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Paper Distribution Decision for Multi-Journal System

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Abstract: Some universities formed a consortium named CORIS. One of CORIS' main roles is facilitating the paper exchanging to publish among its members' journals. This activity is purposed to increase the participation of their lecturers in writing paper, to increase the availability of paper to publish in their journals and to increase the number of institutions where their paper's authors comes from. CORIS helps the researchers by distributing the paper from a university's author to be published to the other university members' journal. As a distribution problem is occured by the current manual management, an information system management for paper distribution to member's journal is need to be built. This study proposes a process of paper targetting by using TOPSIS ranking method. The result to be explained is an analysis of paper distribution selection model using TOPSIS. This paper also explains some designs in the form of flowchart system, data flow diagram and table relation.

Key words: Paper distribution, multi-journal management, TOPSIS, decision support system, data flow diagram

INTRODUCTION

Cooperation Research Inter University (CORIS) is a consortium of informatic university in Indonesia. By the end of 2015, the CORIS' member are consisted of: STMIK AMIKOM Yogyakarta, Potensi Utama Medan University, STMIK STIKOM Bali, STMIK Pontianak, STMIK Tasikmalaya and STMIK Dipanegara Makasar. Each of the CORIS' member has a scientific journal in informatics discipline.

One of CORIS's activities is paper exchanging between the member. This activity is purposed to increase the writer participation from university member in writing paper in order to increase research rank and all the member's journal can obtain the paper source.

Paper exchanging is coordinated by CORIS' secretary. This coordination is purposed to ensure the papers are distributed evenly between the members journal. Coordination is also purposed to ensure that every journal edition can obtain paper from 3 provinces. This is to fulfil the requirement of a journal to become a national journal.

The distribution of timeline and paper number of every journal is shown in Table 1. Every month a university member is required to send 3 papers to CORIS secretary. The secretary has obligation to distribute to each journal management with regard to:

- The shortest published time, so the writer waiting time will not too long
- Each journal gets enough paper every publishing
- Each journal gets paper from >3 provinces

To motivate the activity of the consortium members, a journal publication that still not regular or the university still not sending paper regularly will be given punishment by with holding the distribution to the journal.

During this time the delivery is done manually using email to the secretariat of CORIS. CORIS secretary officers decide the target of each paper journal manually and send it the management of journal destination. The destination journal will process the paper by reviewing it and report the paper status to the CORIS secretary.

In this way, there are often complains raised from the member that the distribution is still not fair. Sometimes also there are papers that even does not distributed. In addition, the position and status tracking process of a paper are also less effective. Therefore, this study creates a system to collect and manage the distribution of paper in CORIS secretary to member's journals. This system is named Coris Paper Distribution System (CoPaDiS).

The journal management system have been many times produced, such as by using the Open Journal Systems (OJS) (Huang *et al*., 2009), CINDI Online Journal System which is a sub system of Concordia Indexing and

Table 1: Paper count needed for every journal

		Count of paper in a month											
Journal code	Journal	1	2	3	4	5	6	7	8	9	10	11	12
J1	CITEC	-	7	-	-	7	-	-	7	-	-	7	-
J2	SISFOTENIKA	8	-	-	-	-	-	8	-	-	-	-	-
J3	Eksplora Informatika	-	-	10	-	-	-	-	-	10	-	-	-
J4	JUSITI	-	-	-	10	-	-	-	-	-	10	-	-
J5	CSRID	-	6	-	-	-	6	-	-	-	6	-	-
J6	VOI	8	-	-	-	-	-	8	-	-	-	-	-

Discovering (CINDI) (Zhao *et al*., 2011) and CONFSYS. Such systems are used to manage one or several journals with each journal will be managed by the journal's editor. They have the function of sending paper by the authors and the delegation of tasks rewiew paper to a qualified reviewer. The results of the reviews will be automatically visible to the author and editor. Paper that has been accepted may be published on the page of the system.

In contrast to the OJS, Cyndy and CONFSYS that focus on the review process, CoPaDis focus on the distribution of paper to each journal member with the limitations in the distribution of the CORIS secretary.

Literatur review: To decide the target of a paper, CoPaDis will rank the CORIS member journals. Many methods can be used to rank, such as Analythical Hierarchy Process (AHP) (Voola and Babu, 2013; Thomtsis *et al*., 2014), Simple Additive Weight (SAW) (Qu *et al*., 2013; Khan, 2015), Weight Product (WP) (Wang *et al*., 2010), PROMETHEE (Karim *et al*., 2011) and Technique for Order Preference by Similiarity to Ideal Solution (TOPSIS) (Khan, 2015).

The method to be used in measuring rank is TOPSIS. This method has been frequently used in creating ordered rank such as to improve scenarios for patient flow of the emergency department of a governmental hospital in Tehran, Iran in order to reduce waiting times of patients (Eskandari *et al*., 2011), to set requirements prioritization of software development (Kukreja, 2013) and to assess site selection of new towns (Asadzadeh *et al*., 2014).

MATERIALS AND METHODS

TOPSIS method is a technique for order preference by similarity to ideal solution (Sevkli *et al*., 2010). The ideal solution (also called positive ideal solution) is a solution that maximizes the benefit criteria and minimizes the cost criteria, whereas the negative ideal solution (also called anti ideal solution) maximizes the cost criteria and minimizes the benefit criteria. So the main principle of TOPSIS method is to get alternative with highest criteria benefit value and lowest criteria cost value. Alternatives that will be recomended by TOPSIS is the one that has smallest distance with positive ideal solution and the one that has highest distance with negative ideal solution.

Suppose a MCDM problem has m alternatives (A1, A2,... Am) and n decision criteria (C1,C2, ..Cn) with criteria weight of (w1, w2 ..wn). The ordering steps in TOPSIS method is explained as (Cui *et al*., 2011):

Step 1: Calculate the normalized decision matrix. The normalized value of xij, rij, can be calculated by:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \left(i = 1,2,...,m, j = 1,2,..,n\right) \quad (1)$$

Step 2: Establish the weighted normalized decision matrix. The weighted normalized value of rij, vij, is obtained using Eq. 2:

$$v_{ij} = w_j r_{ij} \left(i = 1,2,...,m, j = 1,2,..,n\right) \quad (2)$$

Where:

W_j = Weight of the j-th criteria

Step 3: Calculate the positive ideal and negative ideal solution.Denoting the positive ideal solution as A^+ and the negative ideal solution as A^-:

$$A^+ = \left\{\left(\max v_{ij}, j \in J\right), \left(\min v_{ij}, j \in J', i \in m\right)\right\} = \left[v_1^+, v_2^-, ..., v_n^+\right] \quad (3)$$

$$A^- = \left\{\left(\min v_{ij}, j \in J\right), \left(\max v_{ij}, j \in J', i \in m\right)\right\} = \left[v_1^+, v_2^-, ..., v_n^+\right] \quad (4)$$

J and J' are the associated benefit criteria and cost criteria, respectively.

Step 4: Determine the separation measures, using the Euclidean distance. The separation of each alternative from the positive ideal solution, d_i, is represented as

$$d_i^+ = \sum_{i=1}^{n} \left(v_{ij} - v_i^+\right)^2 (i = 1,2,....m) \quad (5)$$

Similarly, the separation from the negative ideal solution, d_i represented as:

$$d_i^- = \sum_{i=1}^{n} \left(v_{ij} - v_i^+\right)^2 (i = 1,2,....m) \quad (6)$$

Step 5: Calculate the relative closeness to the ideal solution. The relative closeness of alternative Ai with respect to the positive ideal solution is defined as

$$C_i^+ = \frac{u_i}{d^+ + d^-} (i = 1,2,...,m) \quad (7)$$

Step 6: Rank the preference order in the descending order of C_i. The best alternative is the first one

RESULTS AND DISCUSSION

CoPaDis has some kind of privileges that is: admin author journal manager CORIS secretary dan CORIS adviser. The admin is given the privilege to manage user data. The author is given the privilege to do registration, journal submitting, communicating about his/her submitted paper and to see information about his/her paper status. The journal manager is given the privileges to send the paper, communicating with the author, communicating with CORIS secretary, to see the status of the paper and to see the paper recap. The CORIS secretary is given the privilege to allocate paper, to do communication with journal manager, to see journal status and to see paper recap. CORIS adviser is given the privilege to see journal status and to see paper recap. The paper reviewing, editing and publishing process are not managed in this system.

Flowchart system of CoPaDis is illustrated in Fig. 1 and data flow diagram of CoPaDis is illustrated in Fig. 2. Based on Fig. 2, there are few places are required for storing data in CoPaDis they are paper, author, journal, criteria and grade table. Table relation that is used in CoPadis System is shown in Fig. 3.

The process of paper allocation by CORIS secretary is supported by the advise from paper allocator module. Paper allocator will rank the target journal by using TOPSIS regarding the criteria entried by CORIS secretary. The criteria is currently used is shown in Table 2.

The value calculation query results from every alternatives are then placed in a matrix. As an illustration, supposed the data in the matrix are shown Table 3.

ased on the data in Table 3, the selection of journal alternative for a paper is explained as:

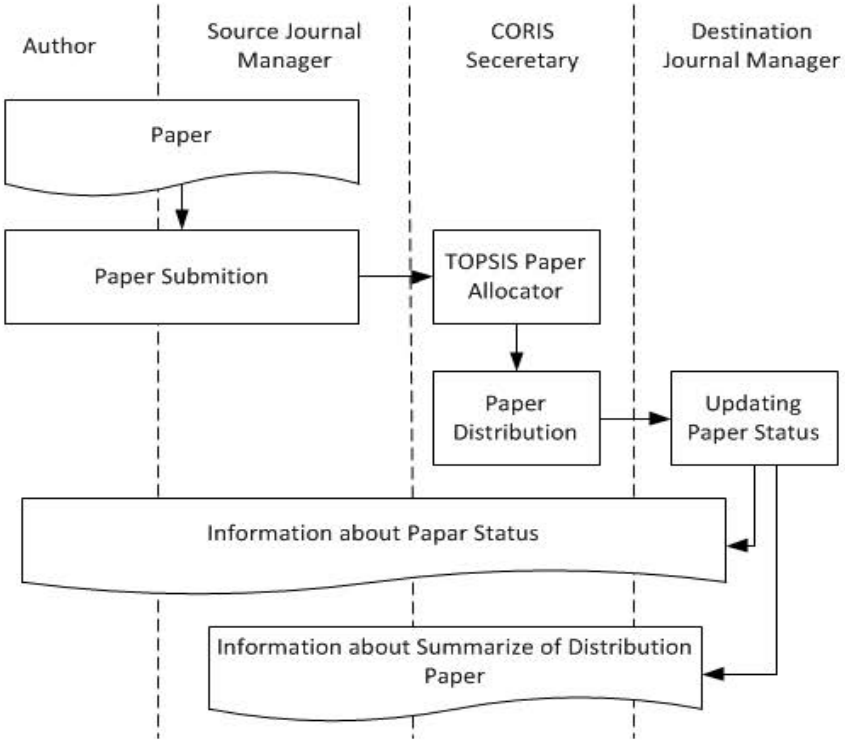

Fig. 1: Flow chart system CoPaDis

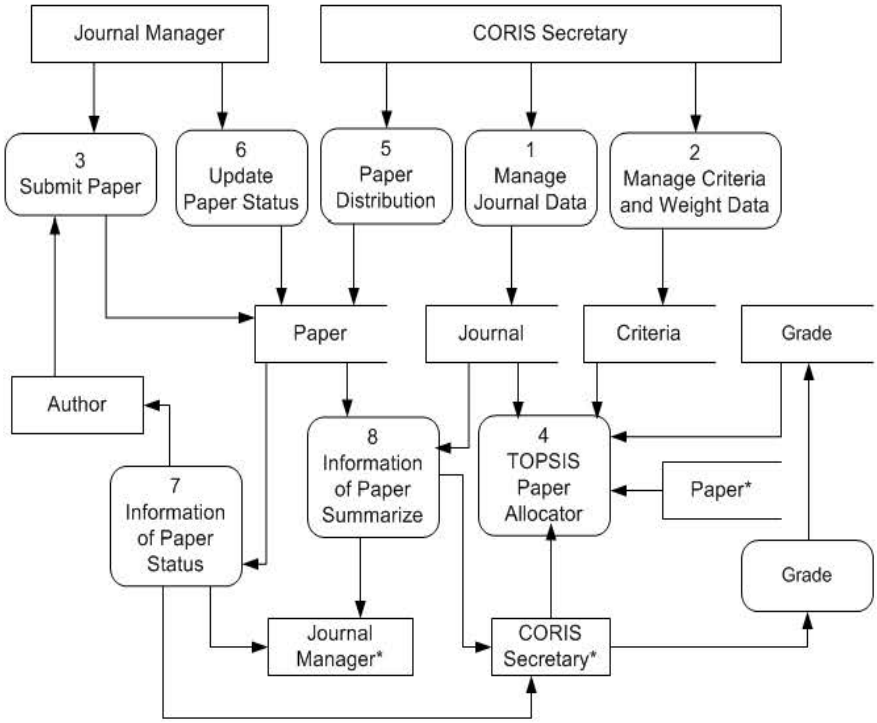

Fig. 2: Data flow diagram CoPaDis

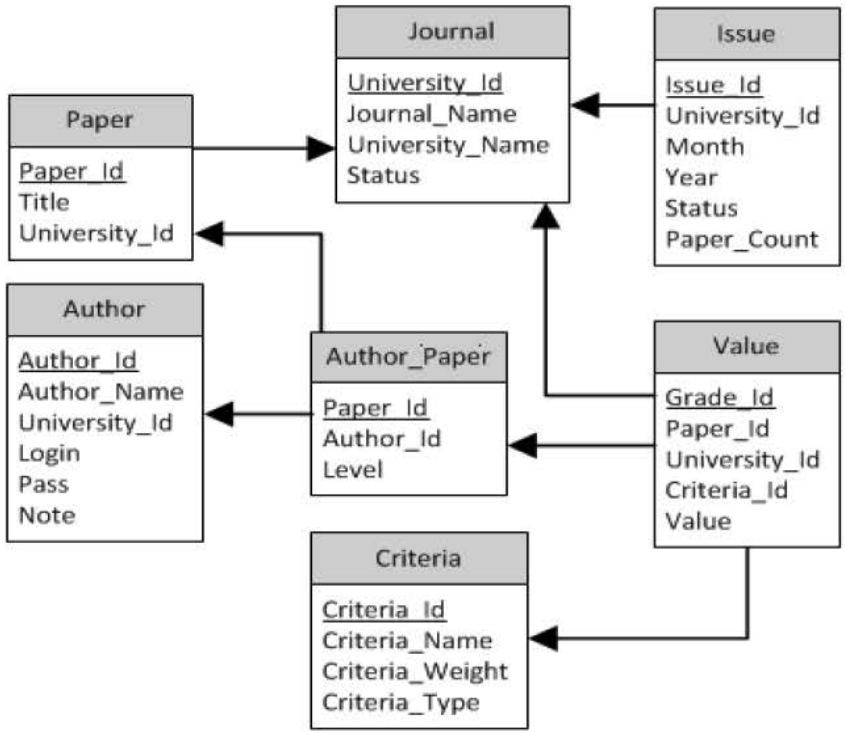

Fig. 3: CoPaDis relationship table

Table 2: Paper distribution criteria

Code	Criteria	Weight	Type
C1	Paper needed in nearest period	3	Benefit
C2	Time to publish	5	Cost
C3	Count of paper from the same university's	5	Cost
C4	Count of paper from the same authoer in one publication	5	Cost
C5	Average processing time	3	Cost

Table 3: Decision alternatives criteria matrix

	Criteria				
Alternative	C1	C2	C3	C4	C5
J1	2	3	2	1	2
J2	4	2	1	1	3
J3	3	3	2	0	2
J4	3	5	2	0	3
J5	5	6	1	0	4
J6	6	2	2	1	4

Table 4: Decision table matrix

	Criteria				
Alternative	C1	C2	C3	C4	C5
J1	0.20	0.32	0.47	0.58	0.26
J2	0.40	0.21	0.24	0.58	0.39
J3	0.30	0.32	0.47	-	0.26
J4	0.30	0.54	0.47	-	0.39
J5	0.50	0.64	0.24	-	0.53
J6	0.60	0.21	0.47	0.58	0.53

Table 5: Weighted normalized decision matrix

	Criteria				
Alternative	C1	C2	C3	C4	C5
J1	0.60	1.61	2.36	2.89	0.79
J2	1.21	1.07	1.18	2.89	
J3	0.90	1.61	2.36	-	
J4	0.90	2.68	2.36	-	
J5	1.51	3.22	1.18	-	
J6	1.81	1.07	2.36	2.89	

Table 6: Separation from ideal solution

Alternative	d^+	d^-	C_i
J1	3.39	1.79	0.35
J2	2.98	2.55	0.46
J3	1.58	3.41	0.68
J4	2.22	2.98	0.57
J5	2.30	3.25	0.58
J6	3.22	2.46	0.43

- Calculate the normalized decision matrix by using Eq. 1. The result is shown in Table 4
- Establish the weighted normalized decision matrix by using Eq. 2. The result is shown in Table 5
- Calculate the positive ideal and negative ideal solution by using Eq. 3-4. The result is:

$$A^+ = (1.81, 1.07, 1.18, 0, 0.79)$$
$$A^- = (0.60, 3.22, 2.36, 2.89, 1.58)$$

- Calculate separation from the positive ideal solution (d^+) and negative ideal solution (d^-) by using Eq. 5-6. The result shown in Table 6
- Calculate the relative closeness to the ideal solution (C_i) by using Formula 7. The result is shown in Table 6
- Rank the preference order in the descending order of C_i. The best alternative is the first one. It is J3

CONCLUSION

This research has been produced a decision support system model analysis in determining the paper distribution target to CORIS member. The designs of flowchart system, data flow diagram and database design have also succesfully created. The next research will be the implementation process and system testing, so the system can be functional as designed.

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