

CHAPTER 8

SUMMARY RESULTS

8.1 Objective and Finding

Based on the research objectives and the literature review, research propositions and hypotheses are evaluated to answer the objectives of this study. The summary results of research questions and hypotheses testing are presented as below.

8.1.1 Objective One

Objective One: To to find the factors 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.

Based on the research objectives and the literature review, four main success factors which are Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity were selected to study.

In order to evaluate the factors that contribute to succession of new product introduction in the case company, questionnaires in section 4 were designed to study and evaluate the agreement level of the respondents in each factor.

8.1.1.1 New Product Introduction Success Factor Evaluation

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

X₁ : A team's ability to integrate and embed in shared knowledge and understanding of current *customers'* needs and future value to customer among product development members.

Based on the result, it indicated that more than **53.5%** of respondents have positive agreement on team's ability to integrate and embed in shared knowledge and understanding of current *customers'* needs and future value to customer among product development members can be contributed to succession of NPI project.

X₂ : A team's ability to integrate and embed in shared understanding of *suppliers'* design, process, and manufacturing capabilities among product development team members.

Based on the result, it indicated that more than **43.9%** of respondents have positive agreement on team's ability to integrate and embed in shared understanding of *suppliers'* design, process, and manufacturing capabilities among product development team members can be contributed to succession of NPI project.

X₃ : A team's ability to integrate and embed in shared understanding of the firm's internal design, process and manufacturing capabilities among product development members.

Based on the result, it indicated that more than **56.1%** of respondents have positive agreement on contribution of team's ability to integrate and embed in shared understanding of the firm's internal design, process and manufacturing capabilities among product development members as it can be contributed to succession of NPI project.

X₄ : A team's ability to integrate and embed in sustain significant improvements in development over long periods of time rests on the capability to learn from experience.

Based on the result, it indicated that more than **49.1%** of respondents have positive agreement on contribution of team's ability to integrate and embed in sustain significant improvements in development over long periods of time rests on the capability to learn from experience as it can be contributed to succession of NPI project.

X₅ : A team's ability to has effectively use of communication and information flow between the team.

Based on the result, it indicated that more than **57.9%** of respondents have positive agreement on contribution of team's ability to has effectively use of communication and information flow between the team as it can be contributed to succession of NPI project.

In summary, agreement level of respondents in contribution of above factors, X₁, X₂, X₃, X₄, and X₅ were calculated and statistically evaluated the agreement level.

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.

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.

X₁ : A team's ability to identify and solve problems in the early phases is essential to succession of the NPI project.

Based on the result, it indicated that more than **59.6%** 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.

X₂ : A team's ability to avoid and reduce uncertainty already in the early phases is essential to succession of the NPI project.

Based on the result, it indicated that more than **49.1%** of respondents have positive agreement on contribution of team's ability to avoid and reduce uncertainty already in the early phases as it can be contributed to succession of NPI project.

X₃ : Applying quality management practices such as lean, TQM, and continuous improvement principles will lead to succession of the NPI project.

Based on the result, it indicated that more than **38.5%** of respondents have positive agreement on contribution of team's ability in applying quality management practices such as lean, TQM, and continuous improvement principles as it can be contributed to succession of NPI project.

In summary, agreement level of respondents in contribution of above factors, X₁, X₂, and X₃ were calculated and statistically evaluated the agreement level.

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.

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.

X₁ : A team's ability to overlap tasks in the early phases is essential to succession of NPI project.

Based on the result, it indicated that more than **43.9%** of respondents have positive agreement on contribution of team's ability to overlap tasks in the early phases as it can be contributed to succession of NPI project.

X₂ : A team's ability to keep relevant people and functions continuously involved from the early to the late phases by the use of cross-functional or multidiscipline team is essential to succession of NPI project.

Based on the result, it indicated that more than **47.4%** of respondents have positive agreement on contribution of team's ability to keep relevant people and functions continuously involved from the early to the late phases by the use of cross-functional or multidiscipline team as it can be contributed to succession of NPI project.

X₃ : Supportive from top management or team champion/ leader is essential to succession of NPI project.

Based on the result, it indicated that more than **54.4%** of respondents have positive agreement on contribution of supportive from top management or team champion/ leader as it can be contributed to succession of NPI project.

In summary, agreement level of respondents in contribution of above factors, X₁, X₂, and X₃ were calculated and statistically evaluated the agreement level.

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.

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.

X₁ : A team's ability to reduce complexity in products, processes, systems, documentation, and organization by reducing the overall development task and making the individual tasks simpler is essential to succession of NPI project.

Based on the result, it indicated that more than **52.7%** of respondents have positive agreement on contribution of team's ability to reduce complexity in products, processes, systems, documentation, and organization by reducing the overall development task and making the individual tasks simpler as it can be contributed to succession of NPI project.

X₂ : Applying the standard tools and practices such as Design for Manufacturability, Design of Experiments, Computer-based tools, Prototype, etc.

Based on the result, it indicated that more than **59.7%** of respondents have positive agreement on contribution of team's ability in applying the standard tools and practices such as Design for Manufacturability, Design of Experiments, Computer-based tools, Prototype, etc as it can be contributed to succession of NPI project.

In summary, agreement level of respondents in contribution of above factors, X₁ and X₂ were calculated and statistically evaluated the agreement level.

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.

8.1.1.2 Evaluation Results of New Product Introduction Success Factors

To evaluate agreement level of respondents in contribution of the four main success factors, Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity, average results of each respondent were calculated and statistically evaluated the agreement level.

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.

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.

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.

Factor 4: A company's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices.

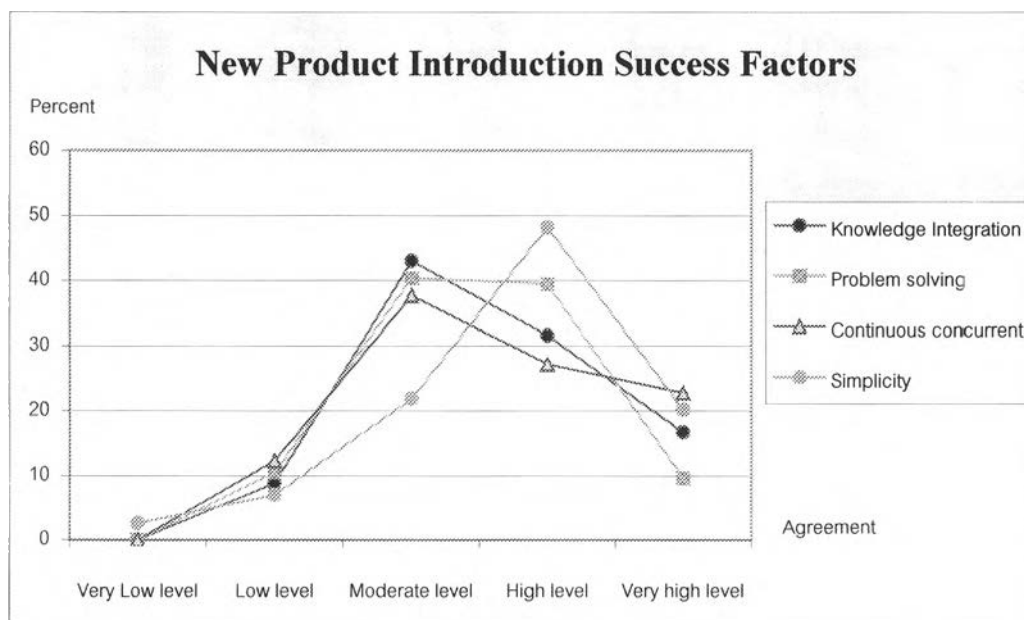


Figure 8.1: Evaluation results of company's agreement in new product introduction success factors

Table 8.1: Evaluation results of company's agreement in new product introduction success factors

Success Factor Evaluation Results									
Factor	Sub-Factor	Questionnaire #	Result					Positive	
			Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree		
Factor 1 Knowledge Integration	X1	Q1	0.0	8.8	37.7	27.2	26.3	53.5	
	X2	Q2	0.0	15.8	40.4	32.5	11.4	43.9	
	X3	Q3	0.0	10.5	33.3	44.7	11.4	56.1	
	X4	Q4	0.0	14.0	35.1	39.5	11.4	50.9	
	X5	Q5	0.0	10.5	31.6	44.7	13.2	57.9	
	Agreement Level			Very Low	Low	Moderate	High	Very High	Positive
			0.0	8.8	43.0	31.6	16.7	48.3	
Factor 2 Problem Solving	X1	Q6	1.8	1.8	36.8	41.2	18.4	59.6	
	X2	Q7	0.0	15.8	35.1	39.5	9.6	49.1	
	X3	Q8	0.0	24.6	36.8	28.9	9.6	38.5	
	Agreement Level			Very Low	Low	Moderate	High	Very High	Positive
				0.0	10.5	40.4	39.5	9.6	49.1
Factor 3 Continuous concurrent	X1	Q9	0.0	14.0	42.1	35.1	8.8	43.9	
	X2	Q10	1.8	8.8	42.1	36.0	11.4	47.4	
	X3	Q11	3.5	12.3	29.8	28.1	26.3	54.4	
	Agreement Level			Very Low	Low	Moderate	High	Very High	Positive
				0.0	12.3	37.7	27.2	22.8	50.0
Factor 4 Simplicity	X1	Q12	0.0	14.0	33.3	32.5	20.2	52.7	
	X2	Q13	3.5	5.3	31.6	43.0	16.7	59.7	
	Agreement Level			Very Low	Low	Moderate	High	Very High	Positive
				2.6	7.0	21.9	48.2	20.2	68.4
Overall Agreement			Very Low	Low	Moderate	High	Very High	Positive	
			0.0	5.3	40.4	43.9	10.5	54.4	

8.1.1.3 New Product Introduction Performance Evaluation

To evaluate performance level of respondents in four main success factors, Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity, average results of team's performance were calculated and statistically evaluated the company's performance level.

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 there are **43.9%** of respondents have team's performance in knowledge integration higher than moderate level while there are **14.1%** of respondents have team's performance in knowledge integration lower than moderate level.

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 there are only **31.6%** of respondents have team's performance in problem solving and uncertainty reduction higher than moderate level while there are **10.6%** of respondents have team's performance in problem solving and uncertainty reduction lower than moderate level.

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.

Based on the result, it indicated that there are only **29.0%** of respondents have team's performance in continuous concurrent higher than moderate level and there are **10.5%** of respondents have team's performance in continuous concurrent lower than moderate level.

Factor 4: A company's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices.

Based on the result, it indicated that there are only **29.0%** of respondents have team's performance in simplicity higher than moderate level and there are **14.0%** of respondents have team's performance in simplicity lower than moderate level.

Company's ability in knowledge integration, problem solving and uncertainty reduction, continuous concurrency, and simplicity were summarized as below table.

Table 8.2: Evaluation results of company's performance in new product introduction

New Product Introduction Performance Evaluation Results							
Performance	Questionnaire #	Result					Positive
		Very Low	Low	Moderate	High	Very High	
Knowledge Integration	Q1-Q13	0.0	12.3	43.9	42.1	1.8	43.9
Problem Solving	Q1-Q13	0.0	8.8	59.6	29.8	1.8	31.6
Continuous concurrent	Q1-Q13	0.0	10.5	60.5	27.2	1.8	29.0
Simplicity	Q1-Q13	0.0	14.0	57.0	21.1	7.9	29.0

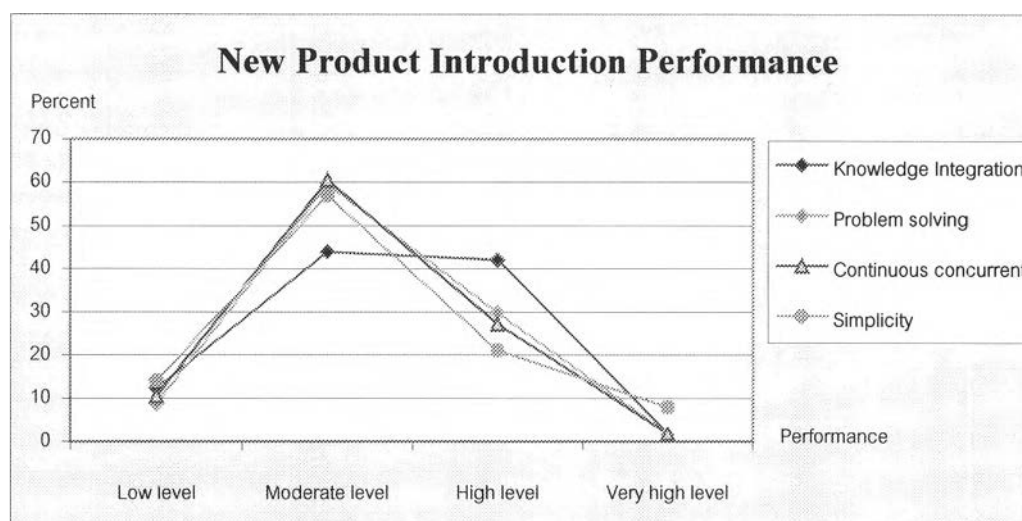


Figure 8.2: Evaluation results of company's performance in new product introduction

From above graph, it indicated that the company has performance in knowledge integration better than problem solving, continuous concurrent, and simplicity.

8.1.2 Objective Two

Objective Two: 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

8.1.2.1 Propositions and Hypotheses Test Results

Based on the research objectives and the literature review, four main research propositions and hypotheses are formulated to guide the objectives of this study.

To check the proposition and hypotheses, results of team's performance in Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity will be 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.

Proposition 1: A company's ability to integrate and embed in shared knowledge, learning and communication and information evaluation have significant positive effect on successful New Product Introduction.

Hypothesis results shown that the correlation between team's performance in ability to integrate and embed in shared knowledge, learning and communication and information evaluation has *significant positive linear relationship* with company success factors at *Pearson's correlation 0.304*.

Proposition 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 have significant positive effect on successful New Product Introduction.

Hypothesis results shown that the correlation between 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 has *significant positive linear relationship* with company success factors at *Pearson's correlation 0.379*.

Proposition 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 have significant positive effect on successful New Product Introduction.

Hypothesis results shown that the correlation between 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 has *significant positive linear relationship* with company success factors at *Pearson's correlation 0.448*.

Proposition 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.

Hypothesis results shown that the correlation between team's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices has *significant positive linear relationship* with company success factors at *Pearson's correlation 0.457*.

8.1.2.2 Correlation between each success factor

Correlation test results shown that there are significant positive linear relationship between success factors as follows;

1. Knowledge Integration Versus Problem Solving and Uncertainty Reduction

- There is a *significant positive linear relationship* between “company's ability to integrate and embed in shared knowledge, learning and communication and information evaluation” and “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” at *Pearson's correlation 0.505*.

2. Knowledge Integration Versus Continuous Concurrent

- There is a *significant positive linear relationship* between “company's ability to integrate and embed in shared knowledge, learning and communication and information evaluation” and “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” at *Pearson's correlation 0.453*.

3. Knowledge Integration Versus Simplicity

- There is a *significant positive linear relationship* between “company’s ability to integrate and embed in shared knowledge, learning and communication and information evaluation” and “company's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices” at *Pearson's correlation 0.526*.

4. Problem Solving and Uncertainty Reduction Versus Continuous Concurrent

- There is a *significant positive linear relationship* between “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” and “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” at *Pearson's correlation 0.554*.

5. Problem Solving and Uncertainty Reduction Versus Simplicity

- There is a *significant positive linear relationship* between “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” and “company's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices” at *Pearson's correlation 0.687*.

6. Continuous Concurrent Versus Simplicity

- There is a *significant positive linear relationship* between “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” and “company's ability to reduce complexity in products, processes, systems, documentation, and organization by applying the standardize tools and practices” at *Pearson's correlation 0.610*.

8.1.3 Improvement points

According to research question 2, the weak points of the team which has less contribution to succession of new product introduction in the case company are evaluated. Improvement points are presented as below.

Research Question 2: Which improvements should be implemented to improve these practices?

According to performance evaluation result, it indicated that the company has performance in knowledge integration better than problem solving, continuous concurrent, and simplicity.

Regarding the effect of company capabilities in Knowledge Integration, Problem Solving and Uncertainty Reduction, Continuous Concurrency, and Simplicity in contribution to succession of new product introduction, the results indicated that all of the company's capabilities have significant positive linear relationship to succession of new product introduction. It means that the higher level of team performance will be resulted in the higher level of succession of new product introduction project.

In order to improve team's performances for more contribution to fast and effective new product introduction process, questionnaires from section 2 were asked in order to evaluate the improvement points.

8.1.3.1 Problem facing in Knowledge Integration

Respondents were asked to answer the question, what do you see as the largest problem within your NPI project for *team ability in knowledge sharing and leaning?*

Based on the result, it indicated that the most critical problem that the company is now facing is low technical or knowledge background of the project. Sharing information between customer, supplier, and team are the next problems that the company also facing.

In order to verify the relationship between project in experience and the problem within NPI project for team ability in knowledge sharing and leaning, Chi-square test was employed.

The results in Chi-Square tests suggest that there is no relationship between project in experience and problem in knowledge background or knowledge sharing, basing on Sign (p) value of (0.082).

However, the test results in this instance is not reliable since eleven cells (68.8%) have expected count less than 5 as indicated under the table. When the percentage exceeds 20%, the Chi-square result becomes unreliable.

8.1.3.2 Problem facing in Problem Solving and Uncertainty Reduction

Respondents were asked to answer the question, what do you see as the largest problem within your NPI project for *team ability in solving problem solving and reduce any uncertainty?*

Based on the result, it 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.

In order to verify the relationship between project in experience and the problem within NPI project for team ability in solving problem and reduce any uncertainty , Chi-square test was employed.

The results in Chi-Square tests suggest that there is a strong relationship between project in experience and team ability in solving problem and reduce any uncertainty, basing on Sign (p) value of (0.007).

However, the test results in this instance is not reliable since eleven cells (81.3%) have expected count less than 5 as indicated under the table. When the percentage exceeds 20%, the Chi-square result becomes unreliable.

8.1.3.3 Problem facing in Continuous Concurrent

Respondents were asked to answer the question, what do you see as the largest problem within your NPI project for *team ability in managing tasks and coordination with external team and intenal team.*

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.

In order to verify the relationship between project in experience and the problem within NPI project for team ability in managing tasks and coordination with external team and intenal team, Chi-square test was employed.

The results in Chi-Square tests suggest that there is a strong relationship between project in experience and team ability in managing tasks and coordination with external team and internal team, basing on Sign (p) value of (0.000).

However, the test results in this instance is not reliable since eleven cells (75.0%) have expected count less than 5 as indicated under the table. When the percentage exceeds 20%, the Chi-square result becomes unreliable.

8.1.3.4 Problem facing in Simplicity

Respondents were asked to answer the question, what do you see as the largest problem within your NPI project for *team ability to reduce complexity in product, process, system, documentation, and organization*.

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.

In order to verify the relationship between project in experience and the problem within NPI project for team ability in reducing complexity in product, process, system, documentation, and organization , Chi-square test was employed.

The results in Chi-Square tests suggest that there is a strong relationship between project in experience and team ability in reducing complexity in product, process, system, documentation, and organization, basing on Sign (p) value of (0.000).

However, the test results in this instance is not reliable since eleven cells (75.0%) have expected count less than 5 as indicated under the table. When the percentage exceeds 20%, the Chi-square result becomes unreliable.