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Decision Support System Implementation for Candidate Selection of the Head of Affairs in Bintaldam Vbrawijaya Using Group Technology And Decision Table

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ABSTRACT: One of agency under the subdivision of The Indonesian National Army is Bintaldam V Brawijaya, acts as the mental founding agency. The head of affairs position replacement is often occurred in this agency, but the positions currently have a large number of incompetence person in charge. Subjection inthe election process leads to the inaccurate placement, resulting in poor leadership. The process of head of affairs assignment starts from candidates dispatching from each head of administrative section. Those candidates must then meet the three elements of assessment, i.e. the personality element, qualification element, and potential element. The candidates will be selected by head of agency as the top leader in the agency. The head of agency, however, poses difficulties to determine which candidate to put into position, frequently because of no proportional system exists to provide assistance in decision making process. A method is needed tomake more accurate placement for better leadership result.This research utilizegroup technology as the assessment elements hierarchical data structure and decision table as the rule evaluation engine to form a decision support system for making the replacement process of the heads of affairs easier and more accurate.

Keywords: Group Technology, Decision Table, Decision Support System, Mental Founding Agency, Indonesian National Army, Qualitative Assessment.

I. INTRODUCTION

The quality of human resource is the main role of improving the productivity of an organization. Competence is an integral part inside human character and can be used to predict both behavior and performance on every job tasks and situation [1]. Hence, it is a requirement to have high competence human resources since it can be used to support improvement of employee performance assessment. Such assessment is then utilized to determine and place employees' position [2]. Nowadays, the subjection issues cannot be avoided, especially in employee's assessment bureaucracy. In the other side, a quantitative assessment often has the disappointing reputation since it is so difficult to measure the parameters. On the other side, the management and the employees require fast and accurate performance assessment process, in which the rapid feedback and improvement can be obtained in the working environment [3].

An agency in which has the main subjection issue in Indonesia is Bintaldam V Brawijaya, a military mental founding agency under the subdivision of TNI (TentaraNasional Indonesia – The Indonesian National Army). The head of affairs position replacement is often occurred in the agency. The replacement event,however, occurs with 29.63% of positions taken by incompetent person in charge. The situation mostly triggered by subjection assessment which leads into inaccurate placement.

The process of head of affairs assignment starts from candidates dispatching from each head of administrative section. Those candidates must then meet the three elements of assessment, i.e. the personality element, qualification element, and potential element. The candidates will be selected by head of agency as the top leader in the agency. The head of agency, however, poses difficulties to determine which candidate to put into position, frequently because of no proportional system exists to provide assistance in decision making process. An objective system is needed to make the process of dispatching easier, faster, but also more efficient and more accurate. In order to solve such problem, the heads of agency, i.e. decision makers, need a decision support system (DSS). The objective of this research is to develop a DSS to solve the problem, by integrating group technology (GT) and decision table (DT), and migrating previously quantitative assessment style into a qualitative one. The GT is used for representing the qualitative elements of assessment, with the use of hierarchical data model to group each element. The GT makes the elements easy to read and classify, as well as the hierarchical level is then simplified into three levels. All the elements contain neither numeric nor comparative value, but replaced by qualitative ones. The second part of the method is DT, which is representing the decision section. It consists of rules, which also consist of multiple conditions (in this case, the GT's elements) and a set of decisions (in this case, the positions taken by candidates).

II. THEORETICAL BASIS

A. Decision Support System

According to Daihani, decision is an alternative of action strategy [4]. While Kusrini said that the decision is an activity to choose a strategy or action in solving a problem where the action aims to achieve a certain target [5]. In the other word, the two experts above were formulating that decision-making is an action in choosing a strategy that is believed will provide the best solution to something.

Turban defines the DSS as a system that serves to support decision makers (i.e. managers) in semi-structured decision situations, but not to replace a manager's position in providing an assessment of the decision [6]. Meanwhile, according to Alter, DSS is an interactive information system that provides information, modeling, and manipulation of data used to assist decision making in semi-structured situations or unstructured situations (not replacing decision-making functions in making decisions), when no one knows exactly how the decision should be made [7].

The main difference between the DSS and the MIS (Management Information System) is that the MIS produces more routine and programmed information, while the DSS has been linked to a specific decision-making process. One example of a DSS is a production scheduling system in a company which operates based on orders.The purpose of DSS is to help managers make informed decisions to solve semi-structured problems, and improve the effectiveness of managerial decision-making rather than efficiency.

B. Method of Software Engineering

Businesses which are related with software engineering can be categorized into three general phases disregard the application area, project size, and complexity. These phases are as follows: the definition phase focusing on "what", the development phase focuses on "how", and the maintenance phase focuses on "change" [8].

C. Group Technology

Group technology or GT is a manufacturing technique in which parts having similarities in geometry, manufacturing process and/or functions are manufactured in one location using a small number of machines or processes. GT is based on a general principle that many problems are similar and by grouping similar problems, a single solution can be found to a set of problems, thus saving time and effort.

The group of similar parts is known as part family and the group of machineries used to process an individual part family is known as machine cell. It is not necessary for each part of a part family to be processed by every machine of corresponding machine cell. This type of manufacturing in which a part family is produced by a machine cell is known as cellular manufacturing. The manufacturing efficiencies are generally increased by employing GT because the required operations may be confined to only a small cell and thus avoiding the need for transportation of in-process parts.

Group technology is an approach in which similar parts are identified and grouped together in order to take advantage of the similarities in design and production. Similarities among parts permit them to be classified into part families [8].

D. Decision Table

Decision tables are a precise yet compact way to model complex rule sets and their corresponding actions. Decision tables, like flowcharts, if-then-else, and switch-case statements, associate conditions with actions to perform, but in many cases do so in a more elegant way. In the 1960s and 1970s a range of "decision table based" languages such as Filetab were popular for business programming. Each decision corresponds to a variable, relation or predicate whose possible values are listed among the condition alternatives. Each action is a procedure or operation to perform, and the entries specify whether (or in what order) the action is to be performed for the set of condition alternatives the entry corresponds to. Many decision tables include in their condition alternatives “don't care” symbol, a hyphen. Using don't cares can simplify decision tables, especially when a given condition has little influence on the actions to be performed. In some cases, entire conditions thought to be important initially are found to be irrelevant when none of the conditions influence which actions are performed [9]. Aside from the basic four quadrant structure, decision tables vary widely in the way the condition alternatives and action entries are represented. Some decision tables use simple true/false values to represent the alternatives to a condition (similar to if-then-else), other tables may use numbered alternatives (similar to switch-case), and some tables even use fuzzy logic or probabilistic representations for condition alternatives. In a similar way, action entries can simply represent whether an action is to be performed (check the actions to perform), or in more advanced decision tables, the sequencing of actions to perform (number the actions to perform) [10].

E. MySQL 5.0

One of today popular RDBMS (Relational Database Management System) is MySQL. Its high speed, ease of installation, as well as its license under GNU General Public License, give rise to make MySQL an option, especially if database publication over internet is needed. This research uses MySQL 5.0 as RDBMS located in the cloud for accessibility. The cloud server in used is www.freemysqlhosting.net, which is a free MySQL database hosting with certain limitations.

F. Borland Delphi 7.0

Borland Delphi 7 is a compiler using Object Pascal Language. It is event-driven and visual programming based compiler designed for Microsoft Windows platform. Borland Delphi 7 was chosen because it is the most stable version of Delphi but has a relatively small installation size, and is capable of running on Microsoft Windows XP, Vista, 7, 8, and 10 operating systems.

III. METHOD OF RESEARCH

The type of this research is software engineering, with SDLC (System Development Life Cycle) is used for development. Waterfall model is chosen as a method of the SDLC implemented. The stages performed are as follows: requirements, design, implementation, testing, deployment, and maintenance.

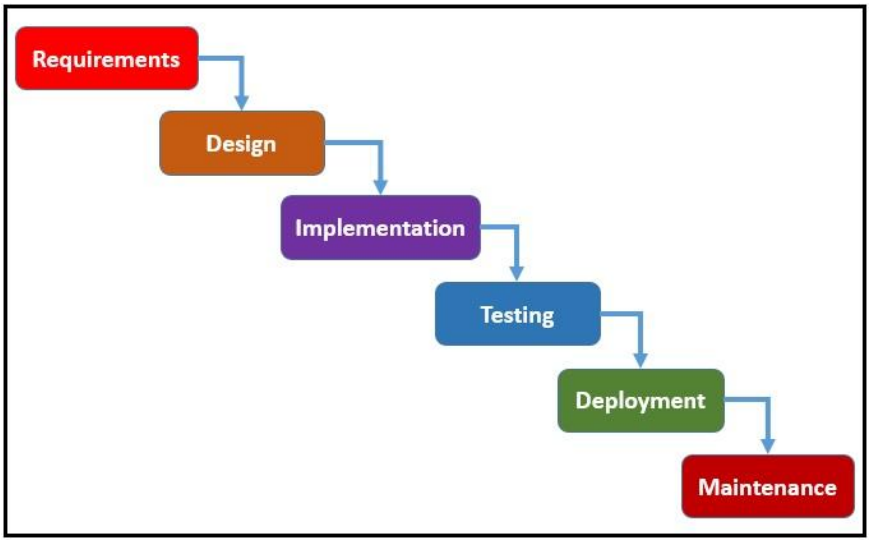

Fig. 1. Diagram of Research Method.

Based on Figure 1, the problem formulation model can be explained in several stages as follows:

A. Requirements Analysis

As the first stage in this research,requirements analysis dictated the author conducted a field study by entering field of study directly to Bintaldam V Brawijaya. Direct observation and interviews are used with the purpose of knowing the initial information about the criteria of every candidates' assessmentand the procedure of placement event.

B. Design

After conducting preliminary research, the problems every head of agencyexperienced can be then identified, tracingback the root of the problem. All problems identified are then feed as input to be solved using both GTand DTmethod to develop the DSS.

C. Implementation

The data needed in this research is the feasibility of a candidate in assessment. These data include candidate's identity and assessment provided by the human research and development. The data were obtained based on survey results or direct observation at Bintaldam V Brawijaya.

D. Testing

The data will be used in data processing which includes some activities as follows: elements data entry, affair departments' data entry, rules data entry in decision table, candidate data entry, analysis and selection of every candidate.

E. Deployment

The purpose of this stage is to analyze the system to be developed in accordance with the needs of the agency. Next will be known the specification of user needs and who will users of the system.

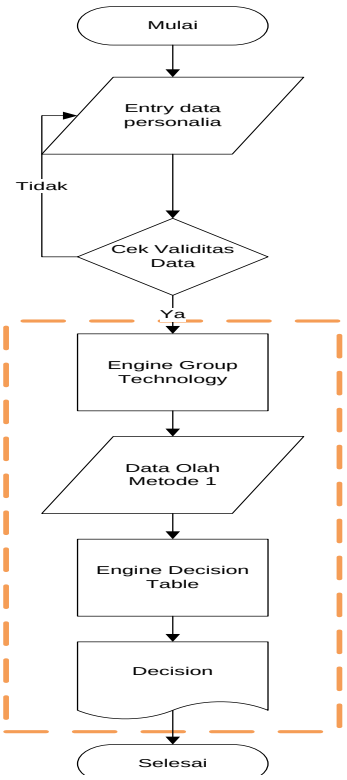

Fig. 2. Flowchart of System Design.

F. Maintenance

Database is used as data storage of DSS. The database in this application uses MySQL which is an open source RDBMS. The database structure is then uploaded to cloud server and tested for connection and accessibility.

As shown in Figure 2, the initial process undertaken in this software design is to provide allentries.It starts from making an entries for candidates and the affair departments. Then the data validation process is performed, to make sure that all data entries are in the valid state. The GT elements are then loaded into process memory, which can then be processed to be chosen one-by-one into element of candidate's qualitative assessment. Once the elements are already in memory, the DT rules then can be entered manually with several elements and one (or several, as optional) head of affairs position(s) as related to the earlier. One decision or more can then be drowned as output from the DSS, after performed some rule evaluation and checked the completeness of elements as conditions.

IV. RESULTS AND DISCUSSIONS

The result of the research is about the concept of calculation step which is applied to DSS software development, accompanied by the result of DSS software execution and test in case of data validation, determination of validity of prospective candidates, and result of DSSappropriate placement for all departments in accordance to DT rules.

A. System Design

According to the waterfall method in SDLC, the design phase consists of the whole design, including system and database design. System design focuses in how the data required are collected from users, i.e. the candidates, the rule creators, the assessors, and the head of agency. It also has a main process to make logical calculation based on rules in DT. Normally, if the elements (conditions) do not overlap in multiple decision (positions) in DT, the decision for every department position should be a single person. However, in some rare occasions when the elements overlap, it is possible for the DSS delivers multiple person for one affair department position. Such this case happen, system will recalculate how many conditions of one candidate compared to another occurred in DT elements from several rules.

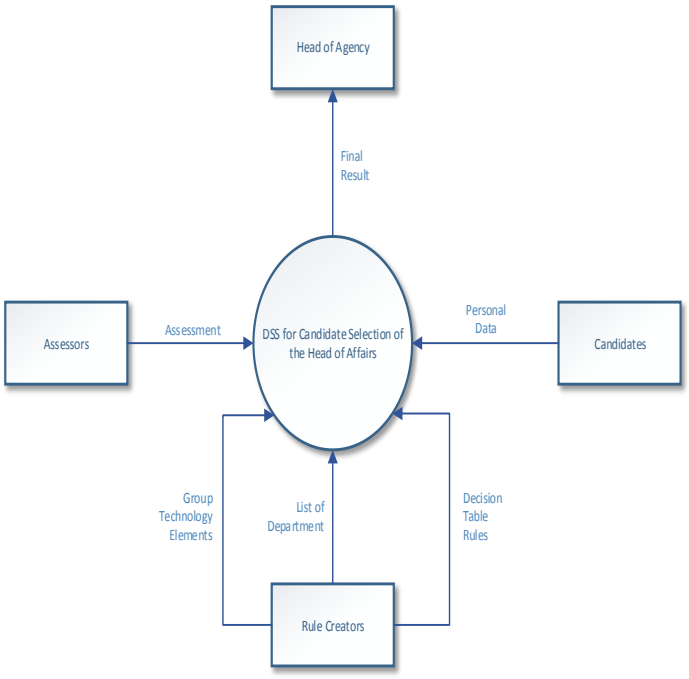

Fig. 3. Context Diagram of the Decision Support System.

The diagram in Figure 3 shows general description of the DSS. Basically, it starts with the actions of the rule creators. They might be one or many persons in the system to make or to define the rules applied to the system. First of all, they give complete list of affair departments available in the agency. Currently, there are as much as 27 departments (positions) in the agency, but in the future it is possible to alter, add, or delete those. For the assessment elements, rule creatorcan then fill the list in the group technology with monocode style. There are three levels of qualitative assessment elements required in the GT data, and only the last level could then be given to make the real assessment. The decision table rules might be defined by the rule creators by entering several conditions with correspond of one or several decisions. The conditions entered are the qualitative elements, while the decisions are the affair departments for the final result.

The candidates, however, have the liability to fill in their personal data, such as name, registration number, address, gender, etc. Once the time of replacement event occurs, the assessors fill the qualitative assessment forms for every candidate and upload these to the system. The DSS in the system then perform the process to calculate every candidate possibility to compete the position based on the assessment created by assessors and crosscheck the rules in the DT created by the rule creators. The final result sent to the head of agency in the form of report.

B. Database Design

The database design focuses on how data can be represented in RDBMS. Some data tables can be member of a group, so that the diagram can be understood easily, thanks to the grouping style (table clustering). Figure 4 shows the database design as reverse engineering from MySQL tools.

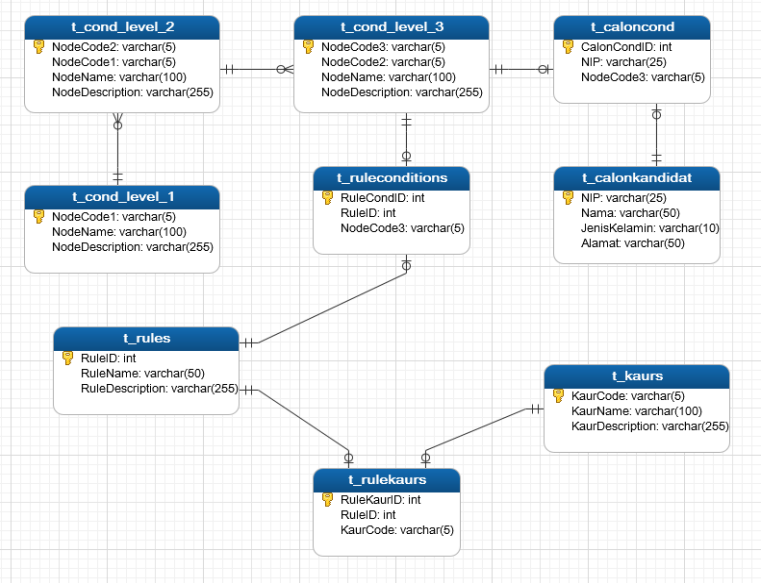

Fig. 4. Database Design of the DSS.

In the first cluster, the elements of assessment is put in three tables. These tables are **t_cond_level_1**, **t_cond_level_2**, and **t_cond_level_3**. All those tables represent the GT's structure.The structure clarifies the hierarchical model (monocode) with three limited level, i.e. personality level, qualification level, and potential level. Only the third level is used in condition or qualitative assessment for the candidates, while the other two are used for element classification. The first cluster is named Group Technology cluster.The second cluster is called Lists of Affairs Department, which consists only one table, **t_kaurs**. The cluster is used to determine the available affairs department in the agency. It is also used to fill DT's decision as single or multi value in each rule.The third cluster is Decision Tables cluster, which is the cluster for determining rules of the decision table. The cluster possesses three tables, namely **t_rules**, **t_ruleconditions**, and **t_rulekaurs**.

The final cluster is Candidates cluster. It consists of two tables, namely **t_calonkandidat** and **t_kandidatcond**.It is used for saving data for candidates and their qualitative assessment from the third level of GT's structure.

C. System Testing

Accuracy and performance testing are conducted to observe the outcome of this DSS. Vast amount of data were generated by a pseudo-random generator to mimic the real-world situation with a lot higher specification. While the number of affair departments currently falls in only 27 records, the qualitative assessments for only 36 records, the count of candidates for 400 persons, and the complexity of rules falls between 30 to 50 items, the system still need to test beyond current specification. Table I shows the time taken for the system to perform calculation until the final result displayed to the head of agency.

Table I. Testing for Various Number of Data.

Test #	Num. of Affair Dept.	Num. of Assessments	Num. of Candidates	Num. of Rules	Accuracy (%)	Time (s)
1	27	36	400	50	100	0.02
2	100	500	1500	200	100	0.93
3	200	1000	3000	300	100	2.60
4	250	1500	4500	400	100	5.62
5	300	2000	6000	500	100	15.73
6	350	2200	8000	600	100	23.44
7	400	2400	9000	700	100	48.02
8	500	2600	10000	1000	100	127.38

As shown in Table I, the DSS still has a very good performance for handling a reasonable number of data, just in a fraction of second. When the data grows into almost impossible for real-world situation, e.g. in test number 8, the time taken is still much shorter than the test number 1 if conducted by manual manner.

D. Deployment and Maintenance

The deployment has been piloted short after the testing, and currently under operation by the agency. For performance appearance the DSS software produced near-instantaneous result as long as the data complexity has only a fraction of the system capability. It is good to hope that in the near future the performance of this DSS software will not eventually wear out, since the data complexity will never reach the testing specification above.

V. CONCLUSION

Based on the test results it can be concluded as follows:

1. By using group technology and decision table in DSS for head of affair departments' placementin Bintaldam V Brawijaya, this research meets the basic requirement.
2. By utilizing Borland Delphi 7 Compiler and MySQL 5.1 RDBMS, software can be developedwhich apply group technology and decision table and produce DSS only with simple operation.

REFERENCES

[1]. Amelia. 2007. AplikasiMetode Group Technology dalam Memperbaiki Tata Letak Mesin Untuk Meminimalkan Jarak Perpindahan Bahan. Surabaya. Thesis
[2]. Chang, Tien-Chien., Wysk., Richard A. and Wang. 2005. Computer-Aided Manufacture. 3th edition, Prentice Hall,Inc. Textbook
[3]. Fauzia, NirulEka. 2008. Aplikasi Group Technology Dalam Perancangan Ulang Tata Letak Fasilitas Produksi Pada Pembuatan Mesin Plastik. Surakarta. Jurnal Simposium RAPI VII.
[4]. Deuse, J. 2013. Renaissance of Group Technology: Reducing Variability to Match Lean Production Prerequisites. Russia. 7th IFAC Conference on Manufacturing Modelling, Management, and Control.
[5]. Kusrini, Sri. 2007. Konsep Dan Aplikasi Sistem Pendukung Keputusan. Yogyakarta: PenerbitAndi.
[6]. Laudon, Keneth C., Laudon, Jane, P. 2001. Managament Information System New Approaches to Organization and Technology. 6th Edition, Prentice Hall International, Inc.
[7]. Shahdi-Pashaki, S. 2015. Group Technology-based Model and Cuckoo Optimization Algorithm for Resource Allocation in Cloud Computing. Iran. IFAC-PapersOnLine 48-3 (2015) 1140–1145.
[8]. Turban, E., 1995. Decision Support And Expert Systems: Management Support Systems. New Jersey: Prentice Hall.
[9]. Turban, E. & Aronson, J. E., 1998. Decision Support System and Intelligent System (5th Edition). New Orleans: Prentice Hall.
[10]. Turban, E., Aronson, J. E. & Liang, T.-P., 2005. Decision Support Systems and Intelligent System (7th Edition). New Jersey: Prentice Hall.

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