$300X_1 + 6000X_2 + 500(X_{3old} + X_{3new}) + 1000(X_{4old} + X_{4newI} + X_{4newT}) + 20000X_5 + 96000X_6 + 96000X_7 + 125000X_8 + 72000X_9 + 500X_{10} + D =$ total budget given by the solution for Objective 1.

4.0 Results Interpretation for Model C Objective 1

Model C is a multi-objective mixed-IP model, involving two objective functions. The model was solved using the preemptive method. The first objective to be achieved was to optimize the total budget that is by the university management for the next round of strategic planning year for both new introduced and existing strategies. Since the budget allocated is not known, we made an assumption that RM 80,000,000 will be allocated by the university management.

Table 4.1 Results for Model C Objective 1

Variable	**80,000,000**
X_1	150
X_2	905
X_3	428
X_{3new}	0
X_4	428
X_{4newI}	0
X_{4newT}	0
X_5	3
X_6	278
X_7	0
X_8	377
X_9	0
X_{10}	20
Optimal value (the minimum unachieved SETARA point)	0.0056

The results in Table 4.1 show than when RM80,000,000 is allocated by the university management, the entire amount will be utilized to achieve as many point as can be achieved with an optimal value 0.0056

1. 150 students development programs with an average of 30 students to be engaged in each program.
2. 905 students being offered scholarship.

3. 428 UUM students to be sent for outbound programs in local universities with credit transfer.
4. No UUM students to be sent for outbound programs in local universities with credit transfer (new introduced strategy)
5. 428 UUM students to be sent for outbound in international universities with credit transfer.
6. No UUM students to be sent for outbound in international universities with credit transfer (new introduced strategy to Indonesia)
7. No UUM students to be sent for outbound in international universities with credit transfer (new introduced strategy to Thailand)
8. Three promotional programs to selected foreign countries to increase the percentage enrollment of international students.
9. 278 staff with industrial experience to be hired.
10. No academic staff with teaching experience abroad will be needed for the next round of budget allocation. This activity has been fully achieved 100%.
11. 377 is the total number of academic staff with PhD
12. X_9 No academic staff should be employed or will be needed for the next round of budget allocation, this activity has been fully achieved.
13. Lastly, 20 staff must be sent for training.

Having achieved objective one, for objective two, is to minimize total budget allocated for the next round of strategic planning, with the allocation of weight to strategies giving priority to strategies with higher rating, the weight allocated to each strategic plan is presented in Table 3.1. Prioritization of each strategy answers the research question 4, budget allocation practices with priority settings with regards to the maximization of benefits and minimization of cost. Objective 2 is analyzed with the allocation of budget 80,000,000 less than the estimated budget as presented in model A; the results are presented in table 4.2.

Table 4.2 Agenda with Weights for Existing and New Strategies

Agenda	Points by SETARA	Weight
X_1	0.6	0.0768
X_2	0.2625	0.0336
X_3	0.6	0.0768
X_{3new}	0.6	0.0768
X_4	0.66	0.0768
X_{4newI}	0.6	0.0768
X_{4newT}	0.6	0.0768
X_5	0.25	0.0320
X_6	0.4	0.0512
X_7	0.3	0.0384
X_8	0.6	0.0768
X_9	4	0.5120
X_{10}	0.2	0.0256

Table 4.3 Results for proposed Model Objective 2

Variable	80,000,000
X_1	150
X_2	905
X_3	428
X_{3new}	0
X_4	428
X_{4newI}	0
X_{4newT}	0
X_5	3
X_6	215
X_7	0
X_8	420
X_9	0
X_{10}	1200
Optimal value (the minimum unachieved SETARA point)	0.0035

The results in Table 4.4 show than when RM80,000,000 is allocated by the university management, the minimum unachieved point (as indicated by *optimal or solution value* = 0.0037).

1. 150 students development programs with an average of 30 students to be engaged in each program.
2. 905 students being offered scholarship.
3. 428 UUM students to be sent for outbound programs in local universities with credit transfer.
4. No UUM students to be sent for outbound programs in local universities with credit transfer.
5. 428 UUM students to be sent for outbound in international universities with credit transfer.
6. No UUM students to be sent for outbound in international universities with credit transfer.
7. No UUM students to be sent for outbound in international universities with credit transfer.
8. Three promotional programs to selected foreign countries to increase the percentage enrollment of international students.
9. 215 staff with industrial experience to be hired.
10. No academic staff with teaching experience abroad will be needed for the next round of budget allocation. This activity has been fully achieved 100%.
11. *420* is the total number of academic staff with PhD
12. X_9 No academic staff should be employed or will be needed for the next round of budget allocation, this activity has been fully achieved.
13. Lastly, 1200 staff must be sent for training.

The minimized unachieved point (as indicated by *optimal or solution value* = 0.0035). The unachieved point for each strategy is less when the each strategy is prioritized.

5.0 Discussion and Conclusion

This research on adjusted PBMA is applicable to are problems with strategic activities for improvement. The Priotization of strategies which are used for ranking the quality of the university. Mixed Integer programming is used for allocation and reallocation of budget on selected activities. The result presented in this study showed for next year of budget allocation, It will be preferable and more beneficial to allocate priorities to every strategy to achieve a higher benefit with the same budget allocation. Prioritization of activities is based on MCC only, in reality, selection of determining preferences of activities by the university management to be founded should be given little consideration, hence preference factor should be included in future work.

References

Brambleby, P. and Fordham, R. (2003a) Implementing PBMA?, 4(3), http://www.medicine. ox.ac.uk/bandolier/painres/download/whatis/pbmaimp.pdf, accessed on 15 April 2016.

Brambleby, P. and Fordham R. (2003b) What is PBMA?, 4(2), http://www.medicine.ox.ac. uk/bandolier/painres/download/whatis/pbma.pdf, accessed on 17 April 2016.

Drugs, C. A. F., & Health, T. I. (2014). Guidelines for the economic evaluation of health technologies: Canada 2006, Ottawa, http://cadth. ca/media/pdf/186_EconomicGuidelines_e. pdf, accessed on 11 June 2016.

Hinton, K. E. (2012). A Practical Guide to Strategic Planning in Higher Education, Society for College and University Planning, http://oira.cortland.edu/webpage/planningandassessmentresources/planningresources/SCPGuideonPlanning.pdf, accessed on 27 July 2016.

Knoll, M. A. Z. (2010). The role of behavioral economics and behavioral decision making in American's retirement savings decisions, *Society Security Bulletin, 70*(4), 1-23.

Mitton, C., Dionne, F., & Donaldson, C. (2014). Managing Healthcare Budgets in Times of Austerity: The Role of Program Budgeting and Marginal Analysis. *Applied health economics and health policy, 12*(2), 95-102.

Petren, S., Bjerklin, K., Marke, L. A., and Bondemark, L. (2013). Early correction of posterior crossbite - a cost-minimization analysis, *European Journal of Orthodontics, 35*, 14–21.

Polisena, J., Tran, K., and Cimon, K. (2010). Home telehealth for chronic obstructive pulmonary disease: a systematic review and meta-analysis, *Journal of Telemed Telecare, 16*(3),120–127.

Smith, K. J., Wateska, A. R., Nowalk, M. P., Raymund, M., Lee, B. Y., and Zimmerman, R. K. (2013). Modeling of cost effectiveness of pneumococcal conjugate vaccination strategies in U.S. older adults, *American Journal of Preventive Medicine, 44*(4), 373-381.

Smith, N., Mitton, C., Dowling, L., Hiltz, M. A., Campbell, M., and Gujar, S.A. (2016). Introducing new priority setting and resource allocation processes in a Canadian healthcare

organization: A case study analysis informed by multiple streams theory, *International Journal of Health Policy Management, 5*(1), 23-31. doi:10.15171/ijhpm.2015.169.

Uctug, F.G. and Yukseltan, E. (2012). A linear programming approach to household energy conservation: Efficient allocation of budget, *Energy and Buildings, 49*, 200–208.