

CHAPTER 9

CONCLUSIVE FINDING AND RECOMMENDATION

9.1 Discussion on Objectives and Finding

The main objective of this study is to find the factor that affect and contribute to fast and effective new product introduction process; thus leading to a successful new product introduction process for an EMS company.

The second objective of this study is to study current situation of new product introduction in the case company and suggest from finding which factors are critical for an EMS company to improve new product introduction process.

Based on the objectives of the study, two research questions were developed: 1. Do company's capabilities have significant affect and contribute to the fast and effective new product introduction process; thus leading to a successful new product introduction process? and 2. Which improvements should be implemented to improve these practices? In order to answer the first and second research question, four main hypotheses and sub-hypotheses were developed and tested. Each hypothesis was evaluated by employing descriptive statistical technique to obtain frequencies, mean, maximum and minimum value, the Pearson Product Moment Correlation or Pearson's correlation to verify linear relationship between two variables, and the chi-square tests of independence to evaluate the discrepancy between a set of observed frequencies and a set of expected frequencies.

According to main objective of this study and the literature review, four main success factors which are Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity were studied and evaluated their contribution to succession of new product introduction in the case company.

According to second objective of this study and the literature review, current situation of the case company was studied and statistically evaluated its performance level in

four main success factors, Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity.

In addition, company's performance in all main success factors were statically evaluated against success factors in order to verify their relationship for future improvement by using Pearson Product Moment Correlation or Pearson's correlation.

Weak points of the team which has less contribution to succession of new product introduction in the case company were evaluated and suggested for future improvement.

9.1.1 New Product Introduction Success Factors

Four main success factors regarding Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity were studied and evaluated their contribution to succession of new product introduction in the case company.

Based on the result, it indicated that more than **54.4%** of respondents have positive agreement on the following factors in contribution to succession of NPI project;

Factor 1: A company's ability to integrate and embed in shared knowledge, learning and communication and information evaluation.

Based on the result, it indicated that more than **59.7%** of respondents have *positive agreement* on contribution of team's ability to integrate and embed in shared knowledge, learning and communication and information evaluation as it can be contributed to succession of NPI project. The result was consistent with and confirmed the previous researches (Griffin and Hauser, 1996; Adler, 1996; Lawrence and Lorsch, 1967; Barclay, 1992a; Hart, 1995; Wheelwright and Clark, 1992).

Factor 2: A company's ability to identify and solve problems early and the ability to avoid and reduce uncertainty already in the early phases by applying quality management practices such as lean, TQM, and continuous improvement principles.

Based on the result, it indicated that more than **49.1%** of respondents have positive agreement on contribution of team's ability to identify and solve problems early and the ability to avoid and reduce uncertainty already in the early phases by applying quality management practices such as lean, TQM, and continuous improvement principles as it can be contributed to succession of NPI project. The result was consistent with and confirmed the previous researches (Miller, 1995; Barclay, 1992b; Krehbiel, 1993; Adler, 1996; Wheelwright and Clark, 1992; May and Pearson, 1993; Fisher and Kirk, 1995; Debackere, 1997).

Factor 3: A company's ability to overlap tasks in the early phases and keep relevant people and functions continuously involved from the early to the late phases under the supportive from top management by the use of cross-functional or multidiscipline team, close relationship with customers and suppliers, top management commitment and visible support is essential to succession of NPI project.

Based on the result, it indicated that more than **50%** of respondents have positive agreement on contribution of team's ability to overlap tasks in the early phases and keep relevant people and functions continuously involved from the early to the late phases under the supportive from top management by the use of cross-functional or multidiscipline team, close relationship with customers and suppliers, top management commitment and visible support as it can be contributed to succession of NPI project. The result was consistent with and confirmed the previous researches (Lawrence and Lorsch, 1967; Hart, 1995; Song, 1997; Rothwell, 1992; Wheelwright and Clark, 1992; Cooper and Kleinschmidt, 1993; Swink,

1996; Griffin, 1997; Bozdogan, 1998; Ragatz, 1997; Wasti and Liker, 1997; Pawar and Riedel, 1993; Swink, 1996).

Factor 4: A company's ability to *reduce complexity* in products, processes, systems, documentation, and organization by applying the standardize tools and practices have significant positive effect on successful New Product Introduction.

Based on the result, it indicated that more than **68.4%** of respondents have positive agreement on contribution of team's ability to *reduce complexity* in products, processes, systems, documentation, and organization by applying the standardize tools and practices as it can be contributed to succession of NPI project. The result was consistent with and confirmed the previous researches (Cooper, 1994; Thomas, 1993; Barclay, 1992b; Rothwell, 1992; Rosenthal and Tatikonda, 1992; Baker and team, 1983; Johne and Snelson, 1988b; Markham and Griffin, 1998, Hart, 1995; Wheelwright and Clark, 1992; Baxter, 1995).

9.1.2 New Product Introduction Performance Evaluation

According to second objective of this study and the literature review, current situation of the case company was studied and statistically evaluated its performance level in four main success factors, Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity.

The study indicated that the company has a same trend of performance level in Problem solving and uncertainty reduction, Continuous concurrent, and Simplicity as average company performance in each factor was at moderate level. While the company performance in knowledge integration has significant higher in performance level as average result is in between moderate level and high level.

9.1.3 Contribution of company's performance to succession of new product introduction

The effect of company's performance in Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity in contribution to succession of new product introduction was studied. Company's performance in all success factors were statically evaluated against evaluation results of company success factors in order to verify their relationship by using Pearson Product Moment Correlation or Pearson's correlation.

Results indicated that company's performances have *significant positive linear relationship* with new product introduction success factors. In addition, results also indicated that there are *significant positive linear relationship* between each success factor.

It means that the higher level of team performance will be resulted in the higher level of succession of new product introduction project.

9.1.4 Problem facing in current company's capabilities

In order to improve team's performances for more contribution to fast and effective new product introduction process, weak points of the team which has less contribution to succession of new product introduction in the case company were evaluated and suggested for future improvement.

9.1.4.1 Problem facing in Knowledge Integration

The result indicated that the most critical problem for team ability in knowledge sharing and leaning that the company is now facing is low technical or knowledge background of the project. Sharing information between customer and supplier are the next problems that the company also facing.

The study also indicates that project in experience could not help to coping with this problems. The reason of that is because of uniqueness of each project, there is different product with different customer and different materials which may resulted in difficulties in applying past experience with the current project.

The product was generally designed by the customer, the company is just transferred their design into manufacturing processes and build the product according to the customer instructions and specifications. In addition, there are very few people in the team whose have technical background in optical design, they are almost graduated in Mechanical and Electrical Engineering. With lacking of knowledge background in the project will also resulted in difficulties of understanding and sharing technical knowledge with customer.

9.1.4.2 Problem facing in Problem Solving and Uncertainty Reduction

The result indicated that the most critical problem that the company is now facing is low knowledge background in using problem solving and improvement tools. Less time to perform any problem solving and improvement and no data/ information available to use for problem solving and improvement are the next critical problems that the company also facing.

The study also suggest that people whose have more project in experience is able to coping with this problems better than the one whose have less project in experience.

9.1.4.3 Problem facing in Continuous Concurrent

Based on the result, it indicated that the most critical problem that the company is now facing is less communication and cooperation between team and customer. Less multi-discipline team or not enough people to perform any specific tasks and low performance in task management are the next critical problems that the company also facing.

The study also indicates that people whose have more project in experience is able to coping with this problems better than the one whose have less project in experience.

9.1.4.4 Problem facing in Simplicity

Based on the result, it indicated that the most critical problem that the company is now facing is low flexibility and low response to change in design and development. No support tools available such as computer based- tools, prototype, quality tools, etc. and no procedure or method use to evaluate the project performance and status against customer requirements are the next critical problems that the company also facing.

The study also indicates that people whose have more project in experience is able to coping with this problems better the one whose have less project in experience.

9.2 Recommendation for performance improvement

According to the company's weak points from item 9.1, in order to improve company's performances for more contribution to fast and effective new product introduction process, below are recommendation for future improvement.

9.1 Better customer relationship

Better customer relationships, frequent communication, and feedback systems lead to better understanding the customer's needs. Customer involvement increases the probability of the product meeting those needs and being successful in the market. Methodologies such as Quality Function Deployment aid in defining customer needs and translating those needs into specific process and quality requirements. Once customer requirements are defined, track and tightly manage those requirements will increase new product introduction performances.

9.2 Plan and manage new product introduction project

Integrate new product introduction project with the business strategy and business plans. Determine the impact of time-to-market on new product introduction project and consider time and quality as a source of competitive advantage. Develop a

longer-term perspective on investments in process and technology into business strategies. Communicate these plans to new product introduction team.

The new product introduction process must be monitored to assure an adequate level of performance through establishment of appropriate metrics or checklists.

Appropriate management controls must be in place to help assure the desired results. These controls should be in the form of design reviews or stage-gate reviews. Design reviews focus on addressing the technical requirements of the development program and the stage-gate reviews focus on addressing the business requirements. These reviews need to be balanced with empowering the teams and preventing delays in the development process.

9.3 Early involvement in new product introduction team

Early involvement of program management, engineering, manufacturing, material, test, quality, and product support personnel in product development provides a multi-functional perspective and facilitates the parallel design of product and process, reducing design process iterations and production problems.

Collocation improves communication and coordination among team members. Empowered, self-directed teams have greater ownership and are more committed to development objectives, improving the chance of a successful design on schedule and budget.

9.4 Involve suppliers early

Suppliers know their product technology, product application, and process constraints best. Utilize this expertise during product development and optimize product designs to the capabilities of the "virtual factory" which includes these suppliers. Reduce supplier base to focus more attention on a long term relationship and incentivize early involvement. Maintain schedule stability and be open to improvement suggestions from suppliers to create better products at lower costs.

9.5 Develop team knowledge and skills.

Technical knowledge in optical design and manufacturing should be provided to new product introduction team members. Quality engineering and reliability techniques such as Design of Experiments, FMEA, etc., will provide an efficient way to understand the role and interaction of product and process parameters with a performance or quality characteristic leading to robust designs and enhanced reliability. Apply "lessons learned" to avoid repeating past mistakes and conduct formal process reviews to assure all process design issues and risks have been appropriately addressed.

9.6 Create an efficient development approach

Form compact product development teams with highly experienced and motivated members by empowering product development teams, and providing technical productivity tools. Align policies, performance appraisal, and reward systems to support these development objectives and team-based approaches.

9.7 Improve the new product introduction process continuously

Re-engineer the new product introduction process and eliminate non-value-added activities. Constantly question why things are done and how they could be done better. Make quality the basis for decisions. Continued integration of technical tools, design process activities and formal methodologies will improve the design process. Invest in training and develop personnel to improve productivity.