2006: 37) there are several reasons why Sense-Making is used in research methods, namely:

1. Sense-Making provides a good relationship to users and encourages them to speak.
2. Sense-Making makes it possible to identify problems that first appear not at all related to information systems.
3. Sense-Making provides a more valid description of the possible problems and how they can be resolved, than if the user was asked to suggest improvements to an existing relationship.

According to Spurgin (2006: 102) the Sense-Making approach is a set of meta-theoretical assumptions that lead explicitly to an overall approach for using methodologies that suggest appropriate methods for framing questions, collecting data, and analyzing to arrive at substantive theory. The research methodology uses the Sense-Making approach in framing research questions, data collection techniques, and analysis.

3.4 Research Design

The research methodology framework is shown in Figure 3.1. Every step of the research design is described as follows:

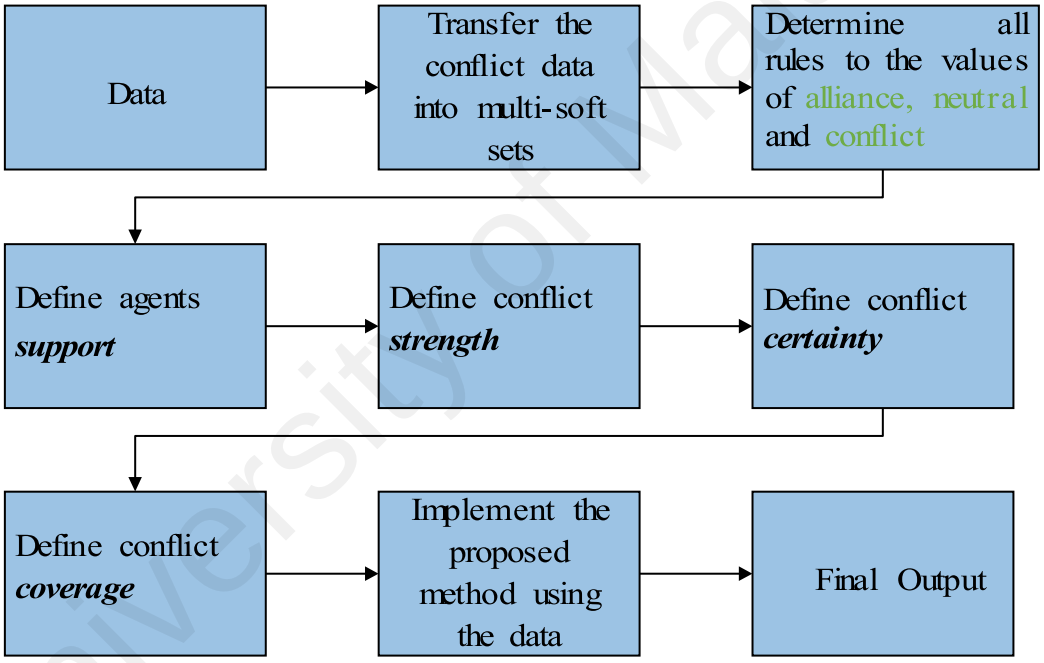

Figure 3.1. Proposed Research Design

Preliminary investigation is required to determine the best opinion about output validation. Therefore, to address these arguments in the domain of conflict analysis model, we compared the output and performances of the two datasets (Pawlak's dataset taken from Pawlak (2005) and real-world Indonesian Parliament dataset). Two datasets are used: the first dataset is used to test the result of proposed model compared with rough set-based model, with the aims to validate the output. If the output is the

same, then the proposed model is valid as generated by rough set model. The second dataset is used to compare the proposed model with rough set-based model in terms of computational time when determining the certainty, coverage, and strength of conflict situations.

The proposed model has three (3) main steps. The first step is transferring the conflict dataset into multi-valued information systems. We generate the table into multi-tables for each party based on conflict situation, followed by the decomposition of a multi-valued information systems into multi-tables Boolean valued. The second step is, in order to express relations among the agents we define three binary relations i.e. alliance (favorable), neutral and conflict (against) among agents in a conflict situations. And the last step is we propose the definition of support, strength, certainty and coverage factors. These three (3) definitions are the main contribution of this research. The complete procedure of the proposed model for the development of conflict analysis based on soft set theory, the pseudo-code is shown in Figure 3.2.

The notion of an information systems, the concept of multi-soft set for representing multi-valued information systems, and the notion of co-occurrence parameter soft set were outlined in this chapter. Development of the alternative conflict analysis model where there is uncertainty about three binary relations, favorable, neutrality, and against among agents in a conflict situation and the pseudo-code for the soft set-approach were elaborated (Sutoyo *et al.,* 2016).

Algorithm: conflict analysis model based on soft set theory
Input: A conflict data set (U, A, V, f)
Output: Support, strength, certainty and coverage of conflict rules

1. Transfer the conflict data set (U, A, V, f) into multi-softsets $(U, A, V_{[0,1]}, f)$
2. Determine all rules to the values of alliance, neutral, and conflict.
3. Calculate support $\text{supp}(u) = \text{card}(\{e \in E : f(u,e) = 1\})$ forall rules.
4. Calculate strength $\sigma(A_1, A_2) = \text{supp}(A_1, A_2) / |U|$ for all rules.
5. Calculate certainty $\text{cer}(A_1, A_2) = \text{supp}(A_1, A_2) / |A_1(x)|_2$ forall rules.
6. Calculate coverage $\text{cov}(A_1, A_2) = \text{supp}(A_1, A_2) / |A_1(x)|_2$ forall rules.

Figure 3.2: The proposed pseudo-code of soft set-approach

3.5 The Operational Definition of Research

There are two kinds of conflict in football game. First, the conflict inside the game among players, referee, supporters, and etc. Second, conflict outside the game among football organization, government, sport committee and etc. Variable of this research is the conflict inside the game at Football association of Yogyakarta.

Starting from the fight among players in the same team, the fight among players with different teams, players attacking supporters, supporters attacking players, players attacked the referee, supporter attacked the referee, until quarrels between coaches.

We built and use questionnaire to interview the agent involved in this football conflict. The questionnaire has been validate by 2 expert judgement from the UTHM lecturer. Moreover we analyze this questionnaire using Cronbach alpha.

3.6 Population and Sample Research

The population in this research is anyone who involved in the football association of Yogyakarta i.e. club management, match inspector, organizing committee, referee, supporter, and player because this province has the most hot and interesting football competition in Indonesia. Yogyakarta has 5 Districts namely Sleman, Bantul, Kulonprogo, Gunung kidul, and Yogyakarta City. Each District has a

football association and football team but in this research we selected 6 people for each 1 chief club management, 1 chief match inspector, 1 chief organizing committee, 1 chief referee, 1 chief supporter, and 1 captain player in order to be fair for each region because each region doesn't have same number of member. Table 3 below shows the detail of the sample of research.

Table 3.1. Research Sample

No.	Yogyakarta City	Sleman	Bantul	Kulon Progo	Gunung Kidul
1	1 Club Manager	1 Club Manager	1 Club Manager	1 Club Manager	1 Club Manager
2	1 Match Inspector	1 Match Inspector	1 Match Inspector	1 Match Inspector	1 Match Inspector
3	1 Organizing Committee	1 Organizing Committee	1 Organizing Committee	1 Organizing Committee	1 Organizing Committee
4	1 Referee	1 Referee	1 Referee	1 Referee	1 Referee
5	1 Supporter Chief	1 Supporter Chief	1 Supporter Chief	1 Supporter Chief	1 Supporter Chief
6	1 Player Captain	1 Player Captain	1 Player Captain	1 Player Captain	1 Player Captain

Each sample will respond to a statement about 5 things that happen in football as follows:

a. player's unsupportive behavior
b. fans riot
c. lack of appropriate facilities and infrastructure
d. unfair referees
e. management of the amateur competition

3.7 Instruments and Data Collection Techniques

1. Instruments

Instruments in this study is using questionnaires that have been tested validity and reliability by using expert judgment from pre experts in the field. According Suharsimi Arikunto (2005: 135), a questionnaire is a number of written questions used

to obtain information from respondents in the sense of a report about his personality or things he knows.

The questionnaires in this study are the statements about a condition of the football conflict that can be shown on the table below:

Table 3.2. Research Questionnaire Grid

Variable	Indicators	Statements number
Football conflict in Yogyakarta	player's unsupportive behavior	1,2,3,4,5,6,7,8,9,10,
	fans riot	11,12,13,14,15,16,17, 18,19,20
	lack of appropriate facilities and infrastructure	21,22,23,24,25,26,27, 28,29,30
	unfair referees	31,32,33,34,35,36,37, 38,39,40
	management of the amateur competition	41,42,43,44,45,46,47, 48,49,50

2. Data Collection Technique

Data collection techniques used in this study is to provide a questionnaire to the respondent to fill each statement according to the appropriate instructions in the questionnaire. Questionnaires in this study is a closed questionnaire with 4 choices of answers, respondents live answer that has been provided, and each item questionnaire is provided four alternative answers. The questionnaire has been validated by 2 expert judgement and analyzed using Cronbach alpha. To be clearer the data collection techniques can be depicted as a graph shown in Figure 3.3 as follow:

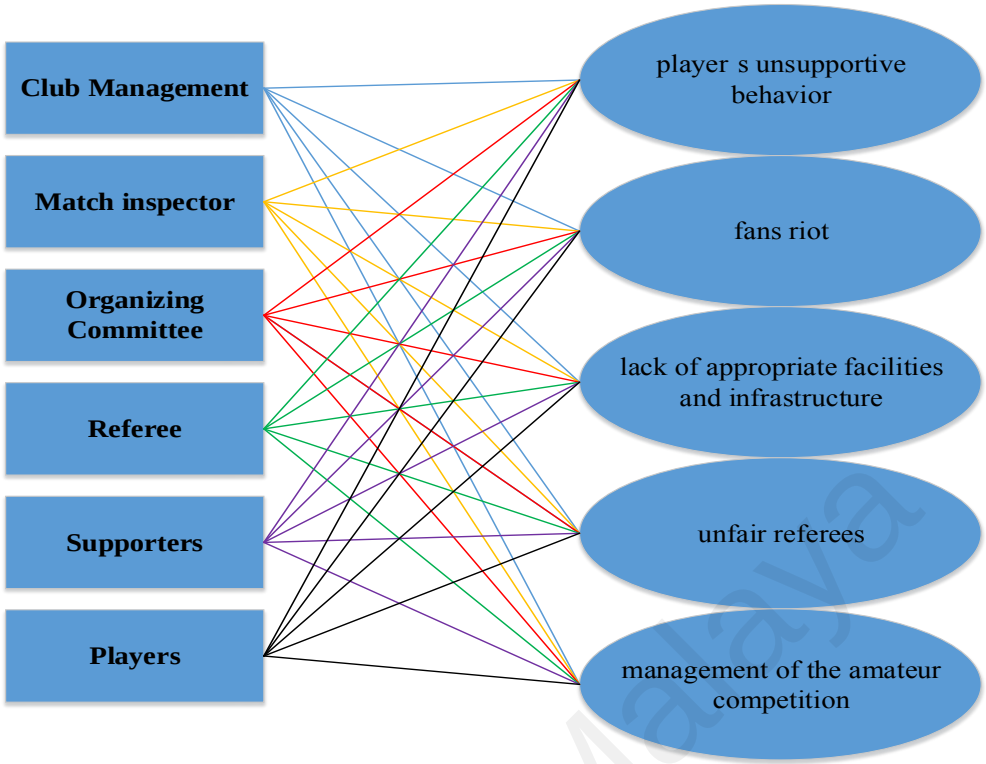

Figure 3.3. Proposed Data Collection Techniques

3.8 Data Analysis

In research, data analysis is an activity after all data has been collected, and is grouped based on variables and types of respondents. The series of research activities, grouping, systematic, interpretation and verification of data so that a phenomenon has social, academic and scientific values packed in the following steps:

1. Compute the agent that is alliance, neutral, or conflict (Sutoyo *et al.,* 2016).

   Alliance: *Let* (F,E) *be multi-soft sets representing a conflict table, two agents* $x,y \in U$, *and* $e \in E$. *The alliance between x and y if and only if* $F_E(x,y)=1$, *where*

$$F_e(x,y)=1, \text{ for } F(e,x)F(e,y)=1 \text{ or } x=y.$$

   This means that, for $F_e(x,y)=1$ agents x and y have the same view about issue e (are associated on issue e).

Neutral: *Let* (F,E) *be multi-soft sets representing a conflict table, two agents* $x,y \in U$, *and* $e \in E$. *The neutrality between x and y if and only if* $F_E(x,y)=0$, *where*

$$F_e(x,y)=0, \text{ for } F(e,x)F(e,y)=0 \text{ and } x \neq y.$$

For $F_e(x,y)=0$, means that at least one agent *x* or *y* has neutral method to issue *e* (is neutral on issue *e*),

Conflict: *Let* (F,E) *be multi-soft sets representing a conflict table, two agents* $x,y \in U$, *and* $e \in E$. *The conflict between x and y if and only if* $F_E(x,y)=-1$, *where*

$$F_e(x,y)=-1, \text{ for } F(e,x)F(e,y)=-1.$$

For $F_e(x,y)=-1$, means that both agents have different views about issue *e* (are in conflict on *e*).

2. Compute the matrix discernibility among agents (Sutoyo *et al.,* 2016)

Let (F,E) be multi-soft sets representing a conflict table. By a discernibility matrix of D in $D \subseteq E$, denoted $M(D)$ is a $n \times n$ sized matrix, where $n=|U|$ and defined as

$$e(x,y)=\{d \in D : d(x) \neq d(y)\}.$$

Thus entry of matrix $M(D)$ i.e. is the set of all attributes which discern agents *x* and *y*. Any entry of the matrix corresponding to agents *x* and *y* provides for those degree of conflict between agents *x* and *y*.

3. Compute conflict function (Sutoyo *et al.,* 2016)

   Additionally require the assessment about views between two agents *x* and *y* with admiration to the situated from claiming issues $D \subseteq E$. To this end, we characterize a work known $\rho_D(x, y)$ as a *clash intersection* defined as follow:

$$\rho_D(x, y) = \frac{|\delta_D(x, y)|}{|D|}.$$

   Clearly $0 \le \rho_D(x, y) \le 1$. If $\rho_D(x, y) \neq 0$ we will say that *x* and *y* are clinched alongside clash in *D* in a degree $\rho_D(x, y)$, and obviously if $\rho_D(x, y) = 0$, *x* and *y* are in coalition over *D*.

4. Compute degree of conflict (Sutoyo *et al.,* 2016)

   Let (F, E) be multi-soft sets representing a conflict table and $D \subseteq E$. As opposed to function ρ we can define function ρ^*, which characterizes separation between agents more accurately, by accepting that separation between agents continuously Previously, conflict will be more terrific over separation between agents which need aid unbiased, i.e.

$$\rho_D^*(x, y) = \frac{\sum_{d \in D} \phi_d^*(x, y)}{|D|}.$$

   where

$$\phi_d^*(x,y)=\frac{1-\phi_d(x,y)}{2}=\begin{cases}0 & \text{if } d(x)d(y)=1 \text{ or } x=y\\ 0.5 & \text{if } d(x)d(y)=0\\ 1 & \text{if } d(x)d(y)=-1 \text{ and } x\neq y\end{cases}.$$

The $\rho(x,y)$ will be called a degree of conflict between x and y. A pair (x,y) is said to be:

d. Allied, if $\rho(x,y)<0.5$

e. In conflict, if $\rho(x,y)>0.5$

f. Neutral, if $\rho(x,y)=0$.

3.9 Summary

There are many aspects of mathematics in football games. The latest in this study is to use mathematical models to analyze conflict in football. Through this research method it is expected to provide an overview of the research design which includes: procedures and steps that must be taken, research time, data sources, and with what steps the data is obtained and then processed and analyzed.

Through this mathematical model, agents can be grouped according to their perspective on an issue. Determination of agent grouping is also based on alliance, neutral, and conflict on an issue. Then a matrix of reliability among agents can also be determined for those with a degree of conflict between agents x and y for example. Finally, through computing the conflict function, the conflict analysis process can be used as a complete recommendation based on a mathematical model.

CHAPTER IV

RESULTS

4.1 **Introduction**

Conflict analysis in the context of football is a tool used to examine, find and formulate the conditions of agents who are involved comprehensively in the framework of development programs including planning, implementation and evaluation. Conflict is about the perceptions and understanding of people about events, policies and institutions. Conflict analysis helps stakeholders to reconsider their perspectives that are more often strongly influenced by emotions, misunderstandings, assumptions, suspicions and distrust. In situations of conflict situations, emotions can easily defeat logic and reality. Because it is important to distinguish opinions from facts. Conflict analysis is not a stand-alone search activity that is closely related to the basic elements and tasks of development and the sustainable pattern of conflict management.

In this section, we present the application of proposed soft set method for handling conflict of Indonesia Super league problem. We compute the relation including alliance, neutral, and conflict. Then we compute the discernibility among agents. After that we compute the conflict function among agents and finally we compute the degree of conflict among agents. The main problem is described in the following section.

4.2 **The Relation Among Agents and Issues Based on The Result of SPSS 23**

In this questionnaire, we use Quantitative Data Analysis to elaborate the result. There are six agents and five issues in football league as described on table 4.1 below:

Table 4.1. Agents Involved and Its Issues

No	Agents	No	Issues
1	Club Management	A	player's unsupportive behavior
2	Match Inspector	B	fans riot
3	Organizing Committee	C	lack of appropriate facilities and infrastructure
4	Referee	D	unfair referees
5	Supporter	E	management of the amateur competition
6	Player		

The viewpoint among above agents toward issues are given on table 4.2 as follow:

Table 4.2. The Viewpoint and the Relation among Agents and Its Issues

No	Agent	Issues	Viewpoint
1	Club Management	A	Neutral
		B	Support
		C	Support
		D	Support
		E	Support
2	Match Inspector	A	Support
		B	Against
		C	Against
		D	Neutral
		E	Neutral
3	Organizing Committee	A	Neutral
		B	Neutral
		C	Against
		D	Neutral
		E	Against
4	Referee	A	Support
		B	Support
		C	Neutral
		D	Against
		E	Neutral
5	Supporter	A	Against
		B	Against
		C	Support
		D	Support
		E	Support
6	Player	A	Against
		B	Support
		C	Neutral
		D	Support
		E	Against

The relationship of each agent to a detailed issue described above can be obviously depicted in the form of table, as shown in Table 4.3.

Table 4.3: Information system for the football game conflict

U/A	a	b	c	d	e
1	0	+	+	+	+
2	+	–	–	0	0
3	0	0	–	0	–
4	+	+	0	–	0
5	–	–	+	+	+
6	–	+	0	+	–

From Table 4.3, for the sake of simplicity, we will write – and + instead of –1 and 1, respectively. The attitude of six agents of football game to the above issues is presented as follow:

a. –1 means, that an agent is against (or conflict),

b. 1 means favorable (or alliance) and

c. 0 neutral toward the issue.

Each row of the table symbolizes exclusively an agent, by his method to the contradicted issues. In conflict analysis principally we are concerned in discovering the relationship between agents taking part in the dispute, and explore what can be done in order to develop the relationship between agents, or in order words how the conflict can be resolved. From Table 3.1, we have objects (agents) are Club Managements, Match Inspector, Referee, Organizing Committee, Supporter, and Player. Characteristics (issues) are player's unsupportive behavior, fans riot, lack of appropriate facilities and infrastructure, unfair referees, and management of the amateur competition. Values of characteristics are all values or opinion of each agent about each issue. From Table 4.3, we have the following values:

$$V_a = V_b = V_c = V_d = V_e = \{-,0,+\},$$

Means that each value of each attribute (issue) has the same values of characteristics i.e. $\{-,0,+\}$

An information system comprehends obvious information about the method of each agent to issues being well-thought-out in the argument, and will be used to obtain several accurate information, essential to conflict analysis. In order to rapid relatives between agents we describe three basic binary relatives on the universe: conflict, neutrality and alliance.

4.3 **Alliance, Neutral, and Conflict**

From Table 4.3, let takes two agents x i.e. match inspector and y i.e. referee, then

$$\phi_a(x) = \phi_a(\text{match inspector}) = 1 \text{ and } \phi_a(y) = \phi_a(\text{referee}) = 1$$

Then, from (1) we have:

$$\phi_a(x, y) = \phi_a(\text{match inspector}, \text{referee}) = 1$$

Therefore match inspector and referee are allied in issue player's unsupportive behavior.

Another example for alliance is between match inspector and supporter on the issue b, then

$$\phi_b(x) = \phi_b(\text{match inspector}) = -1 \text{ and } \phi_b(y) = \phi_b(\text{supporter}) = -1$$

Then, we have

$$\phi_b(x, y) = \phi_b(\text{match inspector, supporter}) = 1$$

Therefore match inspector and supporter are allied on the issue fans riot.

For another example we take 2 agents on the issue c, then

$$\phi_c(x) = \phi_c(\text{referee}) = 0 \text{ and } \phi_c(y) = \phi_c(\text{player}) = 0$$

Then, from (1) we have

$$\phi_c(x) = \phi_c(\text{referee, player}) = 1$$

Therefore, referee and player are allied on the issue lack of appropriate facilities and infrastructure. From Table 3.1, let takes two agents x i.e. club managements and y i.e. match inspector, then

$$\phi_a(x) = \phi_a(\text{club management}) = 0 \text{ and } \phi_a(y) = \phi_b(\text{match inspector}) = 1$$

Then, from (2) we have

$$\phi_a(x) = \phi_a(\text{club management, match inspector}) = 0$$

Therefore, club management and match inspector are neutral on the issue player's unsupportive behavior. From Table 3.1, let takes two agents x i.e. referee and y *i.e.* player, then

$$\phi_a(x) = \phi_a(\text{referee}) = 1 \text{ and } \phi_a(y) = \phi_b(\text{player}) = -1$$

Then, from (3) we have:

$$\phi_a(x) = \phi_a(\text{referee}, \text{player}) = -1$$

Therefore referee and player are in conflict on the issue player's unsupportive behavior.

4.4 **General Conflict Graph on Football**

This conflict graph of above table 4.3 with respect to issue player's unsupportive behavior can be effortlessly illustrated by a graph as shown in Figure 4.1.

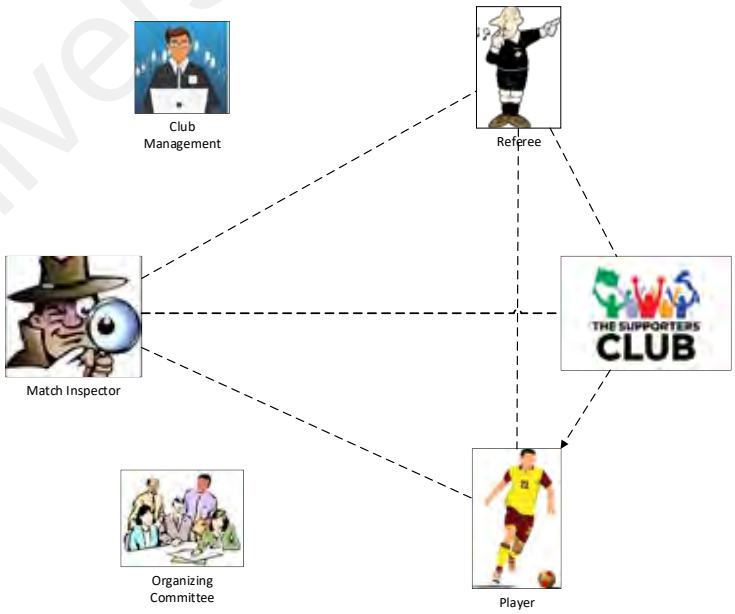

Figure 4.1. Graph of football conflict on issue player's unsupportive behavior

From Figure 4.1 above, apexes of the graph are considered by agents, while branches of the graph are demonstrating relation between agents. Straight lines denote conflicts, dash line denotes alliance and neutrality, for simplicity, is not shown explicitly in the graph. From the Figure 4.1, we can see that:

a. match inspector and supporters are in conflict,
b. match inspector and players are in conflict,
c. Referee and supporters are in conflict,
d. referee and players are in conflict,
e. match inspector and referee are alliance,
f. supporters and player are alliance,
g. Referee and player are alliance, and
h. Club management and organizing committee are neutral

This conflict graph of above table 4.3 with respect to issue fans riot can be effortlessly illustrated by a graph as shown in Figure 4.2.

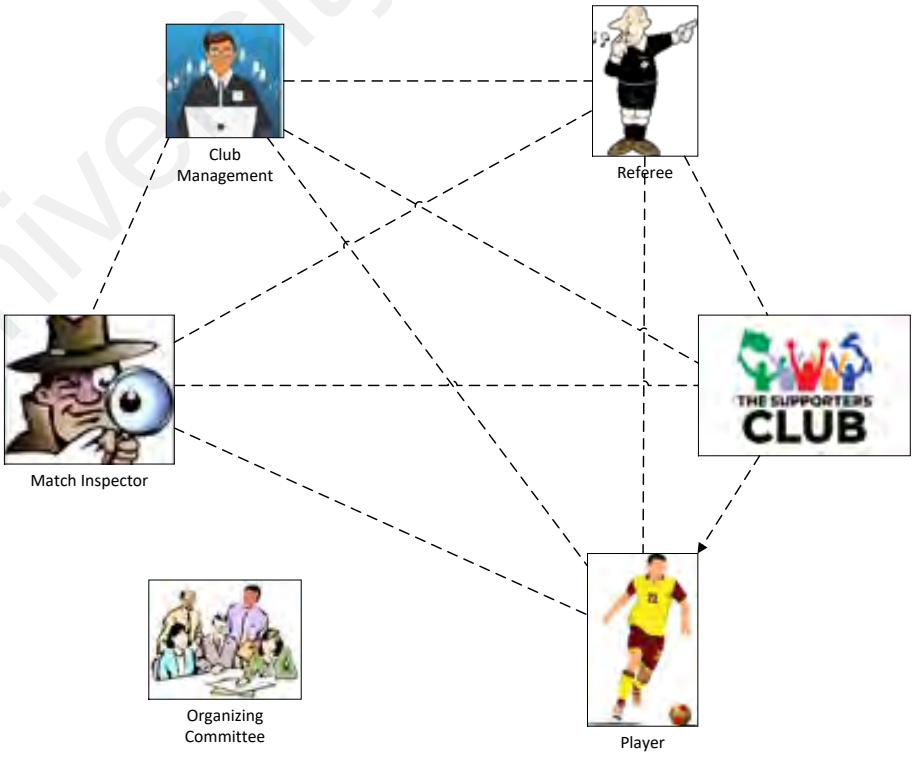

Figure 4.2. Graph of football conflict on issue fans riot

From Figure 4.2 above, apexes of the graph are considered by agents, while branches of the graph are demonstrating relation between agents. Straight lines denote conflicts, dash line denotes alliance and neutrality, for simplicity, is not shown explicitly in the graph. From the Figure 4.2, we can see that:

a. Club management and match inspector are in conflict,
b. Club management and supporter are in conflict,
c. Match inspector and referee are in conflict,
d. Match inspector and player are in conflict,
e. Referee and supporter are in conflict,
f. Supporter and player are in conflict,
g. Club management and referee are alliance,
h. Club management and player are alliance,
i. Referee and player are alliance,
j. Match inspector and supporter are alliance, and
k. Organizing committee is neutral.

This conflict graph of above table 4.3 with respect to issue lack of appropriate facilities and infrastructure can be effortlessly illustrated by a graph as shown in Figure 4.3 below.

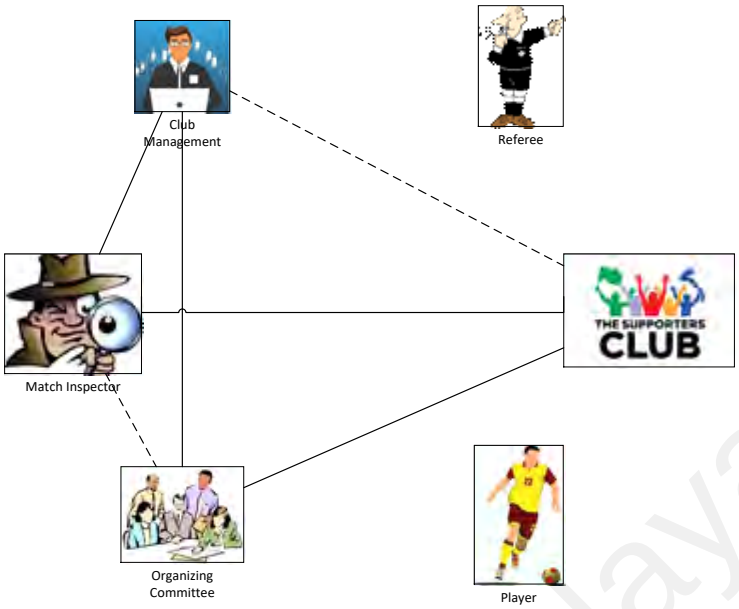

Figure 4.3: Graph of football conflict on issue lack of appropriate facilities and infrastructure

From Figure 4.3 above, same with Figure 4.2, apexes of the graph are considered by agents, while branches of the graph are demonstrating relation between agents. Straight lines denote conflicts, dash line denotes alliance and neutrality, for simplicity, is not shown explicitly in the graph. From the Figure 4.3, we can see that:

a. Club management and match inspector are in conflict
b. Club management and organizing committee are in conflict
c. Match inspector and supporter are in conflict
d. Organizing committee an supporter are in conflict
e. Match inspector and organizing committee are alliance
f. Club management and supporter are alliance
g. Referee and player are neutral

This conflict graph of above table 4.3 with respect to issue lack of unfair referees can be effortlessly illustrated by a graph as shown in Figure 4.4.

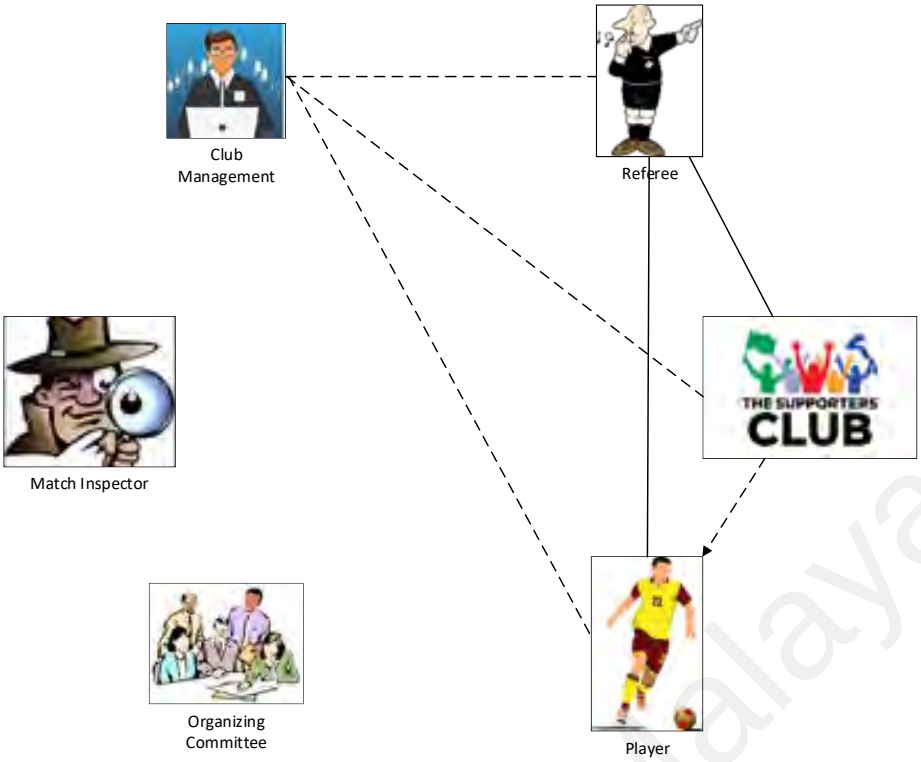

Figure 4.4. Graph of football conflict on issue unfair referees

From Figure 4.4 above, apexes of the graph are considered by agents, while branches of the graph are demonstrating relation between agents. Straight lines denote conflicts, dash line denotes alliance and neutrality, for simplicity, is not shown explicitly in the graph. From the Figure 4.4, we can see that:

a. Club management and referee are in conflict

b. referee and supporters are in conflict

c. referee and players are in conflict

d. club management and supporter are alliance

e. club management and players are alliance

f. supporter and platers are alliance, and

g. match inspector and organizing committee are neutral

This conflict graph of above table 4.3 with respect to issue management of amateur competition illustrated by a graph as shown in Figure 4.5.

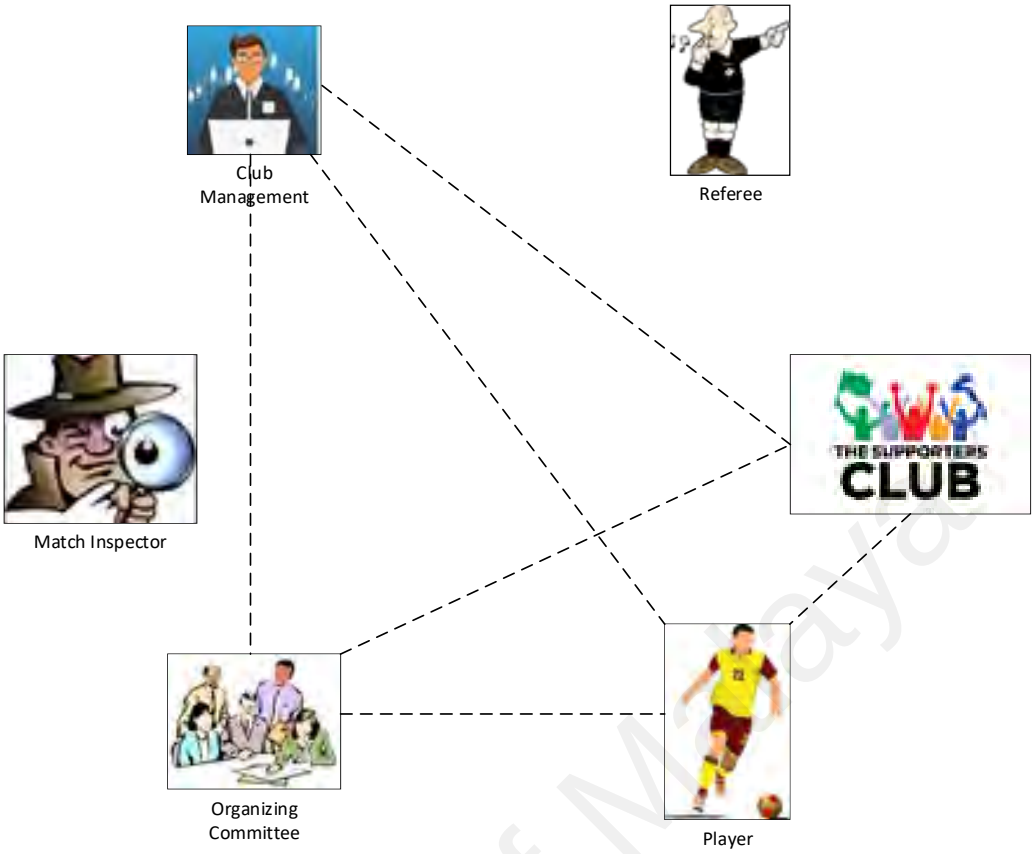

Figure 4.5. Graph of football conflict on issue management of amateur competition

From Figure 4.5 above, apexes of the graph are considered by agents, while branches of the graph are demonstrating relation between agents. Straight lines denote conflicts, dash line denotes alliance and neutrality, for simplicity, is not shown explicitly in the graph. From the Figure 4.5, we can see that:

a. Club management and organizing committee are in conflict

b. Club management and players are in conflict

c. Organizing committee and supporters are in conflict

d. Supporters and players are in conflict

e. club management and supporter are alliance

f. organizing committee and players are alliance

g. match inspector and referee are neutral

4.5 **Discernibility Matrix**

Discernibility matrix based on Equation (4) for the football game conflict above is presented in Table 4.4.

Table 4.4: Discernibility matrix for the Football game Conflict

	1	2	3	4	5	6
1						
2	a,b,c,d,e					
3	b,c,d,e	a,b,e				
4	a,c,d,e	b,c,d	a,b,c,d,e			
5	a,b	a,c,d,e	a,b,c,d,e	a,b,c,d,e		
6	a,c,e	a,b,c,d,e	a,b,c,d	a,d,e	b,c,e	

From Table 4.4, we take the discernibility between agent 1 (i.e. Club Management) and 2 (i.e. Match Inspector). Club Management and Match Inspector have all different opinion of the issues of player's unsupportive behavior, fans riot, lack of appropriate facilities and infrastructure, unfair referees, and management of the amateur competition. For the example, we take club management as agent x and match inspector as agent y on the issue on a. Hence, we have $|\delta_B(x,y)| = 5$, and $|B| = 5$. Therefore, from equation (5), we have

$$\rho_B(x,y) = \frac{5}{|5|} = 1.$$

4.6 **Conflict Function**

All values of conflict function of above case are shown in Table 4.5.

Table 4.5: Conflict function for the football conflict

	1	2	3	4	5	6
1						
2	1					
3	0.8	0.6				
4	0.8	0.6	1			
5	0.4	0.8	1	1		
6	0.6	1	0.8	0.6	0.6	

From Table 4.5, we can see that the highest conflict function on football conflict is on the level 1 and the lowest conflict function is on the level 0.4. For the example, we have agent 5 (Supporter) and agent 6 (Player). On the issue of *a* (player's unsupportive behavior) both agents are in alliance (1), on the issue on *b*(fans riot) both agents are conflict (−1), on the issue on *c*(lack of appropriate facilities and infrastructure) both agents are neutral (0), on the issue of *d* (unfair referees) both agents are in alliance (1), and on the issue of *e* (management of the amateur competition) both agents are conflict (−1). Therefore, we have the distance value using equations (6) and (7) as follow:

On the issue *a* for agents 5 and 6, we have

$$\phi_a^*(5,6) = \frac{1-\phi_a(5,6)}{2} = \frac{1-1}{2} = 0 \text{, then } \rho_B^*(x,y) = \frac{\sum_{a\in B}\phi_a^*(x,y)}{|B|}, \quad \rho_B^*(5,6) = \frac{0}{|5|} = 0$$

.

On the issue *b* for agents 5 and 6, we have

$$\phi_b^*(5,6) = \frac{1-\phi_b(5,6)}{2} = \frac{1-(-1)}{2} = 1 \text{, then } \rho_B^*(x,y) = \frac{\sum_{a\in B}\phi_a^*(x,y)}{|B|},$$

$$\rho_B^*(5,6) = \frac{1}{|5|} = 0.2 .$$

On the issue c for agents 5 and 6, we have

$$\phi_c^*(5,6) = \frac{1-\phi_c(5,6)}{2} = \frac{1-0}{2} = 0.5 \text{ , then } \rho_B^*(x,y) = \frac{\sum_{a\in B}\phi_a^*(x,y)}{|B|},$$

$$\rho_B^*(5,6) = \frac{0.5}{|5|} = 0.1 .$$

On the issue of d, we have

$$\phi_d^*(5,6) = \frac{1-\phi_d(5,6)}{2} = \frac{1-1}{2} = 0 \text{ , then } \rho_B^*(x,y) = \frac{\sum_{a\in B}\phi_a^*(x,y)}{|B|}, \quad \rho_B^*(5,6) = \frac{0}{|5|} = 0$$

.

On the issue of e,

$$\phi_e^*(5,6) = \frac{1-\phi_e(5,6)}{2} = \frac{1-(-1)}{2} = 1 \text{ , then } \rho_B^*(x,y) = \frac{\sum_{a\in B}\phi_a^*(x,y)}{|B|},$$

$$\rho_B^*(5,6) = \frac{1}{|5|} = 0.2 .$$

4.7 **Degree of Conflict or Distance Function**

Finally, the distance values of agents 5 (Supporter) and agent 6 (Player) to all issues is:

$$0 + 0.2 + 0.1 + 0 + 0.2 = 0.5.$$

The same procedure as above i.e. using equations (6) and (7), the entire distance between two agents in Table 3 can be shown in Table 4.6 as follow:

Table 4.6: Distance function for the football conflict

	1	2	3	4	5	6
1						
2	0.7					
3	0.6	0.3				
4	0.5	0.4	0.5			
5	0.3	0.6	0.7	0.8		
6	0.4	0.7	0.4	0.5	0.5	

Certainly, this distance values between two agents replicates more accurately differences between views of agents than another agent. Utilizing equations (6) and (7) provides conflict introduced in Table 8which can be depicted as a graph shown in Figure 4.6 as follow.

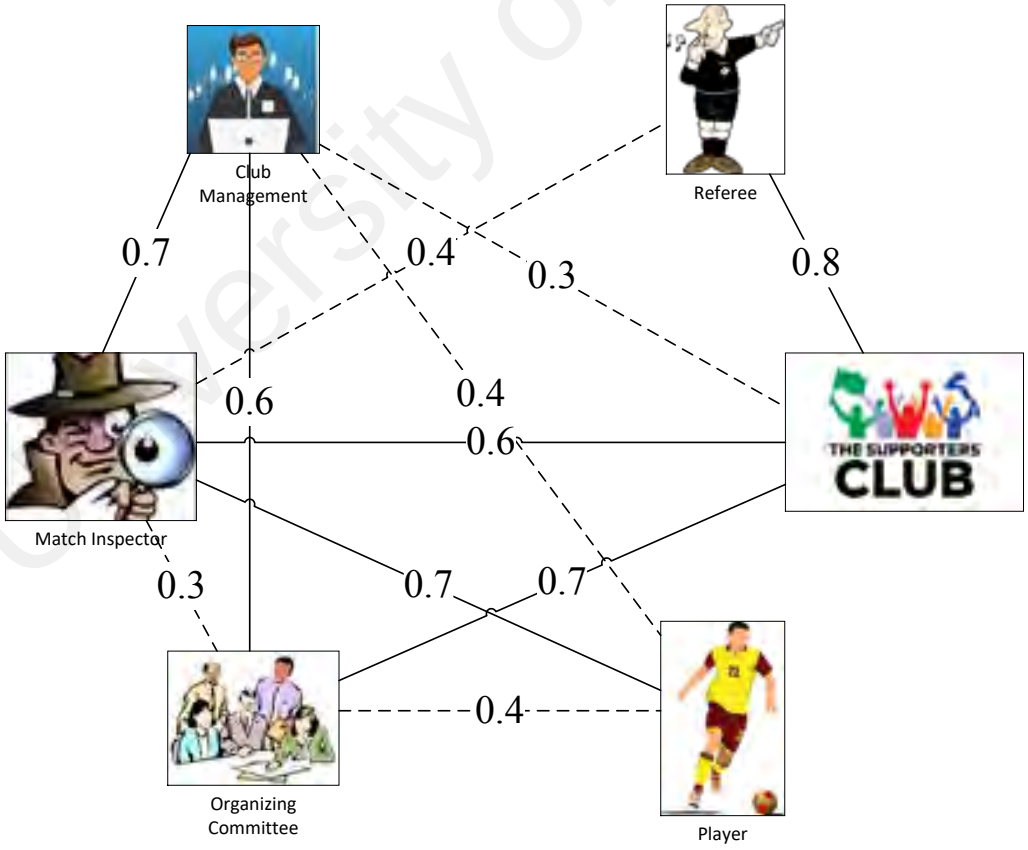

Figure 4.6: Conflict between two agents in football game

From Figure 4.6 above and based on equation (8), it can be seen that the highest degree of conflict in football is between referee and supporter. Whereas there are 5 pairs of agent with the value less than 0.5 that means the agents are alliance i.e. between match inspectors and organizing committee, match inspector and referee, club management and supporter, club management and player, and organizing committee and player. Meanwhile, there are 6 pairs of agent with the value more than 0.5 that means the agents are in conflict i.e. club management and match inspector, club management and organizing committee, match inspectors and supporter, match inspector and player, referee and supporter, and supporter and organizing committee.

4.8 **Summary**

The study of conflict is closely related to the efforts of the Indonesia Football Association in building harmonization between stakeholders and conflict prevention in the implementation of football leagues. The conflict study is intended to describe the overall pattern of strength of inter-group relations, social vulnerability, group cohesiveness, as well as the driving and inhibiting factors of peace as inputs in formulating program policies and strategies. Specifically this activity aims:

1. Identify the strength of relationships between agents involved in the development program
2. Identify social conditions that cause gaps between groups or between agents.
3. Identify the drivers and breakers of peace in society; and
4. Formulate strategies for handling and preventing conflict and establishing peace in an integrated future.

CHAPTER V

DISCUSSION

5.1 Introduction

The main purpose of this research is to propose an alternative soft set theory where there is uncertainty about three binary relations, alliance, neutrality, and against among agents in a conflict situation. Conflict analysis were conducted to ascertain the appropriate data standardization method in order to achieve the following objectives as stated in section 1.5:

1. To propose soft set theory as an alternative method in handling conflict of football league.
2. To discover and explain the relationship among agents involved of the conflict of football league.
3. To identify the degree of the conflict among the agents of football league.

5.2 Findings and Discussion

5.2.1 Soft Set Theory

Many studies proved that soft-set theory has been implemented for analyzing the conflict. In Indonesia, soft-set theory has been implemented to analyze the conflict among political parties in parliament. In this study, we initiated that we can analyze the conflict in football using soft-set theory. Then finally, we can prove that the soft-set theory can be applied to analyze the conflict in football combined with computer generated and mathematical model. Soft set theory can provide significant method in analyzing football conflict using mathematical model. Soft set theory can elaborate both the issue and agents involved in football conflict. Soft set theory can identify the relationship among agents involved the conflict. Soft set theory can classify both issue and agent in football conflict. Soft set theory can analyze the degree of the conflict on the football league. Soft set theory can calculate the degree of the football conflict. It

is confirmed that soft set theory can be used as a method to identify football conflict in Indonesia Super league.

5.2.2 The Degree of Conflicts among Agents

In this sub-section, the main findings with regard to the objectives are analyzed and summarized based on the findings of the studies in this thesis. This will be followed by a discussion of the findings and their linkages to the existing literature and research in order to ensure whether this proposed method supports or contradicts the existing conflict analysis method, particularly conflict analysis based on rough set theory.

The primary objective of this thesis was to propose soft set theory as an alternative method in handling conflict of football league. A comparison of the proposed method and rough set theory is the goal of the conflict analysis. We evaluated the performance in terms of computational time when determining the strength, certainty, and coverage factors of conflict situations.

Since standard soft set theory only deals with a binary-valued information systems, the step began by transferring the conflict dataset into multi-valued information systems. We generated the table into multi-tables for each party based on conflict situation, followed by the decomposition of a multi-valued information systems into multi-tables Boolean valued. An information systems contain explicit information about the attitude of each agent toward issues being considered in the discussion, and will be used to develop various implicit information, required for the conflict analysis (Pawlak, 1998a). In order to express relations among the agents we defined three binary relations i.e. alliance/favorable, neutral and conflict/against among agents in a conflict situations.

After comparing two experiments by using artificial and real-world dataset to calculate the strength, certainty and coverage factors, the results showed that the

proposed method generates exactly the same decision output with conflict analysis based on rough set theory, but performs better in determining the strength, certainty, and coverage factors in terms of computational time. The improvement of proposed method is up to 5.8%, 15%, 13.8% when determining the strength, certainty, and coverage factors, respectively. The outstanding performance of soft set theory over the rough set theory is not a surprise from the literature point of view (Chen et al., 2005; Kong et al., 2008; Ma et al., 2014, 2011). This is agent due to the fact that the soft set theory uses parametrization sets as it is main vehicle.

From Tables 4.3 and 4.6 in chapter 4, we will focus to give recommendation on the agents who are in conflict. *Firstly*, the conflict between referee and supporter, the value of distance function shows that these agents have the value of 0.8; it means there are 5 obvious different opinions between these agents. Although referee is an independent institution, referee must be able to cooperate with the club management to overcome the problems that exist in the football association of Yogyakarta. These agents should overcome the problem happens to be solved together instead of accusing or defending themselves. *Secondly*, the conflict between club management and match inspector, the value of distance function shows that these agents have the value of 0.7, it means there are same 5 obvious different opinions between these agents. Football association of Yogyakarta must precisely consider the arising problems from the viewpoint of the match inspector and club management; the Chief of Football Association of Yogyakarta should be the wisest man in mediating the problems occurred. *Thirdly*, the conflict between Match Inspector and player. The value of distance function shows that these agents have the same value of 0.7; it means these agents are the obvious conflict. Match inspector should be a good partner and supervisor for all agenda of Football Association of Yogyakarta and they should overcome the problem happens to be solved together. *Fourthly*, the conflict between

organizing committee and supporters, the value of distance function shows that these agents have the value of 0.7, it means these agents are in conflict as well. Ironically, organizing committee are the holder for the football competition in Yogyakarta, they should not be conflict, they must work together to find a formula to be given to the Football Association of Yogyakarta to resolve the issues. Lastly, the conflict between Match Inspector and Supporters, match management and organizing committee, and match inspector and supporter should not be happen because the distance function shows that they are only in slightly conflict. Club management, organizing committee, match inspector, and referee are the same position with the supporter. They should become a partner and make a good cooperation to solve the issue on Football Association of Yogyakarta. To sum up, Football Association of Yogyakarta is an independent institution, no one can intervene this organization, but Football Association of Yogyakarta is the branch of Football Association of Indonesia (PSSI) and PSSI is exist in Indonesia. So, PSSI must be able to merge and harmonize the regulations that applied from FIFA and the government of Indonesia.

From Table 4.3, we need to focus to solve on issue *a, b, c d,* and *e* i.e. player's unsupportive behavior Issues of Football Association of Yogyakarta, fans riot of Football Association of Yogyakarta, issue of appropriate facilities and infrastructure, and unfair referees and management of amateur competition because most of the agents agree that the problem is actually happening.

5.3 Summary

From the discussion of this chapter, several experiments test have been done successfully. An illustrative example on how to handle conflict using multi soft sets is presented. Furthermore, the proposed approach of real world dataset of several issues in Indonesia Super League Competition. Overall results particularly in handling

uncertainty, this approach showed better achievement in terms of computational time when determining the strength, certainty, and coverage factors of conflict situations.

CHAPTER VI

CONCLUSION

6.1 Introduction

This chapter explained the outcome of the research, summary of the results limitations of the current research and future work. As a result, the objectives of the research have been attained. The main purpose of this research is to propose an alternative conflict analysis based on soft set theory. Despite the fact that the objectives of the research have been achieved, further improvement is required. It is possible to extend and improve the model by considering the suggestion as stated in Future Work. Therefore, it is suggested to carry out further research to improve the functionality of this work and deal with the real conflict problems more clearly.

6.2 Recommendation

The implementation of this research starting from the beginning to the end produces the following findings:

1. Referee

Referees have always been the main spotlight throughout the league. That is not because of his physical ability and not because of understanding the laws of the game, this is because there are still few referees who have integrity. PSSI needs to run Referee Development Discussion by inviting Former FIFA referee and AFC Referee Director. Referee development is only a small part of the development of football, but has a considerable influence on the development of football itself. Like in a football team that has a coach, the referee must also have a coach. The Indonesian referee must also have a coach. The referee must know everything in the Laws of the Game correctly so that in leading the match, he often does not make mistakes. In conclusion, three things are needed to improve referee competence in Indonesia, namely assessment system,

education program, and communication system. But to help maintain and improve the integrity of the referee should also be the duty of the club. The task of an assessor helps to improve referee competence, but integrity must be the duty of all parties including federations, league operators, and clubs (management and teams) to make referees have integrity so that they can improve the quality of the league.

2. Facilities

Indonesian football is still lagging behind other countries in Asia. The main cause is the lack of adequate infrastructure to support player activity. The main problem in football facilities in Indonesia is the quality of the field and lighting. Therefore, starting in 2017 for 4 years FIFA has provided assistance to improve the quality of football infrastructure in Indonesia.

3. Players

Fighting between players, beatings against referees, and unsportsmanlike games are still characteristic of football in Indonesia. This is because players only learn about hard skills without being balanced with soft skills. The players need to be taught how to face the facts when they lose, respect for referees and opponents, and not easily bribed.

4. Club Management and Supporters

There are 3 points to stop the problem of riots between supporters that still often occur in Indonesia: First, there must be a broad change in security politics. How organizers are responsible for activities that bring in a lot of people. Don't just hand it over to the police. Second, how to foster attitudes and behavior towards football fan communities. Third, the importance of a database that is expected from population data collection. There must be a change in legal politics from the affairs of population data collection. For example, using this identity card database can be used in designing ticket patterns and seating patterns, based on personal data.

6.3 Implications

This research has several implications as follows:

1. Conflict analysis in the context of Football is a tool that is used to examine, find and formulate the conditions of agents who are involved in a comprehensive manner within the framework of a development program including planning, implementation and evaluation. Conflict is about people's perceptions and understanding of events, policies and institutions. Conflict analysis in this study helps stakeholders to reconsider their perspectives, which are more often strongly influenced by emotions, misunderstandings, assumptions, suspicions and distrust. In conflict situations, emotions can easily defeat logic and reality. Therefore it is important to distinguish opinions from facts. Conflict analysis is not a stand-alone search activity that is closely related to the main elements and tasks of development and sustainable conflict management patterns.
2. Mathematical models in analyzing conflict are able to elaborate and classify parts of the problem more comprehensively. This study makes it easier for policy makers to find the source of the problem and take a policy to resolve the problem in accordance with the degree of conflict. This mathematical model can prevent the spread of problems so that the conflicts that occur are not greater and can be overcome immediately.

Conflict analysis is a comprehensive picture of the state, intensity pattern, and character of the agents involved which includes the strength of relations between stakeholders that affect the achievement of development goals and the efforts of peaceful development. The study of conflict dynamics is a series of community data collection, processing and formulation activities that include understanding the context, interaction, intervention, actors, problems in the formulation of development

programs. Through this conflict analysis we can examine and hold negotiations with parties who are experiencing problems more systematically.

6.4 Future Work

The author strongly believes that the proposed method in this thesis highly improves not only the quality of computational time when determining the certainty, coverage, and strength of conflict situations but also has established an extension of soft set theory in the domain of conflict analysis. Based on the results of this thesis and the existing limitations, the research and development can be resumed in the future, such as:

1. This conflict analysis model based on soft set theory only have three attitudes, i.e. in alliance, neutrality and against with respect to the conflict issues. In the future work, this proposed method can be combined with other mathematical tools to soften the agent's attitude toward the conflict issues in order to describe the real conflict problems more clearly.
2. The proposed method can be used by other researchers and practitioners in other real life of conflict analysis.

6.5 Conclusion

It is well known that conflict analysis has been used to handle problems in the fields of military, politics, business & management, urban planning, and etc. The analysis provides us solution to handle conflict situation among agents involved. Rough set theory, a mathematical approach in computational science has been exists for handling conflict situation. In this paper, we have presented another view to handle conflict based on some idea from a new mathematical model, so called soft set theory. It is based on the fact that every rough set is a soft set. We sub-sequentially have also derived an alternative method to handle conflict in view of the idea of conflict issue existence as well as the related algorithm from the point of view soft set theory. We

have delineated the proposed method for an instructional example of football conflict situations. Moreover, we have elucidated the proposed method on real conflict situation of Indonesia football super league. We have shown that, the proposed method can be used to handle conflict and finally make recommendation to the football agents.

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LIST OF PUBLICATIONS AND PAPERS PRESENTED

No.	Type	Presenter	Supervisor	Event	Status
1	Intl. Journal	Kukuh Wahyudin Pratama	Assoc. Prof. Dr. Salleh bin Aman	Journal of Quantitative Analysis in Sports	Submitted
2	Conference	Kukuh Wahyudin Pratama	Assoc. Prof. Dr. Salleh bin Aman	Global Research Conference (GRaCe 2020)	Submitted