
CHAPTER 6



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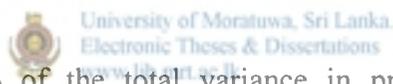
DISCUSSION & CONCLUSIONS

6.0 DISCUSSION AND CONCLUSIONS

The findings enumerated previously would be discussed in this chapter, with a view to arrive at conclusions. Main task here would be to evaluate the hypothesis proposed and based on the findings to arrive at valid conclusions and drive useful recommendations.

6.1 Evaluation of Hypothesis

It was hypothesized that Sri Lanka's rubber product industry productivity is positively related to appropriate use of information technology in the value chain activities. (Refer Page 51). The results of this study revealed a strongly positive correlation of statistical significance between the variables 'productivity' and 'usage of IT'. (Correlation co-efficient $r = 0.843$, regression co-efficient (slope) = 0.556, $K < 001$) on the regression analysis of the productivity and IT usage as per the survey results, revealed a co-efficient of determination, $r^2 = 0.711$ and the intercept = 28.646 at 0.006 level of percent significance.



This shows that 71% of the total variance in productivity is explained by the regression equation and 29% is unexplained. In other words, we could predict that 71% productivity depends on IT usage and the balance 29% may depend on other factors. It also shows that when the IT usage is zero, the productivity level would be 28.646, which mean that there is 29% productivity is achieved without any influence by IT, which can be practically explained and it is the true situation. This further explains that IT usage would enhance the productivity, beyond 29%. Considering the value of the slope, it can be decided that every unit increase in IT usage the productivity would increase by 0.556 units.

Considering the ANOVA that describes anomalies of estimated line and the fitted line the high value of $F (= 24)$ with 99.9% confidence indicates less errors in prediction. High F value means Low Mean Square of Residuals (errors).

Adjusted $r^2 (= 0.683)$ which is calculated to minimize the over estimations if there any. Even that adjusted r^2 value also shows a value over 0.60, indicating the

prediction for correlation is strong. r^2 the co-efficient of determination provides a measure of goodness of fit of the estimated regression equation. If $r^2 = 1$, it is the best fit and $r^2 = 0$, means the worst fit.

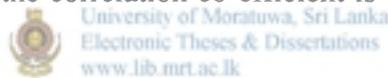
In the software calculation test of significance of correlation co-efficient (t-test) has been carried out. The null hypothesis of (slope=0) has been rejected with 0.001 level of significance. Since level of significance is less than 0.05, the prediction is strong.

Null hypothesis $H_0 \implies B1 \text{ (slope)} = 0$

Research hypothesis $H_1 \implies B1 \text{ (slope)} \neq 0$

Since 0.001 level of significance < 0.05 , the null hypothesis H_0 is rejected.

Considering the results and the above explanation it can be concluded at 0.001% significance level, that there is a correlation between the productivity and IT usage. The point estimate for the correlation co-efficient is 0.843 and slope of estimated line is 0.556.



Two components of IT usage, IT competency and IT deployment have showed strong positive correlation to productivity. Co-efficient of correlation of IT deployment capability, $r=0.889$, where as the 'r' value for the IT competency had been 0.728 This shows that IT deployment is more relevant to achieve productivity than IT competency. In a practical situation too, this behavior could be found correct, as it is more important to implement IT in the company than only identifying and having knowledge and a structure to implement. r^2 value of IT competency 0.531 indicates the regression equation does only a fair job of explaining the productivity variance. However, the IT deployment being strongly correlated to productivity, has a r^2 value of 0.790, which indicates that the regression equation does a god job of explaining the productivity variance up to 80%.

One component of the organizational IT competency the CEO's knowledge and attitude, $r = 0.466$ indicates a moderate to weak positive correlation with productivity. This reveals that the "CEO related" shows weakest correlation with productivity.

However, the second component of the IT competency, the IT aptitude's co-efficient of correlation to productivity is as high as 0.746. From the regression summaries in page 60, it could be found that r^2 for CEO related is 0.218 and the same for IT aptitude is 0.557. This shows that the regression equation of the scatter diagram of Productivity Vs CEO related explains, only about 22% of the total variance observed in productivity and that 78% of the total variance in productivity is 'unexplained'.

Out of the three components of IT deployment capability software capability shows the highest correlation against productivity with a co-efficient value $r = 0.690$, as against a 'r' value of 0.659 for hardware capability. Regression analysis (Refer Page 77) shows r^2 value for software capability is 0.476 while it for hardware capability is 0.434. These results indicate that software capability has a higher correlation on productivity than hardware capability. It can also be observed that the software capability is 98.7% significant and the hardware capability is 98%.

As per the analysis on page 61 (Table 5.7) productivity of 50% of companies sampled fall above the mean value. However, 66.6% companies IT usage has been above the mean value. Out of the two component of IT usage, IT competency of 75% companies have been above the mean value, but only 42% company's IT deployment had been above the mean value.

Analysis on the company ranking as per the study variables (Table 5.8) shows important results, and very much significant to the survey.

Ansell Lanka, which is a global/ multinational company, has ranked 'first' in both productivity and IT usage. This clearly shows the answer to the research problem of lower usage of IT by local companies while proving the hypothesis that "productivity is positively related to the IT usage". Although Ansell Lanka operates in Sri Lanka, their competitiveness is above the local companies. Similarly their IT usage is higher than local companies. This survey proves that the global companies do use IT at a higher level resulting productivity and competitiveness.

Trelleborg Lanka, another global company has ranked 'second' in productivity and also ranked second highest in IT usage. This finding reconfirms the research problem and hypothesis that, productivity is positively related to the IT usage.

It is important to note that in both Ansell Lanka and Trelleborg Lanka IT deployment is the highest, ranked No.1, but IT competency is placed at a lower rank. This indicates that IT deployment is more aggressive and effective in Ansell & Trelleborg compared to other companies.

Table 5.8 also shows that Loadstar has ranked 'first' in the IT usage. Loadstar although a local companies, is one of the leading solid tyre produces in the world, responsible for nearly one fifth of the global market. Survey results clearly shows that Loadstar has highest IT competency having ranked first, i.e. the ability to identify IT tools, systems etc, but since the IT deployment is being developed ranked "second" to Ansell. Probably Loadstar would have identified that more IT usage in their value chain activities, is the best option available today to face global competition.



Richard Peiris ranked third highest with respect to IT usage is in the 'sixth' place as per productivity ranking. This can be explained by the ranking on IT competency, 'second' and IT deployment "fourth" (5th company). Although Richard Peiris has started IT usage few years ago, IT deployment is yet in the developing stage.

The company which ranked 'Last' in all study variable was Eu-Retech, a solid tyre manufacturer/rebuilder who has started business about a year ago. This company has just started commercial activities and still engaged in finalizing their factory layout and installation, but yet to speed up on IT usage.

Hanwella Rubber ranked one above the 'last' in IT usage and also ranked three above the last in productivity, (10th company). This company being latex based yet to increase there IT usage specially in manufacturing operations.

Company wise analysis of productivity and its components Table 5.3 shows in general that the IT activities carried out by Sri Lankan rubber products manufacturing

companies have improved productivity, resulting a greater improvement in ‘qualitative measures’, than in quantitative measures.

The process of analyzing the survey data was concluded in the previous chapter. Now it is the opportunity to synthesize, draw references and arrive at valid conclusion based on the findings. By offering explanations to a few significant issues that will be raised in this chapter, the writer will derive useful conclusions while discussing the research outcomes.

6.2 Research Conclusions and Recommendations

Survey results have well supported the hypothesis “the productivity is positively related to IT usage”.

Statistical analysis done using the survey data confirms the validity of the hypothesis showing a strong correlation between the two variables, productivity and IT usage.



As per table 5.8, Ansell Lanka has ranked **First in Productivity** and in IT usage as well. Trelleborg Lanka use the second highest level of IT has ranked second in productivity. Eu-Retech scored lowest in IT usage has ranked “Last” in productivity. These survey results proves the validity of the hypothesis.

Based on the above analysis and observations it can be concluded that appropriate IT usage in value chain activities would increase productivity thus enhancing competitiveness.

Ansell Lanka and Trelleborg Lanka, two multinational global companies are good examples to be followed by other Sri Lankan rubber product manufacturers.

For the rubber industry of Sri Lanka it is important to develop IT usage appropriately to achieve competitiveness and consider IT as a **Factor of Production** and as a **Strategic Investment**.

Information technology with its fast developments will continue to find ways and means of improving all value chain activities across the supply chains. Sri Lanka rubber industry should think few steps ahead to use these developments to enhance the productivity through e-commerce, e-finance, process automation, e-marketing etc. One should not forget the IT tools available today to collect customer information and thus enhance the “ customer relationship” while providing them with the best possible service. Therefore, IT will no doubt a **Factor of Production** and the related investments could be identified as **Strategic Investments**.

To achieve this it may be necessary to formulate new policies in the areas of education, research and development and technology support. The writer recommends more research to be carried out in this field of information technology and suggest the followings –

1. Include the subject, Information Technology in the syllabus of all educational programs in schools and universities, especially in polymer based courses/degrees.
2. Establish a new research unit under the Industrial Technology Institute (ITI), to carry out studies, surveys and research on the application and the use of Information Technology in the rubber products industry. This can include a comprehensive study on the use of IT by the global players in developed countries.
3. Establish an advisory board to advice on the appropriate use of IT to rubber product manufacturers. This board could be formed with the initiative of the Sri Lanka Rubber Cluster and with the support from the Sri Lanka IT Cluster and the related academia.

May the rubber products industry in Sri Lanka use information technology more extensively, and appropriately with the new policies under e-Sri Lanka, and win the global competition.

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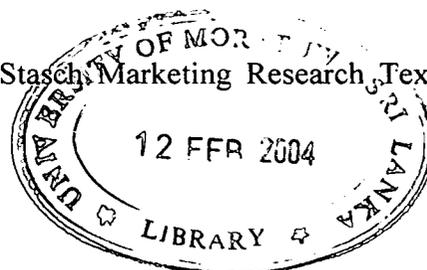


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APPENDICES

APPENDIX 1 - *Questionnaire*

APPENDIX 2 - *Scatter Diagrams*



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QUESTIONNAIRE

Date of the Interview: _____

1. Name of the Company: _____

2. Address: _____

3. Years Established: _____

4. Products:

(i)	output/annum	* Units	* Tons
(ii)	output/annum	* Units	* Tons
(iii)	output/annum	* Units	* Tons
(iv)	output/annum	* Units	* Tons



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5. Annual Turn Over : Rs. US \$

6. No of Employees:

Senior Executives
Executives
Staff
Workers
Total

7. Consumption of natural rubber: _____

8. Name and Designation of the Person Interviewed: _____

9. Remarks: _____

Researcher

Interviewed By:

PART A - ORGANIZATIONAL IT COMPETENCY

Please select the number in the specified column to answer the followings.

Strongly disagree	Tend to disagree	Neutral	Tend to agree	Strongly agree
1	2	3	4	5

1. Your CEO has a wide knowledge of IT, and has obtained academic qualifications on IT.
2. Your CEO has been successful in using IT in value chain activities to yield efficiency.
3. Your CEO is a believer of the usage of IT in value chain activities to improve efficiency.
4. Your company's IT Policy is aligned with the business policies and is capable of driving it forward.

No IT policy	<input type="checkbox"/>
0	1-5
5. Your company's IT strategy deals with applications, systems, software and the infrastructure to support information management, use, processing etc. and has formulated for a defined period and is reviewed at frequent intervals.

No IT strategy	<input type="checkbox"/>
0	1-5
6. Your company's IT strategy is well aligned with the business strategies and corporate goals showing harmony between business and IT.

No IT strategy	<input type="checkbox"/>
0	1-5
7. Your company's has a well established IT department headed by an IT Manager who is a member of the executive team.
8. The level of IT expertise in the company is adequate to identify IT tools to use IT in value chain activities appropriately.
9. Your company's IT staffs are competent in identifying future requirement of IT to meet future business needs.
10. Your company's IT personnel are given continuous training on global IT developments and applications.
11. All the departmental heads of your organization are given a basic training on IT usage and application.
12. IT strategies are developed with the participation of CEO and heads of all operational departments including IT.

PART B - IT DEPLOYMENT CAPABILITY

- 1 Does your company have network system, which interconnect all the software systems?
- | | |
|----------------------------|---|
| i LAN/WAN | 5 |
| ii Others (Internet based) | 3 |
- 2 Does your company operates group ware on a
- | | |
|------------------------|---|
| i Internal (LAN/WAN) | 2 |
| ii External (Internet) | 2 |
| iii Both | 5 |
- 3 What is the line speed?
- | | |
|-----------|---|
| i 10 MB | 2 |
| ii 100 MB | 5 |
- 4 How is your organization's cabling done?
- | | |
|-----------------|---|
| i Structured | 5 |
| ii Unstructured | 2 |
- 5 How do you rate your company total network infrastructure?
- | | |
|---|---|
| i Very poor (network is down most of the time) | 0 |
| ii Unreliable (network is down at unforeseen times) | 1 |
| iii Primitive (just the basis but reliable) | 2 |
| iv Moderate | 3 |
| v Robust (Hardly fails) | 5 |
- 6 Is there any Software using for Human Resource Management?
(Please tick)
- | | |
|--|--|
| i Work Processing Packages /Spreadsheet applications | |
| ii HMR | |
| iii Automated personal scheduling system | |
| iv E-mail | |
| v All the above | |
| vi Any other system | |
- 7 Does your company have any computer aided design packages like CAD - CAM to use technology development?
- | | |
|-----|---|
| Yes | 5 |
| No | 0 |

- 8 Does your company have any automated computerized manufacturing systems, such as,
- i Automatic Banbury feeding system
 - ii Programmable /automated/ semi automated moulding system
 - iii Any other automated / programmable production operations

- 9 Does your company have computerized laboratory equipment
- i Rheometer
 - ii Tensometer
 - iii Any other

- 10 Do you have following systems, which supports to your company's primary activities?

- i Inventory system
- ii Transaction processing systems (Sales order entry or payroll system)
- iii Sales and debtors system
- iv e-commerce application (purchase online, sell on line)
- v Any other

- 11 Which type of inventory control system do you have?

- 1. Batch processing system
- 2. Online real time system

2
5

- 12 Which type of transaction processing system do you have?



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Online	5
Batch processing	2

They are

- i Sales order entry system
- ii Payroll system
- iii Both
- iv Any other

PART C - PRODUCTIVITY MEASUREMENT

(i) Quantitative measures

1. i Annual Sales Turn Over (Average for 3 years)

US \$ Rs

ii Annual Cost of Sales (Average for 3 years)

US \$ Rs

2. No of employees (Average for 3 years)

3. Payroll Cost/annum (Average for 3 years)

4. Percentage of (Rework/ Rejects (Average for 3 years)

a) Less than 1%

b) 1% - 2%

c) 2% - 3%

d) More than 4%

(ii) Qualitative measures

5. Do you practice the following systems in your organizations

- a) TQM
 b) ISO 9000 Quality Assurance System
 c) 5 S House Keeping Practices

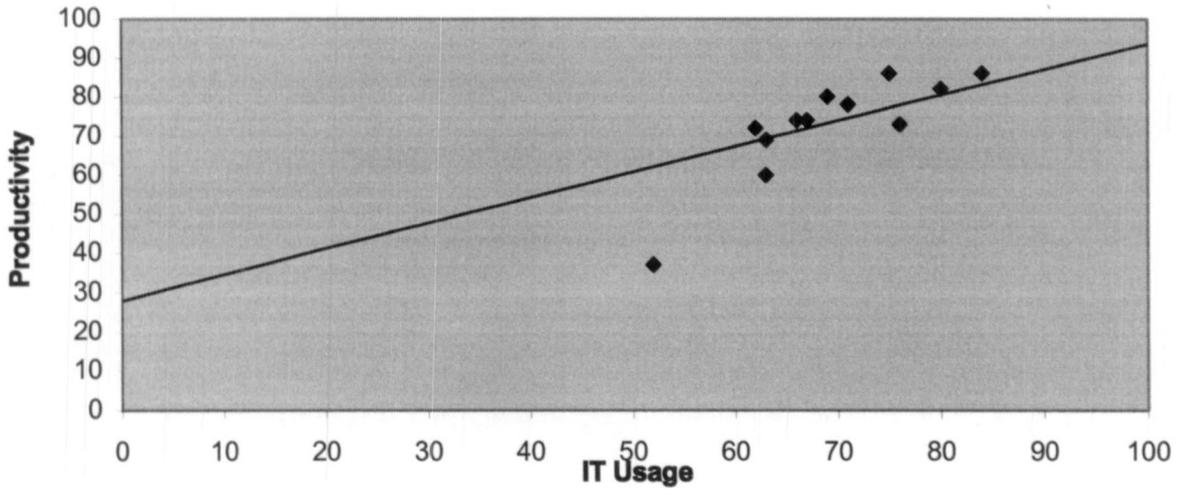
	Yes	No
a) TQM		
b) ISO 9000 Quality Assurance System		
c) 5 S House Keeping Practices		

6. Are the customer's delivery requirements satisfactorily met?

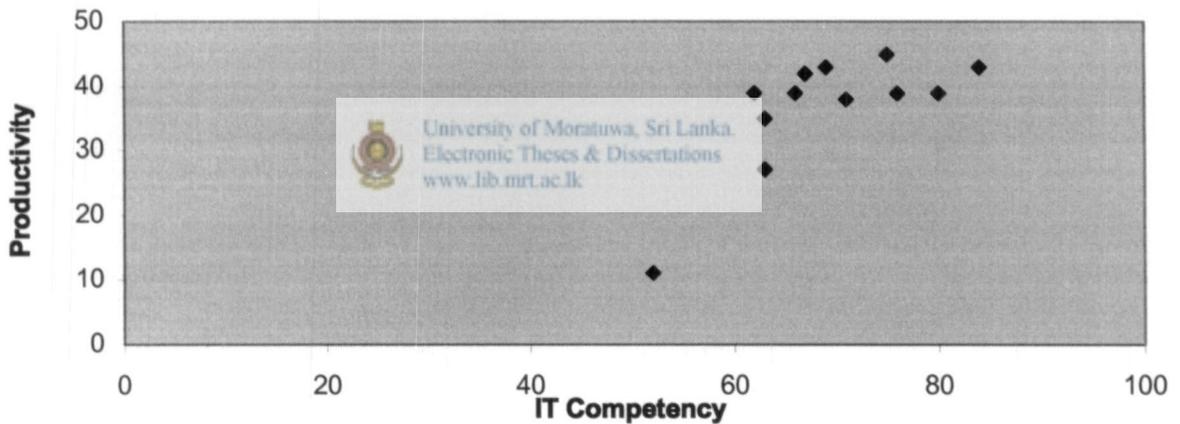
- a) To a great extent
 b) To a moderate Extent
 c) To a smaller extent
 d) Not at all

Scatter Diagrams Showing Relationship Between Variables

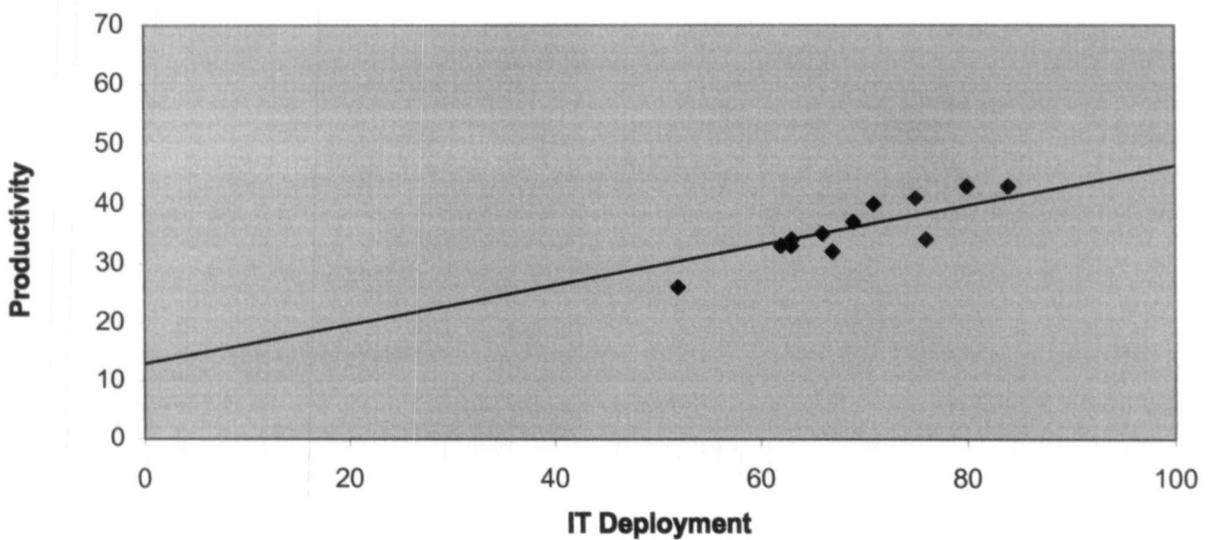
Scatter Diagram 1 - Productivity Vs IT Usage



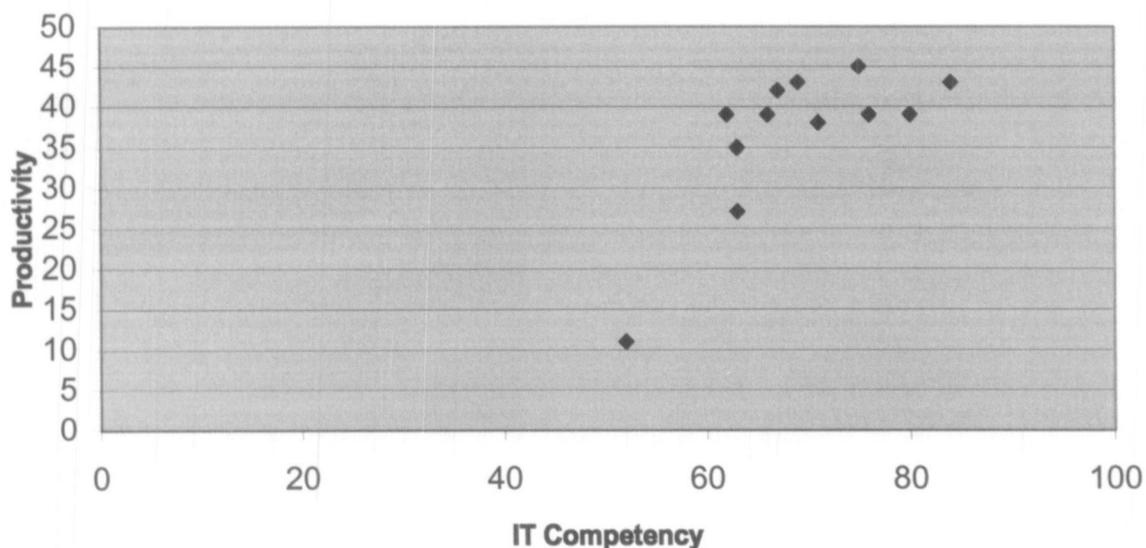
Scatter Diagram 2 - Productivity Vs IT Competency



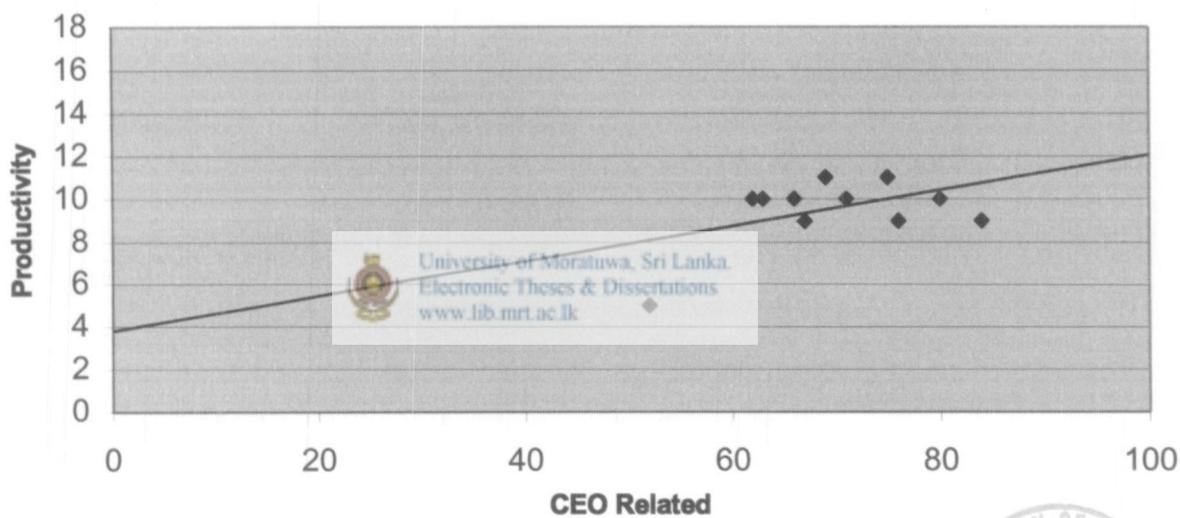
Scatter Diagram 3 - Productivity Vs IT Deployment



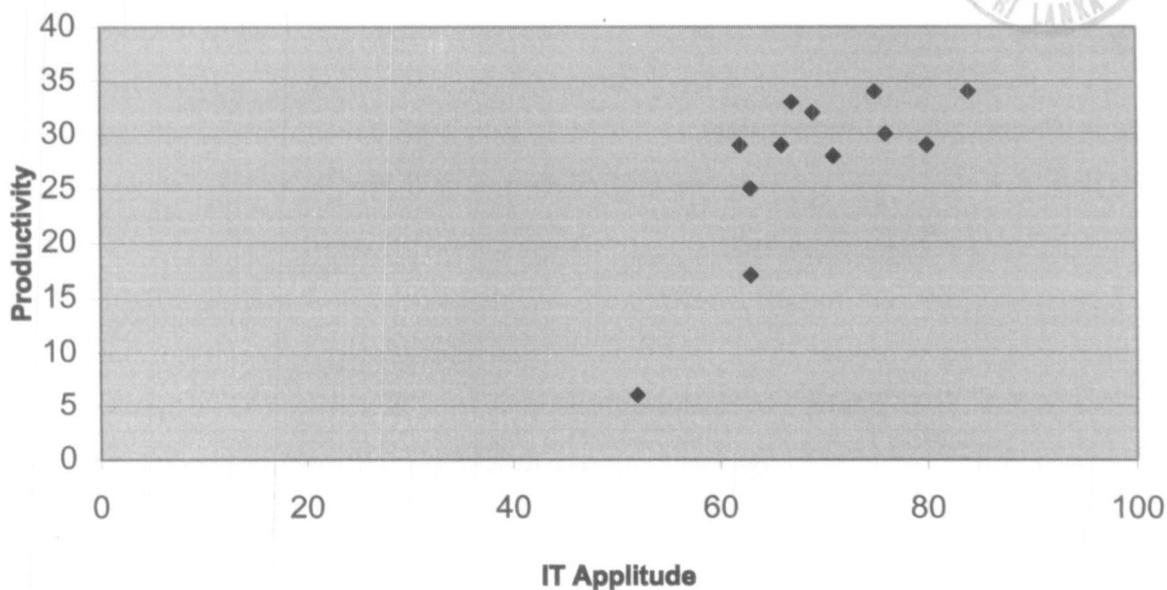
Scatter Diagram 4 - Productivity Vs IT Competency



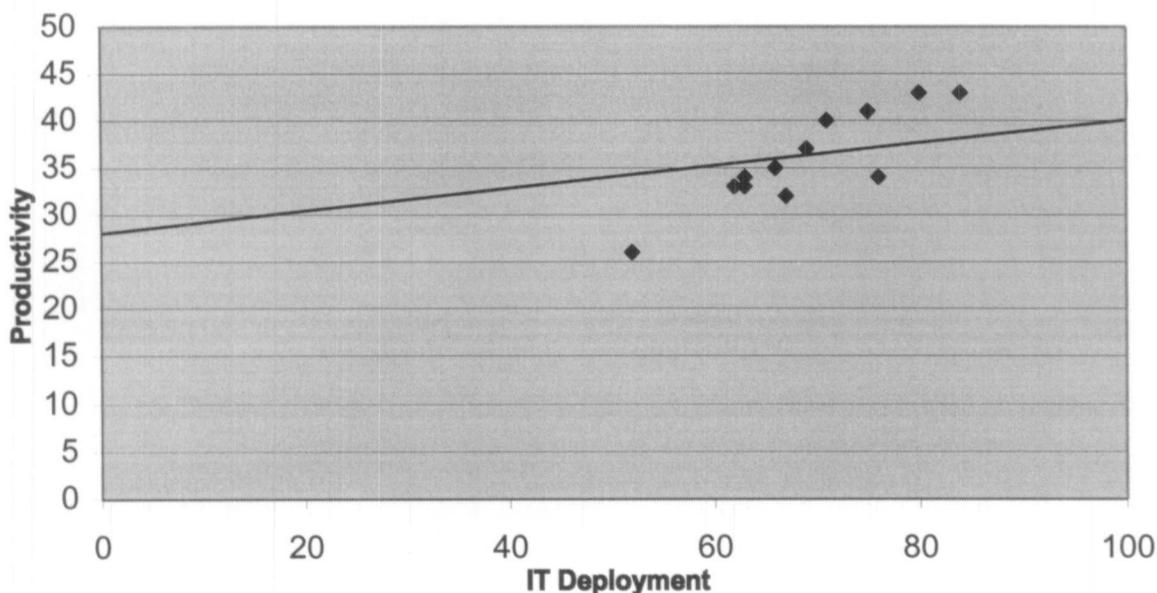
Scatter Diagram 5 - Productivity Vs CEO Related



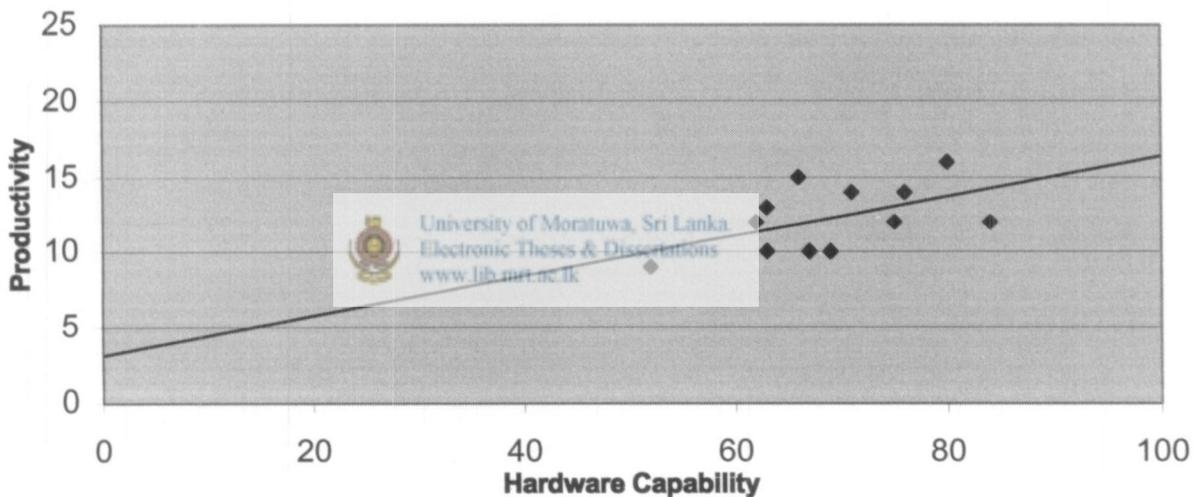
Scatter Diagram 6 - Productivity Vs IT Applitude



Scatter Diagram 7 - Productivity Vs IT Deployment



Scatter Diagram 8 - Productivity Vs Hardware Capability



Scatter Diagram 9 - Productivity Vs Software Capability

