Chapter 5

Conclusions and Future Research Directions

5.1 Conclusion

Models for pooling by switching have been developed in this research are capable to gain the benefit of pooling while keeping the advantages of service level or customer satisfaction of decentralized system can give. The models cover various possibilities of situations that might be found in practice such as in situation where number of resources at each station is fixed for the whole planning horizon. Typical situation for a pooling problem happens in the laundry service that require job switch instead of the resource switch. Models also covers situation where total permanent sources of all stations is fixed or cannot be changed during the planning horizon, they just can be switched from one station to the other following the demand.

Numerical tests of the models show satisfactory performance. Total cost, included the additional cost of switching, and number of resources required to fulfill all of the customer demand can be significantly reduced by switching. Effect of demand correlation coefficient to the benefit of risk pooling effect that usually occur in any other pooling methods also happened in this ‘pooling by switching’ method. In example case, the performance of the system still significantly good in any situation of demand correlation coefficient. The models also quite simple to be applied since in small number of stations and periods like we have in the numerical test, we just need standard excel solver add-ins to solve
the optimization problem. In case of any larger problem than the numerical test, we need more powerful solver or heuristic algorithm.

We need to pay attention on the case where outsourcing or penalty can be applied. Data and parameters we use in the numerical test shows that outsourcing/penalty is sensitive to the change of correlation coefficient and makes the model rely more on the outsource or penalty instead of rely on permanent resources, by the increase of positive correlation coefficient. Situation might be different if parameter set is different from what we set. Overall compared to decentralized system the models perform absolutely significant include models with outsource or penalty so certainly this ‘pooling by switching’ system is feasible to be applied.

5.2 Contribution

This research contributes a new way of resources pooling without sacrificing service to customer as what happened in traditional geographical pooling. Similar way of pooling but for resources that consumed during the process, like the inventories, has been studied in lateral transshipment models. This research develops models for resources that are not consumed during the process, like manpower or machine.

Flexible pooling system developed in this research is different from the conventional pooling system in term of additional cost of switching/transporting. Than the performance test also conducted to know how the system works in different demand correlation coefficient environment. From the test we can see that the system behaves the same as any other way of pooling.
5.3 Future Research Direction

Our models assume that demand is deterministic or at least can be very well forecasted. Different models should be developed to take into account stochastic demand situation. More variation of data and parameter can also be conducted in the future to get more comprehension on the behavior of this ‘pooling by switching’ system in different situations. Test the model in more various data, parameters or other factor that can affect the performance of pooling also means conducting sensitivity analysis for the models. Test the models with real live or empirical data also importance to judge the applicability of these models.

Effect of flexibility of location by switching might also applied partially instead of for the total permanent resources like has been studied in this research. Future research to elaborate the performance of the ‘pooling by switching partially’ will be very interesting to know how is the performance of model of system with 100% switchable permanent resources in this research compare to less number of switchable permanent resources.