

## **CHAPTER V**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

The Aeronautical Radio of Thailand Ltd. or Aerothai is the air traffic control services organization that operates for safe, orderly, expeditious operations of the air transportation system in the region for more than 50 years. The company is facing with the problems that affect company's ATC services both now and in the future. In order to create the quality of service to meet the challenge of increasing safety, capacity, efficiency and reach the customer requirements, the continuous service improvement must be conducted.

The research study develops and uses benchmarking as a competitive tool for systematic measuring Aerothai's air traffic control services against the FAA that is recognized as the world leader in ATC services. The results of the benchmarking study will gain the information needed that assist the Aerothai to enhance its ATC's performance as well as ATC's practices will be improved.

The research study aims at improving air traffic services and searching for the best practices in the same broad industry in air traffic control, Hence the research study employs competitive benchmarking.

The research study applies 4 phases and 14 steps for this process model used in the study.

##### **5.1.1 Planning Phase**

The research study benchmarks three areas: Quality of Service , Technological Support and Human Operations. The quality of service affect its services

performance. Four measures of quality of service were addressed : safety, access rate, timelines of services and flight efficiency but the research study focuses on improvement of safety level, timeliness of service and flight efficiency for Quality of Service.

Selecting the company for used as the benchmark is a difficult and critical task. For this research study, the selection criteria matrix and the weighting scores for selecting the possible benchmarked company are done by the researcher not the experts but the researcher carefully developed the selection criteria matrix and assigns the scores in order to meet and reach the benchmarked company requirements by evaluating each benchmarked company's information and consulting with the experts both inside and outside of the company.

The FAA , NATS and EUROCONTROL are potential benchmarked company. Four selection criteria were developed for selecting the most potential benchmarked company. The criteria were: traffic holding/area control center , services diversity , world class innovation and recognition program for aviation communities and world class and good reputation from aviation communities. For this research study, the researcher selects FAA to be used as the benchmarked company.

### **5.1.2 Collecting Phase**

The research study develops various data collection methods for collecting the benchmarking information. The sources of information come from both primary and secondary sources. The research study collects the benchmarking information both internal and external.

**Internal Data Collection** : Concerned with collecting Aerothai's services performance and current practices. The research study used customer satisfaction surveys as tool to rate Aerothai's service performance from both Aerothai and FAA's airspace user. The employee surveys and interviews are used to identify practices and current operations.

**External Data Collection** : Concerned with collecting FAA's service performance and practices. The customer satisfaction surveys are used to rate FAA's service performance from both FAA and Aerothai's airspace users. The benchmarking questionnaire and secondary research are used to identify the practices and current operations.

### 5.1.3 Analyzing Phase

The research study employs various gap analysis tools to determine the performance gap that exists between Aerothai and FAA. The key strengths and weakness of both Aerothai and FAA during internal and external data collection period can provide the key insight to identify the differences in performance gap in order to determine the best practices that will facilitate the performance change. The performance gap were negative gap for all benchmarking factors, meaning " the FAA's performance is superior to Aerothai's performance for all benchmarking factors". The negative gap stimulates Aerothai to conduct specific actions to close the existing gap, which can be summarized as follows:

#### Quality of Service

**Safety Level** There are some weak points that affect safe operations as follows:

##### Safe Operation related to human operations

- Language difficulty, communications skill problem.
- The controller's cognitive abilities limitations , human factor constraints.
- Pilot-controller interface problem due to language difficulty and communications problem.
- Some factors affect human error and degrade controller's performance such as stress, fatigue, vigilance.

##### Safe Operation related to technology

- Communications system constraints.
- The voice of communication systems was poor.

### **Timeliness of Service and Flight Efficiency**

There are some weak points that affect timeliness of service and flight efficiency as follows :

- Inflexible flight routes.
- Unexpected traffic demand exceed air traffic control capacity.
- Congestion problem and delays.
- Increase traffic demand.
- Communications system constrains.
- Unreliability and availability of current technology support.
- Controller 's constraints that impact on timeliness of service and flight efficiency as follows:

- Language difficulty and communication skill problem.
- Pilot-Controller interface problem due to communication skill.
- Controller's cognitive abilities limitations.
- Controller's error; stress, vigilance, fatigue.

All measures of quality of service indicate negative , which show the need to change and improve especially safety,timeliness of service and flight efficiency. The root-cause analysis was employed for all measures to identify all enablers and its best practices in order to stimulate the performance change.

### **Technological Support**

There are some weak points that affect the technological support performance. The weak points as follows :

- Communications system constraints.
- Non-reliability and non-availability of others current technology such as navigation and surveillance system.
- The voice of communications system was poor. The study focuses on the communications system that needs improvement.



## **Human Operations**

There are some weak points that affect the human operation performance. The weak points are as follows:

- Language difficulty and communication problem.
- Pilot-controller interface problem due to language difficulty and communication problem.
- Controller's cognitive abilities limitations , human factor constraints.
- Some factors that affect human errors and degrade controller's performance. The factors are stress , vigilance and fatigue.
- Current training and selection program constraints while human environment change.

The research study focuses on the improvement of human operation performance as follows:

- Improve communication skill and language abilities.
- Improve pilot-controller interface.
- Improve controller's knowledge and skill.
- Improve controller's cognitive abilities as follows:
  - Problem solving and decision making.
  - Conflict detection and resolution.
  - Situation awareness.
- Ability to gather and process information.
- Some factors that affect human error and degrade controller's performance such as stress, vigilance and fatigue.
- Improve selection and training.

The results of root-cause analysis determine the key findings and best practices. The best practices found can be summarized as follows:

## **The Best Practices for Improvement of Quality of Service**

### **Safety level**

- English language training course.
- Crew resource management and team training.
- Training Tools such as simulation-based training and computer-based training.
- Human factor research.
- Shift work logic, shift work management , work-rest schedules management.
- Satellite and digital-based communications system.
- Technology research and acquisition.

### **Timeliness of Service and Flight Efficiency**

- Air traffic management system.
- User-preferred flight routes.
- Automation and automated System.
- The Best Practices for improvement of safe operation.

## **The Best Practices for Improvement of Human Operations**

- English language training course.
- Crew resource management and team training.
- Simulation-based training and computer-based training.
- Shift work logic, shift work management, work-rest schedules management.
- Human factor research.
- Selection and training.
- Human performance assessment tool.

## **The Best Practices for Improvement of Technological Support**

- Satellite and digital-based technology.
- Technology research & acquisition.
- Joint research with industry and aviation communities.
- Integrated product development team.

By consulting with the Aerothai 's experts , the projected performance required will set at five years. The action plans will establish to accomplish the goals within timescale. The action plans depend on the adoption and modification of best practices found from the results of benchmarking study.

#### 5.1.4 Improving Phase

The results of benchmarking study will bring the opportunities for ATC performance improvement. The key findings and best practices will modify and adapt into Aerothai's environment. The action plans were developed that would achieve the performance goals at five years

The action plans were developed and classified into two main plans as follows:

- 1 Air traffic control performance plan
- 2 Air traffic control operations plan
  - Technological Support Plan
  - Human Operations Plan

#### ATC Service Performance Plan

The service performance plan is created in order to define the service performance improvement needs and address specific actions in order to optimize service operations through meet the airspace user requirements. The plan can be stated as follows:

**Improvement of Safety** : The service improvement aims at improving service's safety and maintain maximum safety level at all phases of services. The plan focuses on the implementation of new and advanced technologies, improvement of human factor operations and the implementation of program support such as human factor research.

**The Action Plans for Safe Operations focus on as follows :**

-Develop and implement English language training program to improve controller's language abilities.

Implement simulation-based training, computer-based training tool to improve controller's cognitive abilities, knowledge and skill.

-Develop and implement crew resource management program and team training to improve team communication skill and pilot-controller interface.

-Develop and conduct human factor research to deploy and utilize the development and improvement of selection and training.

-Develop and implement shift work management practices to minimize the factors that impact on controller's error.

Improvement of Timeliness of Service and Flight Efficiency: The plan aims at improving service's capacity meet the challenge of increasing traffic demand both short and long term, increasing timeliness of service and reducing delays and airspace congestion problem.

For Flight Efficiency, the plan aims at improving the economic performance of airspace users by allowing the airspace users operate at efficient manner. reducing user operating cost, flight paths and flight times.

**The Action Plans for Timeliness of Service and Flight Efficiency focus on as follows :**

-Develop and implement user-preferred flight route program to provide cost-effective routes and flexible flight routes to user needs.

-Develop and implement air traffic management system to balance and manage service's capacity with demand in order to reduce congestion problem and delays.

-Implement automation and automated system to support traffic flow management and increase capacity.

- The action plans for improvement of safe operations



### ATC operations improvement plan

The plans to be created in order to define the operations improvement needs for Aerothai's service operations through the optimization of airspace users requirements that can be addressed as follows:

### ATC technology improvement plan

The action plans aim at minimizing the limitations of existing system and searching for effective system that consists of high quality, reliability and availability and continuous development of modern and state-of-the art technology.

#### **The Action Plans for Technological Support focus on the following :**

- Replace ground-based technology with satellite-based technology.
- Establish technology research & acquisition.
- Develop integrated product development team.

### ATC human operations improvement plan

The plans aim at improving controller's performance and minimizing controller's error.

#### **The Action Plans for Human Operations focus on the following :**

- Develop and implement English language training program to enhance controller's language abilities and communication skill.
- Implement simulation-based training, computer-based training to improve controller's cognitive abilities, knowledge and skill.
- Develop and implement crew resource management program and team training to improve team communication skill and pilot-controller interface.
- Develop and implement shift work management practices to minimize the factor that impact on controller's error.
- Conduct research, based on training to acquire, develop and improve training.
- Conduct research, based on selection to acquire, develop and improve selection.
- Conduct research, based on human performance assessment to acquire and develop the performance assessment methods and models.

## 5.2 Recommendations

Benchmarking is a new approach for Aerothai. The research study is done by the researcher, not the company experts, but it is hoped that this research study can be used as a guideline or pilot project for implementing and developing benchmarking in Aerothai's environment.

The advantages, disadvantages and limitations of this study can be used as a reference point for set the further development and improvement of benchmarking in the future. The results of the benchmarking study may be used as reference point for Aerothai in monitoring, measuring and assessing against the world's best. The approach will bring and search for the best performance and the best practices that will help Aerothai to improve services.

Surely, benchmarking provides numerous benefits for Aerothai. The power of benchmarking not only facilitates Aerothai's ATC services but also any particular business processes in Aerothai that need to gain superior performance and practices.

We can say that benchmarking can be used as a competitive and powerful tool for continuous improvement of Aerothai. Benchmarking needs the people to be involved in the process: top management commitment, employee involvement, education, communicate findings, and creates the need for change. These must be cooperated and coordinated as a single unit in order to attain the success of the approach of "Benchmarking".