Implementation of CBT (Computer-Based Test) System on Aptitude Test Development Using C4.5 Algorithm as Potential Detection Tool for Choosing High School Major

H Jati, R D Ristanto and Nurkhamid
Electronic and Informatics Engineering Education Department, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
Email: handaru@uny.ac.id

Abstract. This study aims to: (1) develop computer-based aptitude test software using C4.5 algorithm as an evaluation system in decision making; and (2) to reveal the level of suitability between the major desired by learners and the potential outcomes of computer-based aptitude test software with C4.5 algorithm. This research is a design and development study. The experimental subjects in this study were three high school students with a total sample of 60 students. The analysis was done by looking at the suitability of the result of the evaluation of computer-based aptitude tests that students have done. The results of this study are: (1) Computer-based aptitude test software successfully developed with several specifications namely; (a) CBT (Computer-Based Test) system model implemented using open mode; (b) Aptitude test instruments used under the Jim Barrett Aptitude Test; (c) The decision tree of the C4.5 algorithm constructed using a binary tree structure with the highest aptitude score criteria as a split value. (2) The trials conducted in three high schools obtained the average score percentage of 73.3% with the Good criteria.

1. Introduction
The phenomenon in studying or choosing the study program indicates that students who graduated from Junior High Schools or Islamic Junior High Schools entering the High School or Vocational High School are not all based on the interest of learners supported by the optimal potential, such as basic common skills (intelligence), talents, and career interests of learners. Incompatibility in the selection of study programs can lead to difficulties and a tendency to fail in learning which will have an impact on the career continuation of learners. The problem is shown in carrernews.id [1] who conducted a survey to high school and vocational high school graduates in 2015 with the theme of the suitability of majors. The survey results show that 67% of high school and vocational school graduates who continue their studies or who work feel not in accordance with the department at the time of school. In addition, the survey results also showed that 58% of high school and vocational school graduates regard a career in line with their major as important. Therefore, early guidance in major choosing, especially in preparing placement and channeling for the continuation of studies in accordance with the potential and conditions that exist in the students themselves need to be done.

The Attachment to the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 64 Year 2014 Article 1 states that major choosing is the program provided to accommodate the interests, talents and/or the ability of learners with the orientation of concentrating,
extension, and deepening of subjects or vocation [2]. The term major choosing program is the same as the majoring program enacted at the senior high school level, which distinguishes only the placement and change of name system adapted to the turn of the new curriculum 2013. The major choosing itself comes from the word interest. Interest is a strong inclination or desire to develop in a focused individual and focused on the realization of a condition by considering the individual's basic capabilities, talents, interests and personal preferences [3].

The purpose of major choosing is contained in Permendikbud No. 64 Year 2014 article 2 stating that majoring in Senior High School has a purpose to give opportunity to learners develop attitude, knowledge, and skill competences of learners according to their interest, talent and/or academic ability in a group of science subjects. In general, the objectives of major choosing program are also described in the manual book of SMA-SMK Curriculum 2013 [2], to help learners to instill interest in subjects, strengthen interest in subjects, and select and set interest groups of subjects that are followed on the educational unit being pursued, career choice or further study option up to higher education level. Based on Permendikbud No.69 Year 2013 [4], the system of major choosing in high school uses three choices of major curriculum, namely: Mathematics and Natural Sciences (MIA) which contains subjects of Mathematics, Biology, Physics and Chemistry; Social Sciences (IIS) focusing on Geography, History, Sociology and Economics subjects; and Language and Cultural Studies (IBB) which contains subjects of Indonesian Language and Literature, English Language and Literature, Other Foreign Languages and Anthropology.

Implementation of the 2013 curriculum that requires the major choosing process be done from class X requires the school implement the major choosing process that is effective and efficient in the acceptance of new learners. There are several success factors of an education according to Erlin Leigh Parker [5] one of the most important is in terms of recruitment or acceptance of learners. If the recruiting tools are good, it will produce good graduates as well. Results of acceptance of learners are good, if the right tools are used in the process of acceptance. The tools used to uncover talents or special abilities possessed by a person are called aptitude tests. In KBBI (the great Dictionary the Indonesian Language), talent is the foundation (intelligence, nature, and nature) brought about from birth. Talent is a potential that must be stimulated in advance so it can be seen as a skill, knowledge, and special skills that become the provision of his life someday [6]. In his book, Sultan Surya explains that everyone is the right person, it serves as the basis for talent tests to develop the great potential of personal qualities. Aptitude Test is a test that aims to know the talents and abilities possessed by someone in the field of science [7].

Based on the book by Jim Barrett [8], Aptitude Test has nine types of problems, namely (1) Visual reasoning test (measure ability to understand reasoning expressed visually); (2) Numerical reasoning test (measure ability to understand reasoning expressed with numbers); (3) Verbal analysis test (measure ability to understand and analyze reasoning expressed using words); (4) Sequential reasoning test (measure ability to understand reasoning about process sequence); (5) Spatial recognition test (measure the ability to understand and recognize an object); (6) Three-D test (measures the ability to understand and recognize three-dimensional objects); (7) System test (measure ability in accuracy and accuracy); (8) Vocabulary test (measure ability in vocabulary use); (9) Figurework test (measure the ability to perform calculations). Each area of expertise has different characteristics based on the level or level of talent one has. In accordance with the area of expertise in high school interest, Jim Barrett [8] states that the characteristics of the skill area have a level or level of components in the aptitude test as in Table 2.

The Guidebook of Curriculum Vocational High School 2013 (2013, p.19) states that aspects that need to be considered in the major choosing of high school students include learning achievement, non-academic achievement, the value of national examination, statement of interest of learners, parental attention and potential detection of learners. Based on the observations from several high schools, major choosing process of students in high school does not match with what is specified in the guidance. There is a gap between the guidance for major choosing arranged by Kemendikbud 2013 and the major choosing process occurring in high school, that is on potential detection aspect.

One alternative to solve the problem is by applying a Computer-Based Test (CBT) system on an aptitude test instrument. Monirosadat conducted a study comparing the use of CBT with Paper and
Pencil Tests (PPT) stating that test participants were more interested in the test features presented with computers [9]. In addition, the Retnawati Study states that learners who have good technology use capabilities, CBT tend to be more accurate than PPT [10]. Jamil, Tariq, & Shami (2012) in the study of teacher perceptions (test organizers) in CBT (Computer-Based Test) vs. PBT (Paper-Based Test) stated that overall sample teachers showed a positive attitude toward CBT, but in some situations they preferred PBT especially for less experienced teachers in the CBT system, while teachers with experience in CBT systems tend to prefer CBT [11]. Some of the factors that cause difficulties in the use of CBT applications, the most influential factors are those derived from "users" and "technology use" itself [12].

There are four forms of computer-based test models and the internet namely (1) Open Mode, can be followed by anyone and without any supervision. Test participants do not need to register participants; (2) Controlled Mode, similar to an open-ended test model, but no test taker is registered by entering a username and password; (3) Supervised Mode, there is a supervisor who identifies the test participants to authenticate and validate the test-taking conditions. For tests in this mode requires the administrator to log and confirm the participants that the tests have been completed correctly at the end of the test; (4) Managed Mode, usually the test is performed centrally [13]. Organizations that manage the test process can define and assure the performance and equipment specifications at the test center. Some of the advantages of using a computer-based test are reducing the time for a test scoring job and creating a written report, eliminating logistical work such as distributing, storing and paper-based tests, test takers can immediately find out the test results. Fagbola states that the use of CBT is an effective solution for the evaluation of education in bulk [14].

The development of C4.5 Algorithm is done in CBT (Computer-Based Test) system as an evaluation system in decision making in the form of potential learners for the major choosing process in high school. C4.5 algorithm is a group decision tree algorithm that has input in the form of training samples and samples. Training samples are sample data that will be used to build a verified test tree. While samples are data fields that will be used as parameter in doing data classification [15]. C4.5 algorithm is one method to make decision tree based on training data that have been provided. The C4.5 algorithm was created by Ross Quinlan which is the development of ID3 which was also created by Quinlan [16]. Some of the development done on C4.5 is as among others can overcome the missing value, can overcome the continue data, and pruning.

There are three stages of C4.5 algorithm (1) Selecting the attribute as the root node and creating a branch for each attribute value, in the C4.5 algorithm to define attributes as root nodes, it is based on the highest gain ratio of the attributes; (2) Divide the case into the branch originating from the node. The way used in C4.5 algorithm is to calculate the number of cases divided based on attributes that can be the root node of the highest attribute value. After that calculation of gain ratio values for each attribute; (3) Repeat the process for each branch until all the cases on the branch have the same class [17]. In the C4.5 algorithm decision tree construction to determine the attribute as the root node, is based on the highest gain ratio value of the existing attributes. The attribute with the highest gain ratio value is selected as a split attribute for the node. The formula of the gain ratio is as follows:

$$Gain\ Ratio(a) = \frac{gain(a)}{split\ info(a)}$$  \hspace{1cm} (1)$$

Where gain (a) is the information gain of attribute a for the set of sample X and split info (a) denotes the entropy or potential information obtained at the division of X into n subsets based on the study of attributes a. While gain (a) is defined as follows:

$$Gain(a) = info(X) - info_a(X)$$  \hspace{1cm} (2)$$
The reason for using the gain ratio \( a \) in the C4.5 algorithm (not the gain \( a \)) as the criterion in the selection of attributes is that the gain has a bias attribute to the attribute having many unique values. For the split formula info \( a \) is as follows:

\[
\text{Split info}(a) = - \sum_{j=1}^{k} \frac{|X_j|}{|X|} \times \log_2 \left( \frac{|X_j|}{|X|} \right)
\] (3)

Where \( X_1 \) denotes the 1st subset of sample \( X \). In other words the formula for calculating the gain ratio value to be selected as an attribute of the existing node is as follows:

\[
\text{Gain Ratio}(a) = \text{Entropy}(X) - \sum_{j=1}^{k} \frac{|X_j|}{|X|} \times \text{Entropy}(X_j)
\] (4)

Early idea developers about the entropy of the random, Shannon suggest that entropy is a measure of the average uncertainty of a data set when it does not know the outcome of an information source [18]. It also shows the average amount of information to be received from the information sources. To get a gain ratio value in the formation of a decision tree, it is necessary to calculate the value of information in units of bits from a collection of objects. The form of calculation for entropy is as follows:

\[
\text{Entropy}(X) = \sum_{j=1}^{k} p_j \times \log_2 \frac{1}{p_j} = - \sum_{j=1}^{k} p_j \times \log_2 p_j
\] (5)

Where:
- \( X \) = Set of cases
- \( k \) = Number of partitions \( X \)
- \( p_j \) = Proportion of \( X_j \) to \( X \)

The split entropy that divides \( X \) by \( n \) records into sets \( X_1 \) with \( n_1 \) rows and \( X_2 \) with \( n_2 \) rows is:

\[
E(X_1X_2) = \frac{n_1}{n} E(X_1) + \frac{n_2}{n} E(X_2)
\] (6)

The value of Entropy \( (X) \) indicates that \( X \) is a more random attribute. On the other hand, the smaller attribute of the Entropy \( (X) \) value implies this slightly more randomly significant attribute for data mining. The value of entropy reaches a minimum value of 0, when all other \( p_j = 0 \) or are in the same class. The value reaches a maximum of \( \log_2 k \), when all \( p_j \) values are equal to \( 1/k \).

### 2. Research Method

This study was conducted with two approaches. The first approach is to develop software with waterfall models [19]. The second approach is to use the Dick and Carey approach model to gain reinforcement of educational-related research conducted [20]. Aptitude test software development model described into five stages namely; (1) Analysis; (2) Planning; (3) Modeling; (4) Construction; and (5) Testing.

Needs analysis is done by collecting software requirements that meet user needs. Needs analysis phase is done with literature study on aptitude test development and field study to know the major choosing process in high school. At this stage of needs analysis is done by observation and direct interview with the school. The observation is done by finding the source of reading related to the major choosing process for the curriculum of 2013 in high school. Interviews are needed to find out the major choosing process undertaken in high school and find an existing gap. The purpose of the planning stage is that the research process can run effectively and efficiently, so that the resulting product can be completed on time. Planning is done by making scheduling on software development process. The development schedule includes the use of the time required to develop the software up to the timing of the software testing itself. Specification needs obtained from the needs analysis, studied and converted into software design. In designing the system used UML modeling language (Unified Modeling
Language) which serves to describe the system boundaries and system functions in general. UML is a modeling language for systems or software that paradigm ‘object-oriented’. Modeling is actually used for simplifying complex issues in such a way that it is easier to learn and understand [21]. The construction phase involves the actual development of the system by developing a graphical user interface, applying models using HTML and creating database systems using SQL Server. The construction phase is based on software model design at the modeling stage. The creation of designed software is a computer based aptitude test application with C4.5 algorithm as evaluation system. Evaluation of aptitude test software development is done by expert testing and field trials. Expert testing involves five people who are experts in educational psychology and web-based applications. Testing is done by testing the function and work of the program thoroughly to minimize the error level of aptitude test software when used. Field trials were conducted in June-July 2017 at three high schools. The field trial subjects were 60 students divided into 20 students per school.

The sampling technique used to determine the respondent is a quota sampling. A quota sampling is a technique or a way to determine the respondents who have certain characteristics to the desired amount, while in the determination of the sample number of respondents refers to Jakob Nielsen which states that at least the number of respondents in the user test for quantitative research is 20 respondents [22]. Aptitude test software is used to detect potential learners based on the choice of major programs in high school at the time of admission of new learners. The analysis was conducted to determine the level of conformity between the choice of the program of interest desired by the learners with the result of potential heteksi from aptitude test software. From result of recapitulation, calculation done with formula percentage as follows:

\[
\text{Percentage} = \frac{\text{number of correct}}{\text{total number of students}} \times 100\%
\]

From the calculation of the percentage value, it can be determined the criteria of conformity according to Suharsimi Arikunto [23].

| Percentage Score | Interpretation   |
|------------------|------------------|
| 0% - 20%         | Unacceptable     |
| 21% - 40%        | Poor             |
| 41% - 60%        | Acceptable       |
| 61% - 80%        | Good             |
| 81% - 100%       | Excellent        |

### Table 1. Criteria Conformity Level

3. **Experiment Results and Analysis**

Aptitude test software is developed based on waterfall model stage, while the analysis and testing using Dick and Carey method. The results of aptitude test software development are described based on the following development stages:

#### 3.1. Analysis

Based on observations in high school, the specification functional requirements of aptitude test software are: (1) Aptitude test software can be used any time and can be accessed anywhere by the user. (2) Users who can access the aptitude test software are the administrator and test participants. (3) Test participants may use the software and follow the test series without having to be registered as a participant in advance. (4) The login page is only used by school administrators.

#### 3.2. Planning

Scheduling aptitude test software development process is done with the aim that research can run in accordance with the time specified. The staging phase is used as a timeline in the aptitude test software development process.
3.3. Modeling

From the results of needs analysis, computer-based test (CBT) aptitude test software is designed and developed using open mode. The choice of CBT architecture model with open mode is done according to requirement analysis that test participants can run the aptitude test software and follow the test series without having to register first as the test participant. That's because software aptitude tests will be applied at the time of admission of new learners, so that everyone can use the aptitude test software to assist in determining the choice of major direction. The design of the CBT system model is illustrated in the UML modeling language (Unified Modeling Language) use case diagram in Figure 1.

![Use Case Diagram Aptitude Test Software](Image)

The aptitude test instrument model used in the software refers to the Jim Barret Aptitude Test which has nine types of problems: Visual, Numerical, Verbal, Sequences, Spatial, Three-D, Precision, Vocabulary and Figurework. The model of the instrument can reveal different areas of expertise. In accordance with the needs analysis in high school for major program, the field of expertise tailored to the needs of major programs in high school areas of expertise MIA, IIS and IBB in Table 2.

| Mathematics and Natural Sciences (MIA) | Social Science (IIS) | Language and Cultural Studies (IBB) |
|----------------------------------------|----------------------|-----------------------------------|
| Mathematics                            | Geography            | Indonesian                        |
| Biology                                | History              | English                           |
| Physics                                | Sociology            | Economics                         |
| Chemistry                              | Economics            | Other Foreign                      |
| Anthropology                           |                      |                                   |

In the evaluation system of the aptitude test software, C4.5 algorithm decision tree was built using binary tree structure, i.e., every node of the decision tree has only two branches (yes or no). The reason for choosing this structure is to simplify the shape of the decision tree and to minimize the occurrence of noise that will affect the performance and speed of the process in decision making. Choosing binary tree
structures to determine the potential of the aptitude test data generates three decision trees, i.e., the MIA program decision tree, the IIS program decision tree, and the IBB program decision tree which will be evaluated according to the interests of the learners. Based on the data characteristic of major program in high school program in Table 2, data as training sample for evaluation of aptitude test were obtained, as in Table 3.

**Table 3.** Characteristic Data Field Major Program in High School

| Major Program            | Indicator     | Aptitude Test |
|--------------------------|---------------|---------------|
|                          |               | Visual | Numerical | Verbal | Sequential | Spatial | Three-D | Precision | Vocabulary | Figurework |
| MIA (Mathematics and Natural Sciences) | Mathematics  | 6      | 9       | 5      | 5         | 3       | 7       | 5         | 3         | 9         |
|                          | Biology       | 8      | 6       | 6      | 5         | 4       | 4       | 4         | 5         | 6         |
|                          | Physics       | 8      | 9       | 3      | 6         | 7       | 8       | 5         | 2         | 9         |
|                          | Chemistry     | 9      | 9       | 4      | 6         | 4       | 3       | 8         | 3         | 7         |
| IIS (Social Sciences)    | Geography     | 8      | 7       | 5      | 5         | 9       | 5       | 6         | 5         | 5         |
|                          | History       | 8      | 3       | 8      | 2         | 2       | 1       | 4         | 6         | 3         |
|                          | Sociology     | 8      | 4       | 8      | 5         | 2       | 2       | 3         | 7         | 5         |
|                          | Economics     | 5      | 9       | 8      | 6         | 4       | 2       | 4         | 5         | 7         |
| IBB (Language and Cultural Studies) | Indonesian | 4      | 4       | 9      | 6         | 3       | 2       | 5         | 9         | 7         |
|                          | English       | 3      | 2       | 9      | 4         | 3       | 2       | 6         | 8         | 3         |
|                          | Other Foreign | 7      | 2       | 8      | 4         | 7       | 2       | 5         | 6         | 4         |
|                          | Anthropology  | 6      | 3       | 8      | 5         | 8       | 7       | 4         | 8         | 3         |

To create a decision tree of each major program, the major program columns in Table 3 are used as labels. When forming the MIA program decision tree, the label on MIA is changed to "correct" while the labels on the IIS and IBB programs are changed to "incorrect", otherwise it will form the IIS and IBB decision trees. After the separation of labels, from the training data sample in Table 3 calculation of the value of gain ratio to form the decision tree C4.5 algorithm. The split value determination is based on the highest aptitude test score of each attribute.

**Table 4.** Calculation of Gain Ratio Value on MIA Program as Root Attribute

| Variable | Split | Total Case | Yes (S1) | Yes (S2) | Entropy | Information Gain | Split Info | Gain Ratio |
|----------|-------|------------|----------|----------|---------|------------------|------------|------------|
| Total    | 12    | 8          | 4        |          | 0,918   |                  |            |            |
| Vis      |       |            |          |          |         |                  |            |            |
| ≥ 9      | 1     | 0          | 1        | 0        | 0,143   | 0,414            | 0,347      |
| < 9      | 11    | 8          | 3        |          | 0,845   |                  |            |            |
| Num      |       |            |          |          |         |                  |            |            |
| ≥ 9      | 4     | 1          | 3        | 0,811    | 0,285   | 0,918            | 0,311      |
| < 9      | 8     | 7          | 1        |          | 0,544   |                  |            |            |
| Verb     |       |            |          |          |         |                  |            |            |
| ≥ 9      | 2     | 2          | 0        | 0        | 0,109   | 0,650            | 0,168      |
| < 9      | 10    | 6          | 4        |          | 0,971   |                  |            |            |
| Seq      |       |            |          |          |         |                  |            |            |
| ≥ 5      | 9     | 5          | 4        | 0,991    | 0,175   | 0,811            | 0,216      |
| < 5      | 3     | 3          | 0        | 0        |         |                  |            |            |
The determination is based on the characteristics of a test result value, i.e., if the value is greater than the criterion value, then the value is acceptable. An example calculation of the gain ratio value to determine the attribute as a root in the formation of MIA program decision tree in Table 4. From the calculation of the gain ratio of each aptitude test attribute, the highest gain ratio is 0.487 in the figurework attribute with the split value 9. So the attribute that becomes the root node in the MIA program decision tree is the figurework with two branches of "yes" or the value of the figurework 9 and branch of “no” or the value of the figurework < 9. The same steps are performed to define attributes as branches until all instances of the branch have the same class.

Once the decision tree is completed, each algorithm from the decision tree is integrated with the interests that the learner has. From the choice of interests of the learners, then interest is adjusted to the talent of the aptitude test results so that the potential of learners can be determined appropriate for the major program in high school. The evaluation system algorithm developed in the aptitude test software to determine the potential of learners can be seen in Figure 2.

### Algorithm for Potential Detection

```java
// MIA Program Algorithm, IIIS Program Algorithm, IBB Program Algorithm
Interest 1, Interest 2, Result, Potential = string

// Description
// Read Interest 1, Interest 2
// If Interest 1 = MIA then
// If Result = Correct then
// Potential = MIA
// Else
// Return (Interest 1)
// End if
// Else if Interest 1 = IIIS then
// If Result = Correct then
// Potential = IIIS
// Else
// Return (Interest 2)
// End if
// Else
// Read (IIB Program Algorithm)
// If Result = Correct then
// Potential = IIB
// Else
// Return (Interest 2)
// End if
// End if
// Write (Potential)
```

**Figure 2.** Algorithm of Evaluation System Aptitude Test Software to Determine Potential Learners

### 3.4. Construction

The interface of the aptitude test software was developed using a web-based application using Laravel 5.2 framework. CBT (Computer-Based Test) system model used is open mode, so everyone can take the test without prior register. The result of aptitude test software development can be seen in Figure 3.
3.5. Testing

Aptitude test software testing is divided into two parts: expert testing and field trials. Expert testing involves five experts in the field of educational psychology and computer-based applications. Testing is done by testing every function and performance of the program as a whole. This is done to reduce the level of error in the software when used. The test results show that the developed software has been running well and field trials can be done. Some suggestions of improvement from the experts include: (1) Need to add description list of choice of major program in high school on the form of input identity of the test participants; (2) Need to add a "see details" menu of student aptitude tests on the administrator page.

Field trials were conducted to see the suitability of the preferred choice of learners with the potential outcomes of aptitude test software. The trial was conducted involving 60 students from three high schools. The results of field trials of aptitude test software from three high schools can be concluded that the average percentage of conformity obtained a score of 73.3% with the Good criteria. More can be seen in Table 5.

| School Name        | Number of Respondents | Correct | Incorrect | Percentage |
|--------------------|-----------------------|---------|-----------|------------|
| SMA Negeri Pecangaan | 1                     | 20      | 13        | 65%        |
| SMA Negeri Welahan  | 1                     | 20      | 16        | 80%        |
| SMA Negeri Jepara  | 1                     | 20      | 15        | 75%        |
| **Total**          | **60**                | **44**  | **16**    | **73,3%**  |

The development of computer-based aptitude testing software with C4.5 algorithm as an evaluation system is a potential detection tool for major choosing in high school. The development of aptitude test software is aimed at learners to determine the choice of direction of interest in accordance with the wishes and abilities possessed.
This study has some limitations as follows: (1) The potential result from aptitude test software is only as a tool to determine the direction of interest of learners, the final decision in determining the major program is done by the school; (2) Detection of student's interest is done based on the questionnaire which has been discussed with parents. The development of test instruments that detect the interests of learners is important so that the potential generated is in accordance with the interests and talents of learners; (3) Many factors influence the incompatibility of potential results. The stability of internet connection and the ability of computer use become the main obstacle experienced when conducting field trials.

4. Conclusions
The study can conclude that: (1) The computer-based talent test software was successfully developed with several specifications namely; (a) The CBT (Computer-Based Test) system model applied using open mode, so that everyone can take the aptitude test without having to register first; (b) Aptitude test instruments used by the Jim Barrett Aptitude Test which has nine types of problems: Visual, Numerical, Verbal, Sequences, Spatial, Three-D, Precision, Vocabulary and Figure work; (c) The decision tree of the C4.5 algorithm is constructed with a binary tree structure based on the characteristics of major fields in high schools as training sample data with the highest score of aptitude test scores as split values. (2) Field trials are conducted to determine the level of conformity between the choices of interests desired by learners and the potential results of aptitude test software. The results of trials conducted on three high schools obtained the average percentage of compliance score of 73.3% with Good criteria.

Suggestions for utilization of aptitude test software products that have been developed are: (1) Aptitude test software can be used as an alternative tool for schools in determining the potential of learners for the process of major in high school; (2) The potential outcome of aptitude test software can be used as a consideration of counseling teachers in determining the choice of major direction in high schools; (3) For learners, aptitude test software can be used as a tool of self-evaluation on their potential talent and ability.

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