The Ability Scoring Model of Software Support Engineers Based on Technical and Communication Skills

P M Seta and Y H Putra
Magister of Information System, Universitas Komputer Indonesia, Indonesia

Email : prabamuki94@gmail.com

Abstract. This study aims to determine the ability of a software support engineer both technical abilities and communication skills. To achieve these objectives, the research begins by determining questions through literature studies and interviews then validate these questions by involving 2 communication experts, 10 support managers, and 30 software support engineers from 3 IT companies ranging from a small business company, medium business company, and large business company. Validity testing is done through filling out a questionnaire to the support manager, communication expert and application support with weighting using a Likert scale. With this research, we succeed in creating the scoring model with a value of more than 90% confidence level to assess the ability of a software support engineer. This assessment model contains 5 questions about database capabilities, 5 questions about basic algorithms, and 10 questions about communication skills. Therefore, this scoring model has been able to represent the real capabilities of a software support engineer.

1. Introduction
An Application Support Engineer is an IT professional who provides technical support regarding a spectrum of software used within a specific business sector. Due to this broad definition, the core responsibilities of an Application Support Engineer vary depending on the industry. Some Application Support Engineers are responsible for database management, while others put more emphasis on the programming end of an application (we excluded the server/IIS part because today in IT industries we have specific team know as "infra" or "Server" team to do so ) The specific focus is dependent on the needs of the business [1][2]. Typically part of an IT support team, an Application Support Engineer needs both technical knowledge and “people” skills to do their job well. Giving how interwoven technology and the business world have become. Application Support Engineers are employed internally by a number of companies across a wide spectrum of industries. Application Support Engineers can also work for an agency and have several different clients. When it comes to work environment, Application Support Engineers often collaborate with other team members, as well as customers [3].

Application support capabilities are not only assessed by technical capabilities but also good communication skills to be able to capture information well and convey information appropriately. There are two important components in effective communication [4]. The first component is the ability to understand the message (understanding), namely the ability to listen to sound or see action, the ability to process messages, and store them in memory. The second component is the ability to respond to messages (expressions), namely the ability to choose the right words or actions, the ability to arrange words and actions into understandable messages. [5]
In software companies, support activities are the part of front-end support, or upfront maintenance. These activities are oriented towards customers to assist them in the operation of their software and/or integrated software and hardware products [6]. This support is focused on providing immediate help to customers when they encounter problems or difficulties that prevent them from conducting their daily business.[7]

In practice, front-end support activities vary from technical support, to participation in testing, quality auditioning, education and training, handling of emergency cases to management of customer profiles. These support activities are more or less integrated or related to the evolution and maintenance work. For example, solving reported problem is closely related to evolution and maintenance, while providing training about newly integrated feature in a software product is not related to maintenance work. Each software company provides a set of support activities.[8][9]

The aim of this study was to determine the ability of a software support engineer both technical abilities and communication skills. To achieve these objectives the research begins by determining questions through literature studies and interviews then validate these questions by involving 1 communication expert, 3 manager supports, and 30 software support engineers from 3 IT companies ranging from a small business company, medium business company, and large business company in Bandung and Jakarta.

2. Methods
2.1. Compose Questions
The ability test of an application support consists of 2 ability tests, namely technical capabilities and communication skills as non-technical aspects. The technical capability test consists of 3 section questions, namely basic algorithms, basic sql database, and basic server configuration. Each question section consists of 5 questions and each question is given 5 choices of answers, but there is only 1 correct answer from the 5 available answer choices. Figure 1 shows an example of a basic algorithms question with 5 answer choices.

```
1  <?php
2  $t = date("H");
3  if ($t > "18") {
4    echo "Have a good day!";
5  } else {
6    echo "Have a good night!";
7  }
8  ?
```

**Figure 1.** Sample Question for basic algorithms section

If the server time shows 02-21-2018 22:56, the output produced is:

a) Have a good day!
b) Have a good night!
c) "Have a good day!"
d) "Have a good night!"
e) PHP Error
The ability test is provided 5 choices of answers for each question but there is only 1 correct answer, meaning that each question is only worth 1 (one) if choosing the correct answer or worth 0 (zero) if it does not choose the correct answer. In each material ability, there are 5 questions so that in each of the ability material formed 32 score combinations. So that in total there will be formed 20 questions, 15 from the technical side (5 basic algorithm questions, 5 basic sql database questions, 5 server configuration questions) and 5 from the communication capability side. Table 1 shows the number of possible combinations of 5 questions given with the total score in each combination. For example C1 or combination 1 has a combination of 1,1,1,1,1 which means questions 1-5 are answered correctly and the total score is 5.

| Scores Combinations |
|----------------------|
| C1 : 1,1,1,1,1 = 5  |
| C2 : 1,1,1,0,1 = 4  |
| C3 : 1,1,0,1,1 = 4  |
| C4 : 1,0,1,1,1 = 4  |
| C5 : 0,1,1,1,1 = 4  |
| C6 : 0,1,1,1,1 = 4  |
| C7 : 1,1,1,0,0 = 3  |
| C8 : 1,1,0,1,1 = 4  |
| C9 : 1,0,1,1,0 = 3  |
| C10 : 0,1,1,0,1 = 3 |
| C11 : 1,1,0,0,1 = 3 |
| C12 : 1,0,1,1,0 = 3 |
| C13 : 0,1,1,0,1 = 3 |
| C14 : 1,0,0,1,1 = 3 |
| C15 : 0,1,0,1,1 = 3 |
| C16 : 0,0,1,1,1 = 3 |
| C17 : 1,1,0,0,0 = 2 |
| C18 : 1,0,1,0,0 = 2 |
| C19 : 0,1,1,0,0 = 2 |
| C20 : 1,0,0,1,0 = 2 |
| C21 : 0,1,0,1,0 = 2 |
| C22 : 0,0,1,1,0 = 2 |
| C23 : 1,0,0,0,1 = 2 |
| C24 : 0,1,0,0,1 = 2 |
| C25 : 0,0,1,0,1 = 2 |
| C26 : 0,0,0,1,1 = 2 |
| C27 : 1,0,0,0,0 = 1 |
| C28 : 0,0,0,0,1 = 1 |
| C29 : 0,0,0,0,0 = 0 |
| C30 : 0,0,0,0,0 = 0 |

Table 1. Score combination from each material

2.2. Validate Questions and Research Results
Validity testing is done by testing the application that has been made directly by the user and then for the assessment obtained through filling out a questionnaire to the support manager, communication expert and application support with weighting using a Likert scale. Table 2 shows the questionnaire varying weight consists of 2 types of statements, namely positive statements and negative statements. Each statement has 3 choices of responses, namely agreeing, normal, disagreeing with varying weights.

| Statement | Agree | Normal | Disagree |
|-----------|-------|--------|----------|
| Positive  | 3     | 2      | 1        |
| Negative  | 1     | 2      | 3        |

Score Qualification

\[ \text{Percentage score (\%) = \frac{\text{number of scores}}{\text{highest number of weights}} \times 100\%} \]  \hspace{1cm} (1)

Here are the assessment criteria for score assessment,

\[ \text{Qualification percentage (\%) = \frac{\text{weight of answer}}{\text{maximum answer weight}} \times 100\%} \]  \hspace{1cm} (2)

a. Percentage of Agree = \( \frac{3}{3} \times 100\% = 100\% \)
b. Percentage of Doubt = \( \frac{2}{3} \times 100\% = 66.66\% \)
c. Percentage of Average score = \( \frac{1}{3} \times 100\% = 33.33\% \)
3. Results and Discussion
In the Validity Test for this study, a validation process into 4 dimensions for the technical capabilities, these four dimensions are: the need for ability scoring model, indirect ability scoring model exam, assessment on ability scoring model, and ability scoring model classification, which validated by the 10 manager support and 30 support engineer which can be seen in table 3 and table 4.

While for communication skills, these four dimensions are: good communication skills, things that invalidate indications of communication skills, good communication skills assessment instruments, and classification of communication skills, which validated by 2 communication experts which can be seen in table 5.

Of the four dimensions will be revealed to be several indicators to facilitate the assessment process and drawing conclusions. Table 3 shows the results of the validation assessment obtained from support manager. The results of this assessment show a value of 90.15%. This means that almost all support managers agree with this model. And the results of the assessment from the support engineer showed 91.67%, which means that most of them agreed to this valuation model. This result can be seen in Table 4. Likewise with the assessment of communication experts, they also agreed that this model was able to represent the communication skills of a support engineer. This is indicated by a percentage of 92.65% in Table 5.

Table 3. Ability scoring model validity test from Support Manager

| Dimension | Questions | Statements | Weight | Support Manager | %  |
|-----------|-----------|------------|--------|----------------|----|
| I         | 6         | Agree      | 3      | 48             | 92,22 |
|           |           | Normal     | 2      | 10             | 20 |
|           |           | Disagree   | 1      | 2              | 2  |
|           |           | Agree      | 3      | 84             | 90,00 |
|           |           | Normal     | 2      | 36             | 72 |
|           |           | Disagree   | 1      | 0              | 0  |
| II        | 12        | Agree      | 3      | 80             | 89,33 |
|           |           | Normal     | 2      | 8              | 16 |
|           |           | Disagree   | 1      | 12             | 12 |
| III       | 10        | Agree      | 3      | 55             | 89,05 |
|           |           | Normal     | 2      | 7              | 14 |
|           |           | Disagree   | 1      | 8              | 8  |
| IV        | 7         | Agree      | 3      | 150            | 91,11 |
|           |           | Normal     | 2      | 12             | 24 |
|           |           | Disagree   | 1      | 18             | 18 |
|           |           | Agree      | 3      | 324            | 94,44 |
|           |           | Normal     | 2      | 12             | 24 |
|           |           | Disagree   | 1      | 24             | 24 |
|           |           | Agree      | 3      | 240            | 92,22 |
|           |           | Normal     | 2      | 50             | 100|
|           |           | Disagree   | 1      | 10             | 10 |
|           |           | Agree      | 3      | 147            | 88,89 |
|           |           | Normal     | 2      | 56             | 112|
|           |           | Disagree   | 1      | 7              | 7  |
| AVERAGE   |           |            |        |                | 90,15|

Table 4. Ability scoring model validity test from Support Engineer

| Dimension | Questions | Statements | Weight | Support Engineer | %  |
|-----------|-----------|------------|--------|-----------------|----|
| I         | 6         | Agree      | 3      | 150             | 91,11 |
|           |           | Normal     | 2      | 12              | 24 |
|           |           | Disagree   | 1      | 18              | 18 |
|           |           | Agree      | 3      | 324             | 94,44 |
|           |           | Normal     | 2      | 12              | 24 |
|           |           | Disagree   | 1      | 24              | 24 |
| II        | 12        | Agree      | 3      | 240             | 92,22 |
|           |           | Normal     | 2      | 50              | 100|
|           |           | Disagree   | 1      | 10              | 10 |
|           |           | Agree      | 3      | 147             | 88,89 |
|           |           | Normal     | 2      | 56              | 112|
|           |           | Disagree   | 1      | 7               | 7  |
| AVERAGE   |           |            |        |                | 91,67|
Table 5. Ability scoring model validity test from Communication Expert

| Dimension | Questions | Statements | Weight | Communication Expert | Freq. | Score | % |
|-----------|-----------|------------|--------|----------------------|-------|-------|---|
| I         | 6         | Agree      | 3      | 11                   | 33    | 97,22 |
|           |           | Normal     | 2      | 1                    | 2     |        |
|           |           | Disagree   | 1      | 0                    | 0     |        |
| II        | 12        | Agree      | 3      | 10                   | 30    | 88,10 |
|           |           | Normal     | 2      | 3                    | 6     |        |
|           |           | Disagree   | 1      | 1                    | 1     |        |
| III       | 10        | Agree      | 3      | 15                   | 45    | 90,00 |
|           |           | Normal     | 2      | 4                    | 8     |        |
|           |           | Disagree   | 1      | 1                    | 1     |        |
| IV        | 7         | Agree      | 3      | 12                   | 36    | 95,24 |
|           |           | Normal     | 2      | 2                    | 4     |        |
|           |           | Disagree   | 1      | 0                    | 0     |        |
| AVERAGE   |           |            |        |                      |       | 92,65 |

A quick and accurate response and support to customers’ requests ensures their satisfaction and increases the quality of provided services. This support primarily depends on experience and skills of support personnel [10][11].

4. Conclusion
With this research, we succeed in creating the scoring model with a value of more than 90% confidence level to assess the ability of a software support engineer. 90.15% of support manager which means that the measurement of technical capability in this model is correct and needed. 91.67% of support engineer which means that the questions in this model are accepted and needed by support engineer. 92.65% of communication expert which means that measuring communication skill in this model is correct. Therefore, this scoring model has been able to represent the real capabilities of a software support engineer.

Acknowledgement
The authors gratefully acknowledge Magister of Information System, Universitas Komputer Indonesia for the funding support of research and research facility.

References
[1] Alsyouf, I. 2007. The role of maintenance in improving companies’ productivity and profitability. International Journal of production economics, 105(1), pp.70-78.
[2] Kans, M., and Ingwald, A. 2008. Common database for cost-effective improvement of maintenance performance. International journal of production economics, 113(2), pp 734-747.
[3] Stojanov Z 2011 Software maintenance support activities: Challenges for very small software companies 1 , pp 1-5
[4] Sharp, H., and Robinson, H. 2005. Some social factors of software engineering: the maverick, community and technical practices. ACM SIGSOFT Software Engineering Notes, 30(4), pp 1-6.
[5] Kriegsman, M., and Barletta, R. 1993. Building a case-based help desk application. IEEE Expert, 8(6), pp.18-26.
[6] Kajko-Mattsson, M. 2004. Problems within front-end support. Journal of software maintenance and evolution: Research and Practice, 16(4-5), pp 309-329.
[7] Parikh, G. 1986. Exploring the world of software maintenance: what is software maintenance?. ACM SIGSOFT software engineering notes, 11(2), pp 49-52.
[8] Mamone, S. 1994. The IEEE standard for software maintenance. *ACM SIGSOFT Software Engineering Notes*, 19(1), pp 75-76.

[9] Niessink, F., and Van Vliet, H. 2000. Software maintenance from a service perspective. *Journal of Software Maintenance: Research and Practice*, 12(2), pp 103-120.

[10] Pentland, B. T. 1992. Organizing moves in software support hot lines. *Administrative Science Quarterly*, pp. 527-548.

[11] Heras, S., García-Pardo, J. Á., Ramos-Garijo, R., Palomares, A., Botti, V., Rebollo, M., and Julián, V. 2009. Multi-domain case-based module for customer support. *Expert Systems with Applications*, 36(3), pp 6866-6873.