



Bea Scoring System: Selecting the Right Person for Scholarship

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ABSTRACT

Disability may involve visual disability, physical disability, learning disorder, speech disorder, mental disorder and others various disabilities. This situation can reduce the quality of life, and causes clear drawback to that person. Due to this, in many countries, there are scholarships for students with disability, and students with disability parents. Universiti Utara Malaysia also provides a scholarship known as Bestari Education Award (BEA) scheme to assist poor students with disability. The process of selecting the right student for the scholarship is through a manual approach by analyzing the individual application forms and usually very time consuming. In this study, a scoring system is developed to simplify the selection process. The score is based on monthly household income, number of dependents and taking into consideration any disabilities, critical illnesses, *orang asli* and orphan. This scoring system can replace the long manual process of analyzing the forms and assist administrative to strategize the management of this special scheme.

Keyword: Financial Assistance, Manual Selection, Scoring System

JEL Classifications: I24, C60

1. INTRODUCTION

Bestari Education Award (BEA) scheme was formed to acknowledge excellent students in need of additional financial assistance. Although the students have financial support such as from Perbandanan Tabung Pendidikan Tinggi Nasional (PTPTN), they use that funding to help their family. Then, they end up with less money and face difficulties to accommodate the cost of living. Realizing the financial support needed, Department of Hal Ehwal Pelajar and Alumni (HEPA), Universiti Utara Malaysia (UUM) aims to help students by waiving their university fees through BEA scheme. The implementation of this scheme not only to accommodate the students from excellent academic results and low-income families, but it is also to encourage those students who are disable person and/or having a critical illness, *orang asli* and/or orphan.

The selection of the students is conducted manually by analyzing the application form where in the first filter stage two criteria are used i.e., cumulative grade point average (CGPA) more than 3.00 and household income less than RM 3000. The second filter stage is to conduct interview for all applicants fulfill those two criteria. During the interview others criteria i.e., number of dependents, disable person and/or having a critical illness, *orang asli* and/or orphan would be considered to select the right students for receiving BEA scheme but it is based on the interviewer judgment. This manual process is very time consuming and inefficient in selecting the successful applicants.

In this study, a scoring system is developed based on those criteria to simplify the selection process in short listing the final candidates to be interviewed for BEA scheme. The following sections

explains regarding decision criteria used in the scoring system, the derivation of mathematical formulation of the score, overview of the scoring system and conclusions of the study.

2. SOME REVIEW ON DECISION CRITERIA

Poverty is often associated with low family income and indirectly to some extent affects the children's academic achievement. A research report by Southern Education Foundation (Steve Suitts, 2013) state that low income students are more likely than students from wealthier families to have lower tests scores, fall behind in school, dropout, and fail to acquire a college degree. These gaps in learning and achievement have not improved in recent years, while the numbers of low-income students have worsened in the South and nation. According to Ismail (2009), experts of the United States state department of education confirms that gap among students achievement does exist, and it is caused by environmental factors, namely high living standards, standards of sociology, health and poor families. Students who are poor are unlikely to pursue graduate level while the rich are most likely to pursue graduate level, as academic achievement is influenced by quality of life (Hernandez, 2011). A number of researches also show that family income appears to be more strongly related to children's ability in achievement rather than to their emotional outcomes (Brooks-gunn and Greg, 1997).

Common definition of poor family with various aspects to consider are gathered and consolidated from governmental sources. In Malaysia, the current minimum wage is RM 900. Assuming that both the parents are working, we can say that the family gross income is RM 1800. If the family gross income is less than RM 1800, we can consider this to be below the poverty line and poor. Families can use their incomes on savings, consumption of "normal" goods and services, and on goods and services for the disabled child's care (e.g., equipment, travel, special diet, special clothing, renovation, relocation, wheelchairs). In addition, they receive services such as in-kind support from voluntary organizations. Ideally, all of these should be identified and recorded. If they are subsidized, then, as stated above, the value of the subsidy should also be included as income. In this way one can measure both the use of services and all of the resources available to obtain them.

Disabilities are believed to have a relationship with economic status. The number of children with disabilities is on the rise. These children, like any child, require care, but children with disabilities often require exceptional levels of care and related costs (Anderson et al., 2007). The literature reports troubling findings on association between low income and children with special needs, with associations between these factors that might go both ways (Birenbaum, 2002). In other words, children with a disability are often born into low income families. Parents of a disabled child require more time off work and are more likely to work reduced hours and to decline overtime (Thyen et al., 1999; Breslau et al., 1982; Mother Caring for Children with Disabilities, 2000; Bumbalo et al., 2005). Thus, families who care for children with a disability often find themselves sliding towards poverty.

Another study by the national U.S. once reported that 40% of families of children with special health care needs, experience a financial burden due to their child's condition (Kuhlthau et al., 2005). Similar findings were also reported in other countries (Fawcett et al., 2004; Beresford, 1995). Besides children with disabilities, disabilities among elderly persons were also considered in this study. Many elderly persons require long-term care not because they are physically impaired, but because they have impairments in mental and cognitive functioning. The most prevalent of the diseases which result in cognitive impairments is Alzheimer's disease. However, there are also a variety of other conditions, including multi-infarct dementia, Pick's disease, and the dementias associated with Parkinsonism and Huntington's chorea that affect cognitive abilities. They are all progressively degenerative diseases which ultimately affect not only a person's cognitive abilities but physical capacities as well.

Households that spend more time providing care on disability children and disability elderly person will have less time for work and, therefore, lower employment incomes. Lower incomes will likely result in less spending and consequently some of the child's needs may not be met. Hence, not only is the child with the disability affected, but so are the other family members. Families who care for a child with a disability are more likely to be single income families with lower quality jobs yielding lower incomes, to live in poor quality housing, and to live in poverty. The size and impact of the burden incurred by these families, however, is not well-known. There is evidence in the literature that parents of children with disabilities face unique financial challenges and meeting their child's needs and making financial ends meet is difficult for most. Moreover, these financial challenges become worst as the severity of disabilities increase. Studies have shown that the severity of the disability has an impact on the resources and cost of care (Meyers et al., 1998; Dowling and Dolan, 2001).

By taking into account family income, disabilities among family members and the number of dependents in the family, hopefully the system created can lists the name of scholarship applicants based on scoring and thus, it can replace the long manual process of analyzing the forms and assist HEPA to strategize the management of this special scheme.

3. METHODOLOGY

We started with identifying suitable scholarship criteria in developing a mathematical scoring formulation for selecting the right students for the scholarship. BEA is designed to ease burden and fund the students from disadvantaged backgrounds.

Currently for the first filter stage, the decision criteria for student's selection is referred to those who possess outstanding leadership with CGPA more than 3.00 and their parent's household income not exceeding RM 3,000. The criteria used are too broad and ineffective in filtering the applicants. Therefore, the first step prior to the mathematical scoring formulation is to add significant decision criterion to ensure that most qualified students will receive this scholarship.

According to Easterlin (2000), there are two measures of living standards which are income and consumption. Income is the remunerations involving claims on goods and services by individuals or households. In contrast, consumption refers to resources actually consumed. Many components of consumption are measured by looking at household expenditures.

In this study, the monthly household income (MHI) is referring to monthly family gross income. There are four main components in the measurement of income: (i) wage income from labor services; (ii) rental income from the supply of land, capital, or other assets, (iii) self-employment income, and (iv) current transfers from government or non-government agencies or other households. Therefore, in constructing the mathematical scoring formulation, we define MHI as a total income of parents (or guardian's) including fixed income, extra income, pension, or welfare. If the income is one time basis, the applicants have to mention its average value (divided by 12 months).

Another criterion for measuring living standards is consumption. Most researches define it in four main classes of consumption: (i) food items, (ii) non-food or non-durable items, (iii) consumer durables, and (iv) housing. All of this consumption is not easy to measure since everything is not documented by the parents (guardians). Instead of using amount of consumption, we use the method of assigning a weight to persons related to the consumption.

Based on Table 1, the most priority is given to the children with one weight factor, and other relationship is given half weight factor. We also consider a person with disabilities, having any critical illnesses, and parent's taking care of their parents and/or relative, to be counted into the mathematical scoring formulation. We hope the fund can play its role to "ease burden" of the parent (or the guardian) of applicants.

Other than disability and critical illness, we also allocated one (1) weight factor for *Orang asli* and orphan in order to encourage them to pursue their study in a higher level and to develop better life.

3.1. Mathematical Scoring Formulation

Based on the decision criteria in previous section, the mathematical scoring formula is

$$pp = \frac{MHI}{w}$$

Table 1: Weight of each criterion

Relationship with parents/guardian	Normal case	If they are among the "persons with disabilities"	If they have any "critical illness"
Children*	1	1	1
Parents	0.5	0.5	0.5
Grandparents	0.5	0.5	0.5
Relative	0.5	0.5	0.5
Others	0.5	0.5	0.5

*Children includes biological or adopted, children from a current or previous marriage and all step-children

Where, *cpp* is consumption per person, MHI is monthly household income.

$$w = \sum_{i=1}^k w_i, \text{ for } i = 1, 2, \dots, k \text{ and } w_i = \begin{cases} 1 \\ 0.5 \\ 0 \end{cases}, \text{ based on the weight}$$

allocation as explained in Table 1.

The score is based on *cpp* and rank from smallest to the largest, and applicants with the lower scores are the most likely to be called for interview by HEPA.

3.2. Illustrative Examples

The following illustrate three examples of different applicant scenarios in demonstrating the calculation of the score based on the mathematical scoring formulation (*cpp*) in the previous section. Suppose that all of the three applicants (Applicants 1, 2 and 3) are having the same MHI which is RM 2000 and number of dependents that is four. Table 2 shows example 1 where the applicant's parents (or guardian) are responsible for four dependents with disabilities and critical illnesses. The score (or *cpp*) is calculated by dividing MHI (RM 2000) with the total weight which is 9. Thus the score is 222.22.

Tables 3 and 4; display examples 2 and 3 respectively. The scores are 444.44 (RM 2000/4.5) and 250 (RM 2000/8) respectively for Applicant 2 and Applicant 3. Next, the three scores are ranked from smallest to largest. In this case, Applicant 1 will be the best person to be called for interview, followed by Applicant 3, and Applicant 2. We show that, the weight plays an important role in determining the score. Although all of the three applicants have

Table 2: Example 1 of weight calculation

Name	Relationship	Automatic (by default)	Persons with disabilities	Critical illness	Weight
A	Children	1	1	1	3
B	Children	1	1	1	3
C	Parents	0.5	1	0	1.5
D	Relative	0.5	0	1	1.5
Total					9

Table 3: Example 2 of weight calculation

Name	Relationship	Automatic (by default)	Persons with disabilities	Critical illness	Weight
A	Children	1	0	1	2
B	Grandparents	0.5	0	0	0.5
C	Parents	0.5	0	0	0.5
D	Relative	0.5	0	1	1.5
Total					4.5

Table 4: Example 3 of weight calculation

Name	Relationship	Automatic (by default)	Persons with disabilities	Critical illness	Weight
A	Children	1	0	1	2
B	Children	1	1	0	2
C	Children	1	1	0	2
D	Children	1	0	1	2
Total					8

the same MHI and number of dependents, the score are different due to different background of the dependents. This indicates that the weight plays an important role in the decision of BEA.

This scoring formulation is used in the following system (Figure 1) where an instrument i.e., on-line application form with relevant criteria was created and validated using simulated data. Since the focus of this paper is mathematical scoring formulation, therefore we will not discuss the detail of the online BEA system. Figure 2 shows the sample of scoring based on the mathematical formulation.

4. CONCLUDING REMARKS

A valid and reliable scoring system was successfully developed to assist HEPA and shorten the time for filtering process in handling hundreds of application form every semester. By taking into

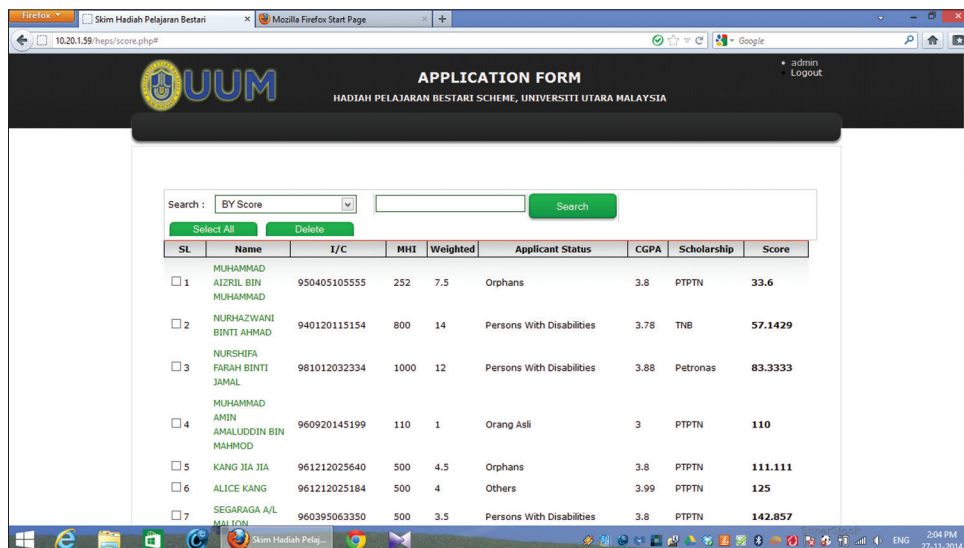
account family income, disabilities and critical illness among family members, the number of dependents in the family, *Orang asli* and orphan; hopefully the system created can lists the name of scholarship applicants based on scoring and thus, it can replace the long manual process of analyzing the forms and assist HEPA to strategize the management of this special scheme.

This is the initial version of the system which uses simple weightage scoring; in the future, we look forward to upgrade the scoring by using discriminant analysis based on a few batches of online database applicants in determining the discriminant function. The variables involved in building this function will be the MHI, applicant/dependent status (i.e. disability, critical illness, *Orang asli*, orphans), CGPA, SIRA and the applicant's results (i.e. successful or not). Perhaps by using discriminant function, the filtering of qualified applicants is more thorough and accurate.

Figure 1: Bestari Education Award online application



Figure 2: List of applicants according to scores (simulated data)



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