CHAPTER 6
CONCLUSION AND SUGGESTION

6.1. Conclusion

After doing all development for break schedule and work pattern by creating program in Microsoft Excel, the conclusion of this research are drawn:

a. The algorithm generated to build new break schedule is explained in Algorithm 1.

b. The criteria for selecting the best break schedule among several scenarios are:

   1) Working hour should not be more than five consecutive hours and followed by rest period that should not be less than one hour (Thailand's Ministry of Labour, 1998).

   2) The greatest value of maximum line can be handled by one stagger among other scenarios with same total break time.

   3) The least number of stagger team needed among other scenarios with same total break time.

   4) Total working hour for stagger that assigned in maximum capacity of line teams can be handled is at least 8 hours.

   5) Break time frame must be on multiplication of quarter hour.

   6) Check all break duration for stagger team whether has same length or not.

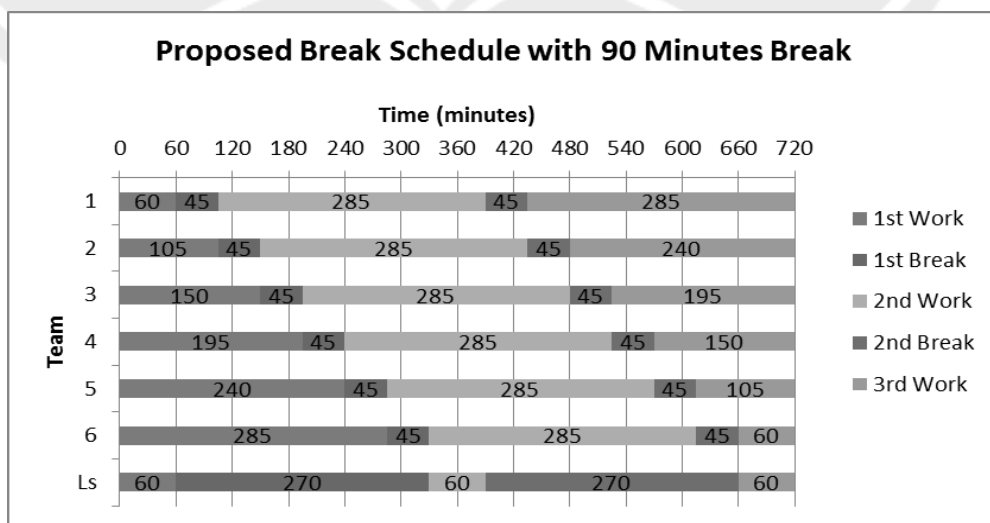c. The best break schedule achieved in this research can be seen in Figure 6.1.

Figure 6.1. Break Schedule's Final Result

d. The best break schedule achieved in this research assigns one stagger team to handle 6 line teams.

e. The algorithm generated to build work pattern is explained in Algorithm 2.

f. The criteria for selecting the best work pattern among several scenarios are:

 1) Workweek should not be more than 60 hours (EICC, 2014; Apple, 2013).

 2) There must be two crews assigned on one day as there are three crews in the company and two shift works in one day.

g. The best work pattern that has followed the regulation from EICC (2014) and Apple (2013) can be seen in Figure 6.2.

Week	MON	TUE	WED	THU	FRI	SAT	SUN
1	Work	Work	Work	Work	OFF	OFF	Work
2	Work	Work	Work	OFF	OFF	Work	Work
3	Work	Work	OFF	OFF	Work	Work	Work
4	Work	OFF	OFF	Work	Work	Work	Work
5	OFF	OFF	Work	Work	Work	Work	OFF
6	OFF	Work	Work	Work	Work	OFF	OFF

Work Pattern						Workweek (hours)
Work	Work	Work	Work	OFF	OFF	42

Figure 6.2. Work Pattern's Final Result

h. As the same work pattern is applied for all crews, combination of assignment for all crews regarding with shift work named shift schedule is generated. The best result of shift schedule can be seen in Figure 6.3.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Day	A	A	A	A	C	C	C	C	B	B	B	B	A	A	A	A	C	C	C	C	B
Night	C	C	B	B	B	B	A	A	A	A	C	C	C	C	B	B	B	B	A	A	A
Off	B	B	C	C	A	A	B	B	C	C	A	A	B	B	C	C	A	A	B	B	C

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Day	B	B	B	A	A	A	A	C	C	C	C	B	B	B	B	A	A	A	A	C	C
Night	A	C	C	C	C	B	B	B	B	A	A	A	A	C	C	C	C	B	B	B	B
Off	C	A	A	B	B	C	C	A	A	B	B	C	C	A	A	B	B	C	C	A	A

Figure 6.3. Shift Schedule's Final Result

6.2. Suggestion

Several considerations for future research extension are level of production in the company, cost incurred, and number of headcount. Level of production in the company is used when the demand is not constant. The policy for work pattern

can be created based on level of production. If there is a change for the schedule, current schedule and proposed schedule can be compared considering the cost incurred and number of headcount. The program also needs to be developed for analysis as this research analyzes the schedule manually. By providing program for analysis, user can get the best result automatically.

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APPENDIX 1
USER GUIDE FOR BREAK SCHEDULE PROGRAM

Overview

This program is used for building break schedule automatically. However, this program works as calculator only as the program cannot choose the best break schedule over several scenarios created. In the input section, this program will generate several scenarios based on possible values of break schedule components. The output of this program is break schedule for all scenarios generated in input section. This program is built on one of feature in Microsoft Excel, VB Program.

Operating Break Schedule Program

1. Open Microsoft Excel's file named Final Project DONE.xlsm
2. Make sure to enable Macro feature
3. Choose worksheet named Input
4. Look at break schedule section in Input sheet
5. Click command button named Input below break schedule's input data
6. Fill in shift length in hour, number of line assigned, and break time in minutes on user form showed
7. If there is mistype, click button named Clear to clean out data inputted in user form
8. If cancelling to fill in break schedule's input, click button named Cancel and user form will be closed
9. If button named OK is clicked after fill in all input, several scenarios will be generated automatically based on possible values from input data
10. After all scenarios are generated, click command button named RUN Break Schedule and break schedule over all scenarios will be built in worksheet named Break Schedule. If the value in break schedule is greater than 5 hours or 300 minutes, it will be displayed by red colored number. Break schedule that has red colored number cannot be considered as good break schedule. If there are some break schedule that pass the regulation, those will be evaluated later manually.

Editing Break Schedule Program

1. Open Microsoft Excel's file named Final Project DONE.xlsm

2. Click on Developer tab. If there is no Developer tab, click File, select Options, choose Customize Ribbon, Give check mark for Developer on Main Tabs, and Click OK.

3. On Developer tab, click Visual Basic

4. Double click in Sheet1 (Input). In this sheet, there are several private sub there.

5. Look at Private Sub Command_input_Click(). This private sub is used for giving instruction when command button named Input for break schedule is clicked.

3. Double click on UserForm_BreakSchedule. This forms display how user form for break schedule would like to showed including instruction for command button in user form.

4. Double click on user form. There are several private subs regarding with the display on user form. Private Sub UserForm_initialize() is used for displaying no values showed on textboxfor all input. Private Sub Command_ok_Click(), it is used for generate the input on scenarios after clicking command button named OK. The value on Work1_cont represents initial first work. Currently value of Work1_cont is 15 with increment 15. The value of Work1_cont will be tried by do loop command until equal to 120. If there is change on value of Work1_cont, three parts regarding with Work1_cont can be changed manually. The value for first stagger break also can be changed manually. Currently minimum value for b1 or break1 is 40 with increment 5 to find possible value for combination of break. Those two values can be changed depend on the needs. Private Sub Command_clear_Click() is used for clean out any values in input after command button named Clear is clicked. Private Sub Command_cancel_Click() is used for closing user form as canceling input data in user form after command button named Cancel is clicked.

1. Double click on Sheet1 (Input). Look at Private Sub RUNBreakSchedule_Click(). That is used for generate break schedule based on scenarios created in Input sheets after clicking command button named RUN Break Schedule.

2. Double click on Modules folder. There are two modules for break schedule. Those are BreakScheduleScn1 and BreakScheduleScnOther. Both modules there work as function to calculate break schedule that are called in when command button named RUN Break Schedule is clicked. BreakScheduleScn1 Module is used for calculating break schedule for scenario 1 only. constraint_10AM is used for giving limitation when line team gets long break. Currently, the value for constraint_10AM is 3. If 3 hours is too long to be the limitation, value for constraint_10AM can be changed manually. BreakScheduleScnOther Module is used for calculating break schedule for all scenarios generated in input except scenario 1.
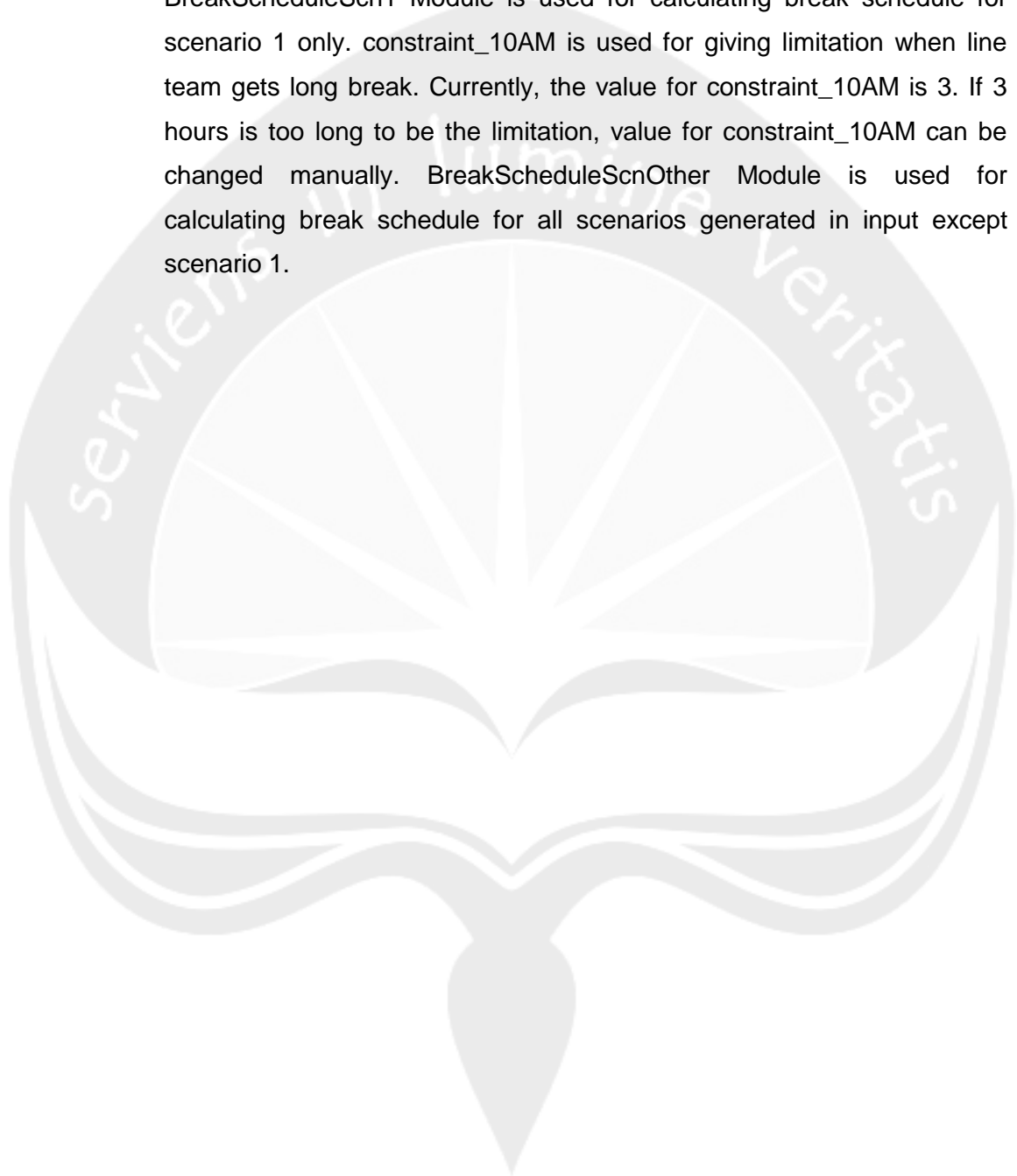
APPENDIX 2

USER GUIDE FOR WORK PATTERN PROGRAM

Overview

This program is used for building work pattern automatically. However, this program works as calculator only as the program cannot choose the best work pattern over several scenarios created. In the input section, this program will generate several scenarios based on possible values of placement of first day work on work cycle. The output of this program is work pattern for all scenarios generated in input section. This program is built on one of feature in Microsoft Excel, VB Program.

Operating Work Pattern Program

1.   Open Microsoft Excel's file named Final Project DONE.xlsm

2.   Make sure to enable Macro feature

3.   Choose worksheet named Input

4.   Look at work pattern section in Input sheet

5.   Click command button named Input below work pattern's input data

6.   Fill in shift length in hour, break time in minutes, day-off in day, and work cycle in day

7.   If there is mistype, click button named Clear to clean out data inputted in user form

8.   If cancelling to fill in work pattern's input, click button named Cancel and user form will be closed

9.   If button named OK is clicked after fill in all input, several scenarios will be generated automatically based on possible values from input data

10.   After all scenarios are generated, click command button named RUN Work Pattern and work pattern over all scenarios will be built in worksheet named Work Pattern. If the value of workweek is greater than 60 hours, it will be displayed by red colored number. Work pattern that has red colored number cannot be considered as good work pattern. If there are some work pattern that pass the regulation, those will be evaluated later manually.

Editing Work Pattern Program

1. Open Microsoft Excel's file named Final Project DONE.xlsm

2. Click on Developer tab. If there is no Developer tab, click File, select Options, choose Customize Ribbon, Give check mark for Developer on Main Tabs, and Click OK.

3. On Developer tab, click Visual Basic

4. Double click in Sheet1 (Input). In this sheet, there are several private sub there.

5. Look at Private Sub Input1_Click(). This private sub is used for giving instruction when command button named Input is clicked.

6. Double click on UserForm_WorkPattern. This forms display how user form for work pattern would like to showed including instruction for command button in user form.

7. Double click on user form. There are several private subs regarding with the display on user form. Private Sub UserForm_initialize() is used for displaying no values showed on textboxfor all input. Private Sub Command_ok_Click(), it is used for generate the input on scenarios after clicking command button named OK. Private Sub Command_clear_Click() is used for clean out any values in input after command button named Clear is clicked. Private Sub Command_cancel_Click() is used for closing user form as canceling input data in user form after command button named Cancel is clicked.

8. Double click on Sheet1 (Input). Look at Private Sub RUNWorkPattern_Click(). That is used for generate work pattern based on scenarios created in Input sheets after clicking command button named RUN Work Pattern.

9. Double click on Modules folder. Double click on WorkPattern Module. The module works as function to generate work pattern that is called in when command button named RUN Work Pattern is clicked. Currently, this program generates work pattern only for 6 days and 7 days' work cycle. If there is any option of work cycle beside those values, the assignment for work and day off on each week and each crew must be added manually. Looping command for displaying week also needs to be considered.