3 Research Design

3.1 Scope of the Study

The research under this context will consider all the offshore software development companies registered under Software Exporters Association of Sri Lanka and incorporated on or before the year 2005. Products revenue portion is less than 30% of the overall revenue and more than 90% of the total sales that should be earned from offshore software services. The value of business considered as the present value of future pre tax cash flows.

3.2 Methodology

Conduct a survey on all the offshore software development companies registered under Software Exporters Association of Sri Lanka excluding product companies whose product revenue is more than 30% of the annual revenue or the sales from locals operations are more than 10% of total sales. Details of software companies registered under Sri Lankan Software Exporters Association were retrieved from the official web site of SEA [30]. Author used a questionnaire to identify software companies falling within the scope of study since readily available data was not given by the SEA to identify software companies falling under the above criteria defined in the scope of the study.

The names of the respondent companies are not mentioned due to confidentiality of the data collected for this research purpose. A number has been assigned to the company name when presenting data for analyzing purposes.

3.3 Data Collection

3.3.1 Primary Data Collection

A blend of questionnaires and one-on-one interview were conducted to collect data. The one-to-one interviews used to collect sensitive data and to understand the business strategy and current status. Interviews were helpful to collect alternative data when interviewees refused to reveal information considered as a violation of their disclosure agreements of the said company. The author interviewed top management of the companies registered under SEA of Sri Lanka.

3.3.2 Secondary Data Collection

Further industry publications from ICTA and SEA and information available in the official websites of these institutions were collected. This information helped to understand the market conditions and demand for IT services, growth of offshore software development opportunities and the country's strategy to develop Sri Lanka as an attractive destination for offshore software development [31].

3.4 Conceptual Framework

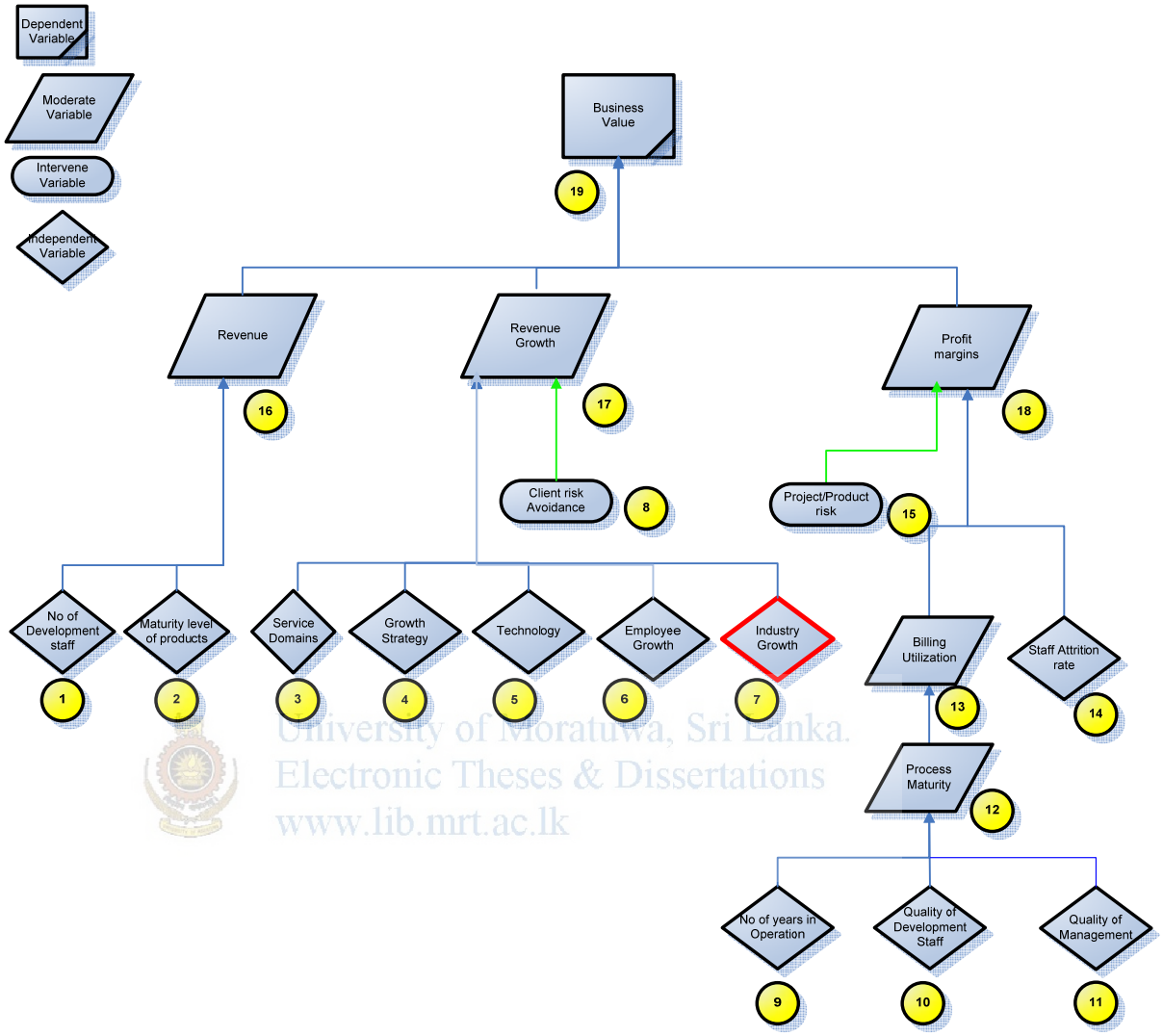

Figure 2: Conceptual Framework

Dependent variable	Independent Variable	Moderate variable	Intervene variable
19. Business Value	1. No of Engineers 2. Maturity level of products 3.Service Domains attractiveness 4.Growth Strategy attractiveness 5. Technology capability 6. Employee Growth 7. Industry Growth 9. No of years in Operation 10.Quality of Development Staff 11.Quality of Management 14. Staff Attrition rate	16. Revenue 17. Revenue Growth 12. Process Maturity 13. Billing Utilization 18. Profit margins	8.Client risk avoidance 15. Project/Product risk

Table 1: Type of Variables in the Conceptual Framework

Dependent Variable	Independent/Moderate/Intervene Variable
16. Revenue	1. No of Engineers 2. Maturity level of products
17. Revenue Growth	3. Service Domains attractiveness 4. Growth Strategy attractiveness 5. Technology capability 6. Employee Growth 7. Industry Growth 8.Client risk avoidance
12. Process Maturity	9. No of years in Operation 10. Quality of Development Staff 11. Quality of Management
13. Billing Utilization	12. Process Maturity
18. Profit margins	13. Billing Utilization 14. Staff Attrition rate 15. Project/Product risk
19. Business Value	16. Revenue 17. Revenue Growth 18. Profit margins

Table 2: The relationship match with variables in Conceptual Framework

Variable Name	Definition of Variable for this research purpose
1. No of Engineers	Average number of engineers worked for offshore software development company for year 2006.
2. Maturity level of products	The phase in which products are placed in the product life cycle, market share and market growth rate of the product and the net cash flow generated from the product.
3. Service Domains attractiveness	The forecasted growth rate of service domains served by the offshore software development companies in existing and potential markets.
4. Growth Strategy attractiveness	The ability of the company to used partnership and alliances to access latest technology, new markets, new service domains and grow in revenue and market share.
5. Technology capability	The ability of the company to grasp latest technology, cultural fit and senior management motive to fit with latest technology.
6. Employee Growth	The growth rate of staff in an offshore software development company in year 2006.
7. Industry Growth	The growth rate of offshore software development industry in Sri Lanka
8.Client risk avoidance	The ability of an offshore software development company to met commitment promised to its stake holders and number of repetitive projects/clients from existing clients.
9. No of years in Operation	The number of financial years in business.
10. Quality of Development Staff	Academic and professional qualification of engineers and professional service staff and their years of experience.
11. Quality of Management	Academic and professional qualification of senior management and their years of experience.
12. Process Maturity	Practicing properly define tailored version of software engineering process suitable to company business model and senior management commitment to invest on processes and update it periodically.
13. Billing Utilization	How much company is able to bill on actual effort they put on servicing offshore software development projects
14. Staff Attrition rate	Number of employees left the company as a percentage of number of employees worked for year 2006.
15. Project/Product risk	Portfolio risk of projects and the cost and schedule overruns of projects undertaken by the offshore software development company.
16. Revenue	Annual revenue of the offshore software development company for the year 2005 and year 2006.
17. Revenue Growth	The growth rate of revenue from in year 2006.
18. Profit margins	The net profit margin of the company for a financial year.
19. Business Value	The net present value of future pre tax cash flows of an offshore software development company.

Table 3: Definitions of variables used

3.5 Hypotheses Design

The following sets of hypotheses were deigned to identify the relationship between identified dependent and independent variables.

H1o = There is no relationship between annual revenue and number of engineers that work for the offshore software development company.

H1a = There is a relationship between annual revenue and number of engineers that work for the offshore software development company

H2o = There is no relationship between annual revenue and maturity level of products developed by the offshore software development company.

H2a = There is a relationship between annual revenue and maturity level of products developed by the offshore software development company

H3o = There is no relationship between revenue growth and attractiveness of service domains served by the offshore software development company.

H3a = There is a relationship between revenue growth and attractiveness of service domains served by the offshore software development company.

H4o = There is no relationship between revenue growth and attractiveness of growth strategy adopted by the offshore software development company.

H4a = There is a relationship between revenue growth and attractiveness of growth strategy adopted by the offshore software development company.

H5o = There is no relationship between revenue growth and technology capability of an offshore software development company.

H5a = There is a relationship between revenue growth and technology capability of an offshore software development company.

H6o = There is no relationship between revenue growth and employee growth rate of a offshore software development company.

H6a = There is a relationship between revenue growth and employee growth rate of a offshore software development company.

H7o = There is no relationship between revenue growth and offshore software development industry growth in Sri Lanka.

H7a = There is a relationship between revenue growth and offshore software development industry growth in Sri Lanka.

H8o = There is no relationship between revenue growth and client risk avoidance.

H8a = There is a relationship between revenue growth and client risk avoidance.

H9o = There is no relationship between process maturity and number of years in business operation.

H9a = There is a relationship between process maturity and number of years in business operation.

H10o = There is no relationship between process maturity and quality of development staff in an offshore software development company.

H10a = There is a relationship between process maturity and quality of development staff in an offshore software development company.

H11o = There is no relationship between process maturity and quality of management team in an offshore software development company.

H11a = There is a relationship between process maturity and quality of management team in an offshore software development company.

H12o = There is no relationship between billing utilization and process maturity level of an offshore software development company.

H12a = There is a relationship between billing utilization and process maturity level of an offshore software development company.

H13o = There is no relationship between profit margins and billing utilization

H13a = there is a relationship between profit margins and billing utilization

H14o = There is no relationship between profit margins and staff attrition rate

H14a = There is a relationship between profit margins and staff attrition rate

H15o = There is no relationship between profit margins and project/portfolio risk

H15a = There is a relationship between profit margins and project/portfolio risk

H16o = There is no relationship between business value and revenue of the company

H16a = There is a relationship between business value and revenue of the company

H17o = There is no relationship between business value and revenue growth of the company

H17a = There is a relationship between business value and revenue growth of the company

H18o = There is no relationship between business value and profit margins of the company

H18a = There is a relationship between business value and profit margins of the company

3.6 Questionnaire

The questionnaire consists of three main parts.

3.6.1 Section A:

Consists of a few simple direct questions to understand the business of the interviewing companies. Revenue distributed among the offshore software services and products are captured in question number one and revenue distribution between local and foreign operations were captured in question number ten and seventeen. This data was used to identify whether the interviewing company falls within the research scope of study.

Number of years in operations and type of ownership, technologies used are captured in question number two, three and eight. The break down of engineers, senior management according to their qualifications and experience are captured in question number five, six and seven.

Service domains or the industry sectors served by the company as offshore software services or product sold by the company is captured in question number nine and sixteen. Operational markets and professional services offered by the software companies were captured in question number eleven and twelve.

Number of products developed and successfully deployed in the market is captured in question number thirteen, fourteen and fifteen. Maturity level of products captured in the question number eighteen. There were few optional questions asked using Boston Consultancy Group growth vector matrix to cross check and justify the answers provided for product maturity level in mandatory questions for companies that earn a portion of its revenue through product sales.

3.6.2 Section B:

Indirect questions were asked to capture the employee growth rate and the staff attrition rates for year 2006.No direct technical questions were asked to calculate these ratios.

Billing utilization information was captured in question number five. Level of process maturity and the senior management commitment were captured in question number seven. Commitment to customers by the company management team and cost and schedule overruns were captured in question number eight.

The interval scales were use to capture the revenue figures for fiscal years 2005 and 2006. Net profit margins attributable to shareholders were captured in question numbers ten, eleven and twelve. Historical figures and the interval scales were used to protect the confidentiality of financial data rather than seeking current year absolute figures.

Information relating to number of customers/projects served during the company life time and the repetitive clients/projects served by the company and the average number of projects undertaken per financial year were captured from questions eleven to thirteen. Project and product portfolio information were captured in the questions fourteen and fifteen. More emphasis was given to collect information such as how many projects or products contribute to achieve 50 percent of total sales when they were ranked on revenue from highest to lowest using pareto analysis.

Question number sixteen targeted the technology capability of the company. Few optional questions were asked to gather general understanding of technology focus of the company. Degree of market attractiveness of existing service domains served by the company and potential service domains that the company plans to serve in both existing and potential markets were captured in the question number seventeen.

Question numbers eighteen and nineteen were directed to gather growth strategy of the company and how growth strategy has helped to achieve objectives of the company in terms of revenue growth, increase in market share and creating competitive advantage over its rival firms.

3.6.3 Section C:

Question number one of this section was targeted to capture future growth of the company and a general understanding of its growth plan and break down of expenditure in terms of tangible and intangibles. This section aims to capture enough information to calculate business value of the company by calculating the projected cash flow of the company for the next three years.

Question number two is an optional one to capture either cost of capital or ROCE which can be used as a DCF factor to calculate the business value of the company. The questionnaire used for the data collection purpose of this research is included on Appendix A.

Conceptual Frame work Variable	Question number of the Questionnaire	Data type of the captured data
1. No of engineers	Section A Q5	Absolute values (numerical)
2. Maturity level of products	Section A Q18	Likert scale
3. Service domain attractiveness	Section B Q17	Likert scale
4. Growth strategy attractiveness	Section B Q19	Likert scale
5. Technology capability	Section B Q16	Likert scale
6. Employee Growth	Calculated (Section A Q5)	Ratio
7. Industry growth	Industry publications	Ratio
8. Client Risk avoidance	Calculated(SectionBQ8, 11,Q12)	Ratio and ordinal data
9. No of years in operation	Section A Q2	Absolute values (numerical)
10. Quality of development staff	Section A Q5, Q6 and Q7	Absolute values (numerical) and ordinal data
11. Quality of management	Section A Q5	Absolute values (numerical) and ordinal data
120. Process maturity	Section B Q7	Likert scale
13. Billing utilization	Section B Q5	Ratio
14. Staff attrition rate	Section B Q1, Q2 and Q3	Ratio
15. Project/Product risk	Section B Q8, Q11 and Q12 Q13, Q14	Ratio and Likert scale,
164. Revenue	Section B Q9	Absolute values (numerical)
17. Revenue growth	Section B Q9	Ratio
18. Profit margins	Section B Q10	Ratio
19. Business value	Section C Q1 and Q2	Absolute values (numerical)

Table 4: Map the questions of the questionnaire with the variables of the Conceptual Framework

3.7 Descriptive Statistical Information of respondent companies

Out of the 47 registered companies in SEA the author was able to collect data from 30 companies that were within the scope of this research context. The response sample covered 63% of total number of companies registered under SEA of Sri Lanka. Distribution of offshore software service companies versus companies serving both products and offshore services are shown in the following graph.

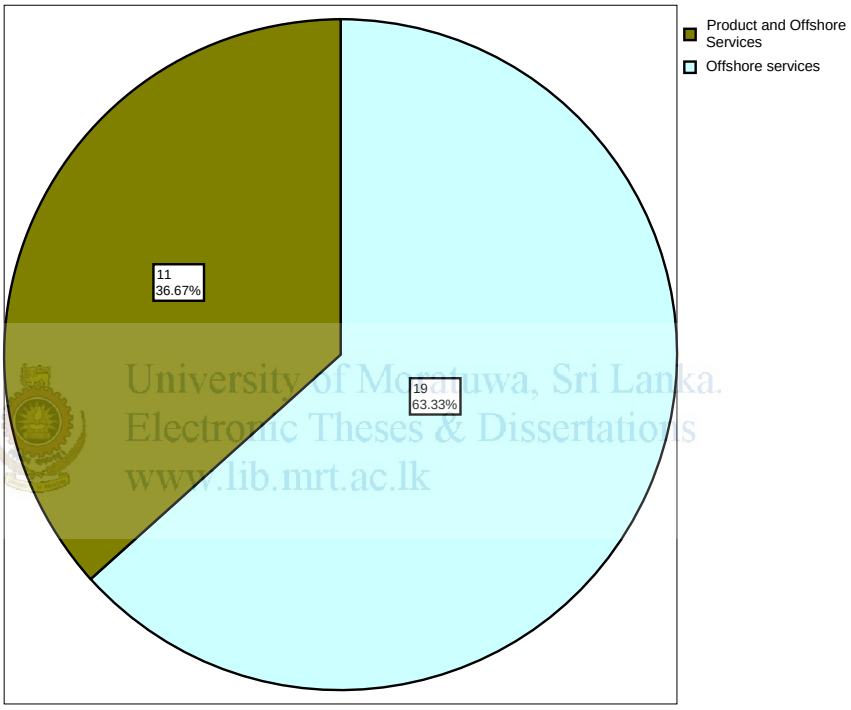

Figure 3: Distribution of Product/offshore services and pure offshore services

Statistics	No. of Engineers	Product Maturity Level	Annual Revenue (US $ million)
N	30	19	30
Mean	103.10	7.89	2.45250
Median	51.50	8.00	1.30000
Mode	50	7	.900
Std. Deviation	193.382	1.487	4.416804
Range	1075	5	24.500
Minimum	25	5	.500
Maximum	1100	10	25.000
Sum	3093	150	73.575

Table 5: Descriptive statistics for Revenue model variables

The responded sample consists of 3093 engineering staff as at year 2006. Out of which one company (Virtusa) is having 1100 employees, which is 36% of the total work force of the sample population. Because of this the range between maximum and minimum value is very high and this was the cause for the high standard deviation of 193. Therefore the mean value of 103 does not represent the actual number of engineers worked in a software development company. The mode value of 50 gives a more accurate value than the mean value for number of engineers worked in a company.

There were 19 product companies that are in the sample and all of these companies product contribution to the sales was less than 30%. Product maturity of the responded companies was high with a mean value of 7.89 out of 10.

In 2006, total revenue for the sample is US $ 73.5 million, out of which one company (Virtusa) represented of one third. Therefore the mean value of annual revenue 2.45 does not reflect the true picture of the average annual revenue earned by a software company registered in SEA. The mode value of US $ 0.9 million represents a more realistic picture for the annual revenue earned by a company.

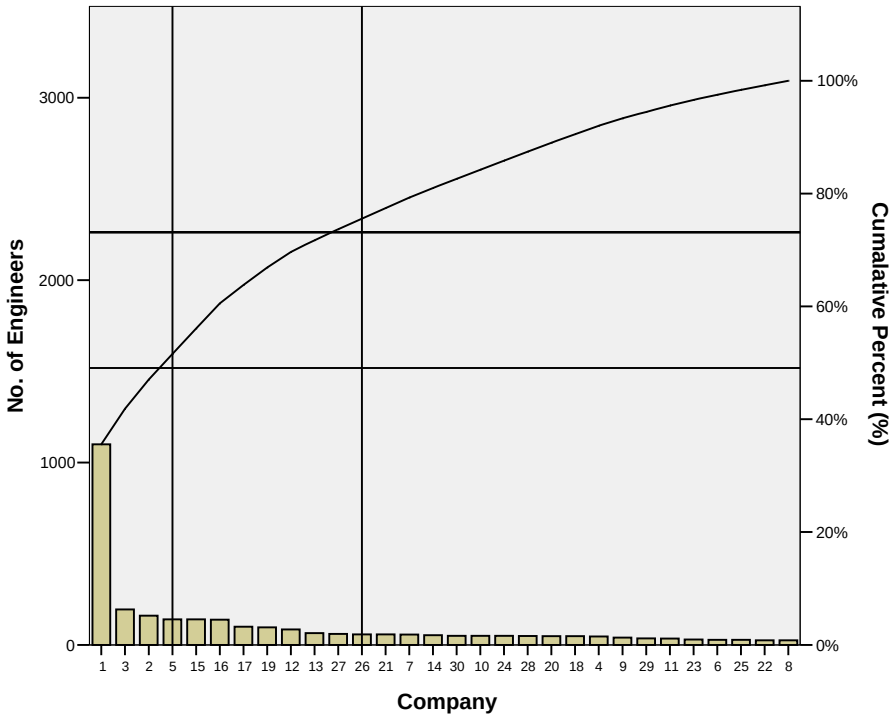

Figure 4: Pareto analysis of Number of engineers worked in year 2006

In year 2006, 50% of the software development workforce in the sample worked in four companies out of the 30 software development companies.75% of the software development workforce was working for 12 companies out of the 30 respondent software development companies. Therefore it is clearly evident that there are a few companies playing a major role in the software development offshore services.

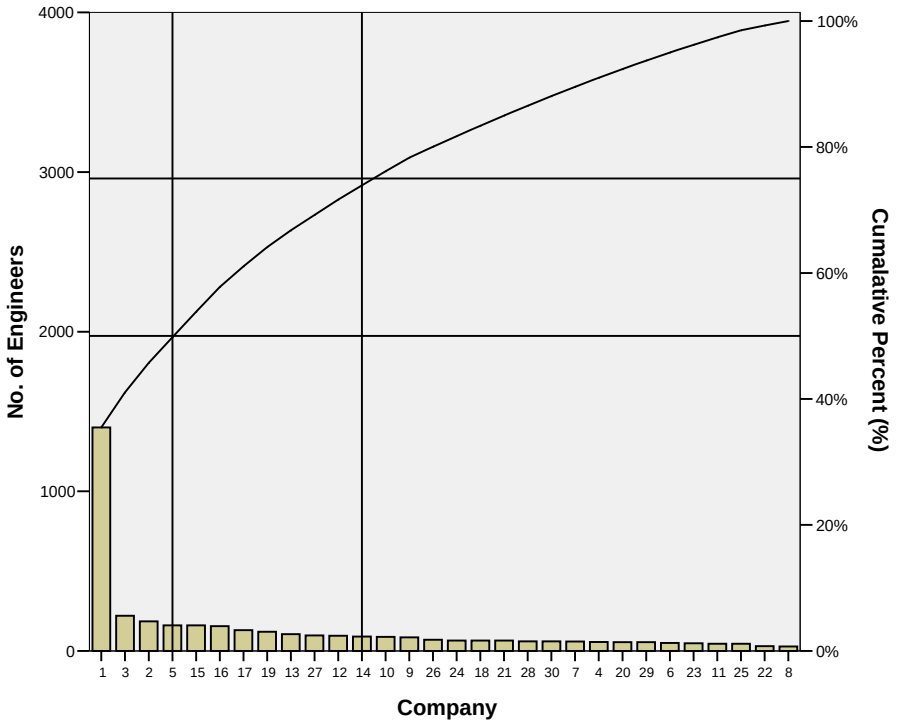

Figure 5: Pareto analysis of Number of engineers worked in year 2007

The four companies employed 50% of the IT workforce of the respondent companies for 2007 that was same as for year 2006. Twelve companies employed 75% of the IT work force of the respondent sample. One new company had entered in to the 75% quartile while one company was removed from this position.

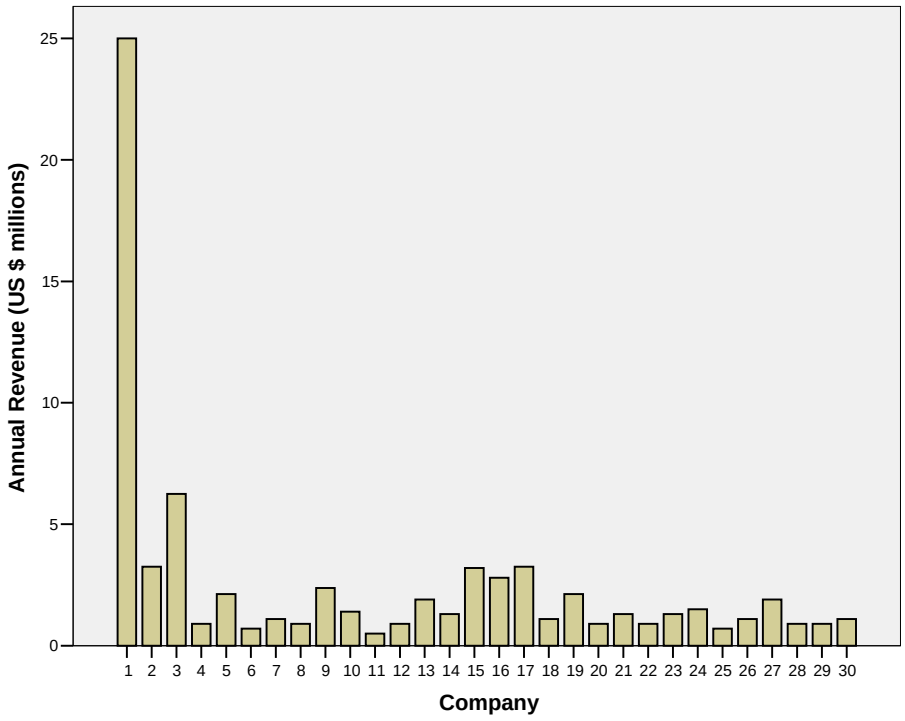

Figure 6: Annual Revenue (US $ millions) for year 2006

Two reference lines were drawn using the mean value of US $ 2.45 million and mode value of US $ 0.9 million. The mean value of US $ 2.45 million does not represent the true picture of the sample companies annual revenue. As indicated in the bar chart reference line drawn at US $ 0.9 million represent a more realistic picture of the annual revenue earned by the sample for year 2006.

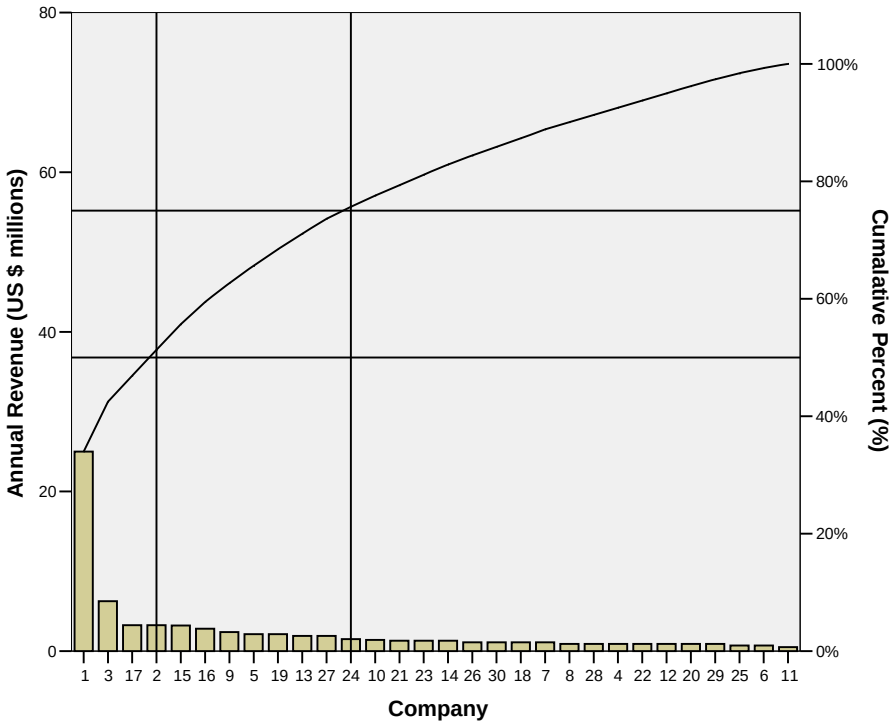

Figure 7: Pareto analysis of Annual revenue (US $ millions) for year 2006

The US $ 25 million revenue earned by Virtusa for the year 2006 represented the 34% of the total revenue earned by the sample companies. Four large-scale players generate 50% of the total revenue earned by the reported sample. 75% of the total revenue was earned by 12 companies in the sample.

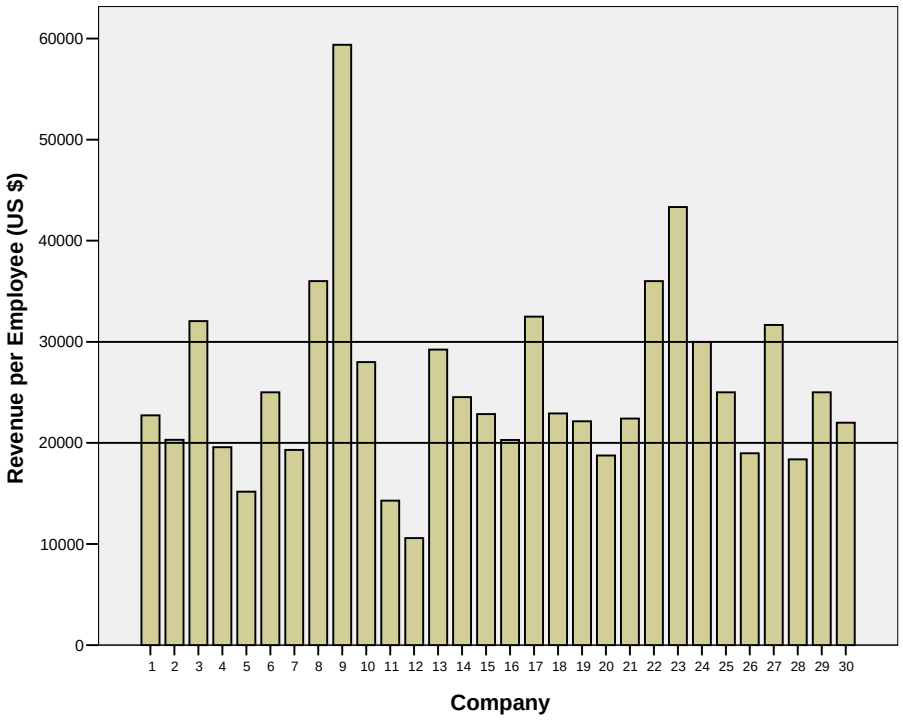

Figure 8: Revenue earn per employee (US $) for year 2006

The average revenue earned per employee for the software development industry in Sri Lanka falls between US $ 20,000 to US $ 30,000 per engineer per year [19]. Sixteen out of the 30 respond companies fall in this range. All the companies who earned more than US $ 30,000 per engineer was having a product sales portion in their annual sales. It was found that product companies are able to generate more revenue per engineer than pure offshore services companies.

Statistics	Service domain attractiveness	Growth strategy focus	Technology capability	Employee growth 2006 (%)	Stake holder risk avoidance	Revenue growth
N	30	30	30	30	30	30
Mean	13.80	18.10	12.73	.3570	5.5833	.2422
Median	14.00	17.00	13.00	.2000	5.6000	.1600
Mode	14	14	12	.10	5.60	.08
Std. Deviation	1.883	4.528	1.015	.35471	2.44799	.16323
Range	7	15	4	1.26	9.20	.46
Minimum	11	12	11	.07	.80	.08
Maximum	18	27	15	1.33	10.00	.54
Sum	414	543	382	10.71	167.50	7.27

Table 6: Descriptive statistics for Revenue Growth model variables

Service domain attractiveness average is good in the responded sample. This is 13.8 whereas the maximum possible value is 20.The standard deviation is 1.9

The mean value of the growth strategy is 18.1 whereas the maximum possible value is 30. Therefore it is evident that most of these offshore software development companies are planning to grow through joint ventures and alliances with foreign partners in US and Europe either to get access to market or service domains or at least to access the latest technology. Minimum value is 12 and the maximum value is 27. Few large companies were not willing to have alliances to get access to markets and service domain. Overall all the companies would like to have alliances and partnership to get access to latest of technology.

Technology capability of the respondent companies registered in the SEA is very high. The mean value is 12.73 where the maximum possible value is 15. Minimum value reported for the technology capability is 11. The range between these two values is 4.

Employee growth rate of the respondent companies is very high and the mean value is 36%. Maximum reported growth rate is 133% and minimum reported growth rate is 7%.

Stakeholder risk avoidance was calculated using the multiplication of value attributable for stakeholder commitment and the percentage of repetitive clients out of the total number of clients served from the inception. The resulting figure indicates how well the company is servicing the client satisfaction and ability to retain clients served in the past. This is a very important factor in the very competitive offshore software development industry to safeguard the future revenue stream. The mean value of stakeholder risk avoidance is 5.6 whereas the maximum possible value that can be obtained is 10. Therefore on average client satisfaction and risk avoidance is at a medium level for the respondent companies. However the minimum value is 0.8 and the maximum value is 10, resulting in a range of 9.2. This is the cause for the high standard deviation of 2.45. Calculations are shown in the Appendix B.

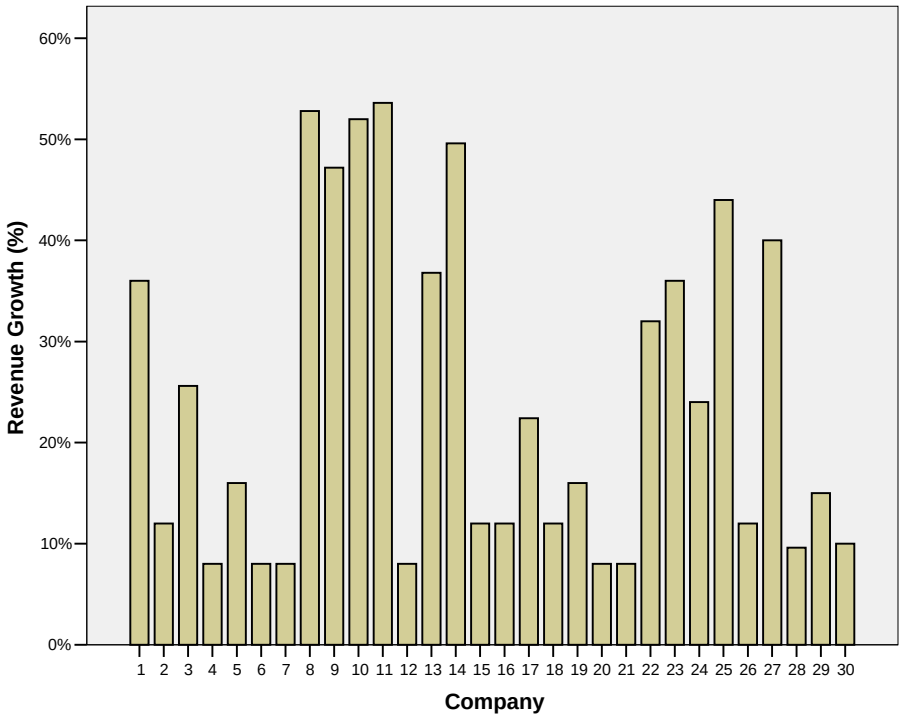

Figure 9: Annual Revenue Growth reported in 2006 for sample companies

The mean value of revenue growth is 24.2% for the sample. The minimum value is 8 percent and the maximum value is 54%. The standard deviation of 16% indicates that the revenue growths of individual companies were largely dispersed from the mean value. There were 12 companies in the responded samples recorded a revenue growth higher than the mean value.

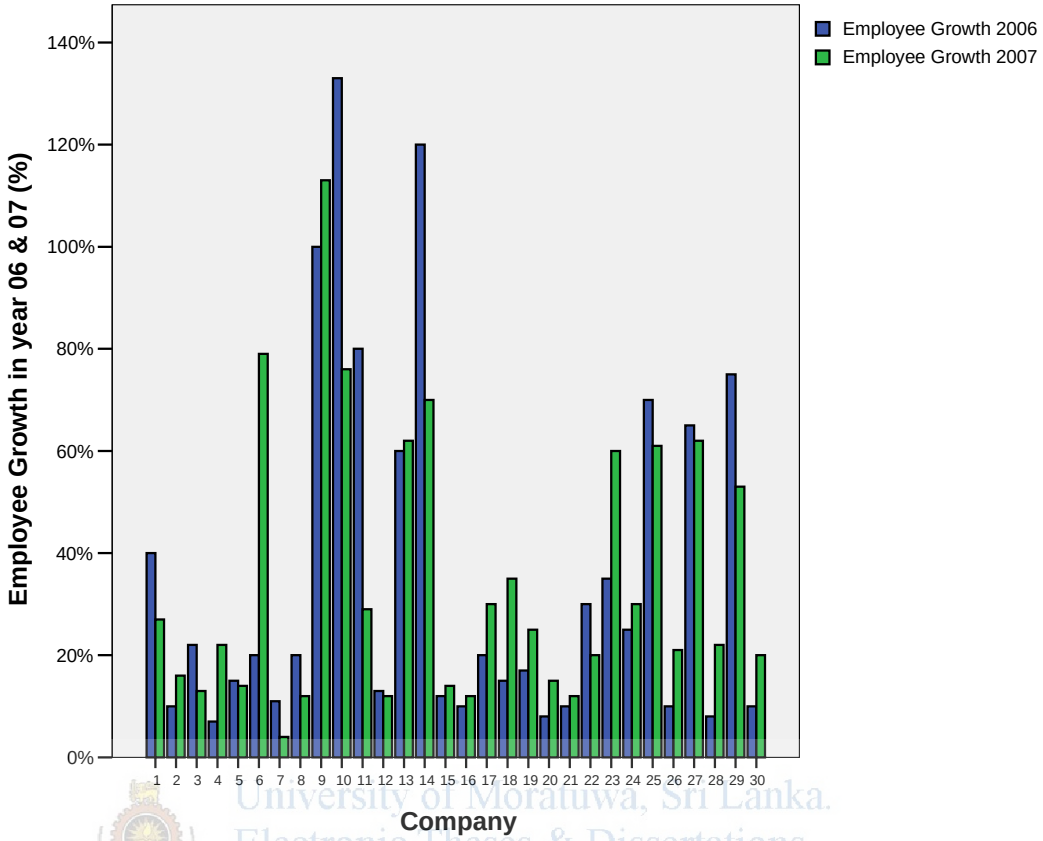

Figure 10: Employee Growth for the year 2006 and 2007 for responded companies

Employee growth rate for the year 2006 of the sample is very high. The mean value was around 35.7%. The maximum value reported was 133% and whereas the minimum value was 7%. Most of the companies have reported 10% employee growth rate for the year 2006. Because of the long value range, the standard deviation is high as 35.4%.

Statistics	Number of years in business	Quality of engineers	Quality of management	Management commitment	Process maturity
N	30	30	30	30	30
Mean	5.57	6.9163	14.0860	3.87	14.27
Median	5.00	6.9900	14.9000	4.00	14.00
Mode	4	6.10(a)	15.00	4	14
Std. Deviation	2.648	.71678	2.57761	.571	2.067
Range	13	2.57	12.50	2	9
Minimum	2	5.67	6.50	3	11
Maximum	15	8.24	19	5	20
Sum	167	207.49	422.58	116	428

Table 7: Descriptive statistics for Process Maturity model variables

Average number of years in business for the responded sample is 5.5 years. However, the standard deviation is very high and it is 2.65 years. Therefore years of experience were highly dispersed from the mean value for most companies.

Value for the quality of engineers and quality of management was derived using their qualification and years of experience in the IT industry. The criteria used to calculate the values are described in the Appendix C and Appendix D. The mean value for quality of engineers is 6.9. The standard deviation is 0.7 and therefore most of the companies in the responded samples are having a value close to the mean value. The mean value for quality of management is 14 and the standard deviation is 2.57. Indicators for the quality of engineers and the quality of management were very good for the responded sample. This was shown the very high standard of the IT workforce in Sri Lanka.

Management commitment is very high in the responded sample. It is having a mean value of 3.87 where the maximum possible value is five. Standard deviation of 0.57 and the range between the maximum value and the minimum value is 2. This means that most of the company's actual value is close to the mean value. The level of process maturity is not as good as other parameters discussed above in the responded sample. The mean value was 14.27 where the maximum possible value is 20. Standard deviation of 2 means there is a very high central tendency towards the mean value.

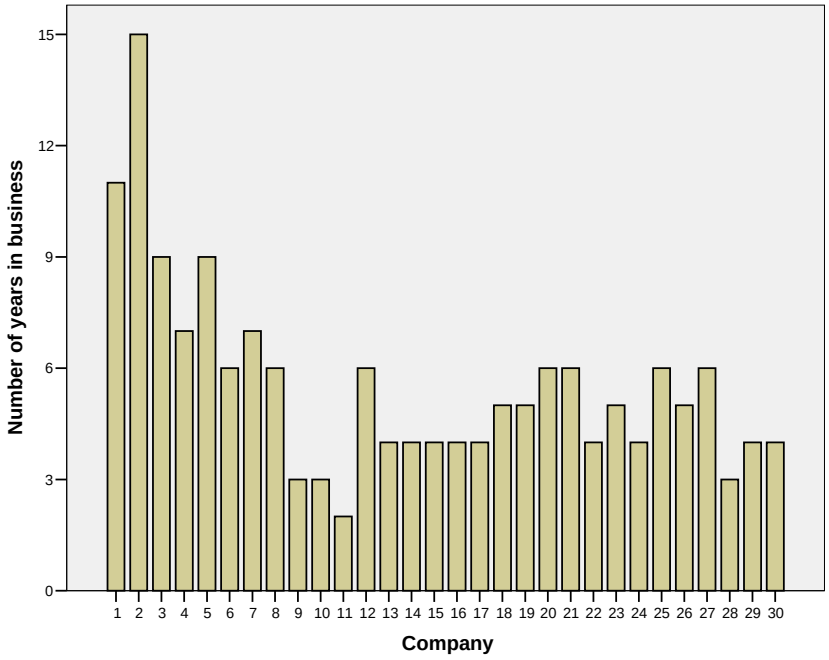

Figure 11: Number of years in business for responded companies

The maximum number of years in business was 15 and the minimum number of years in business was 2 years. Other than six companies all others were having less than six years of business experience. This will indicate offshore software development industry in Sri Lanka has not yet matured.

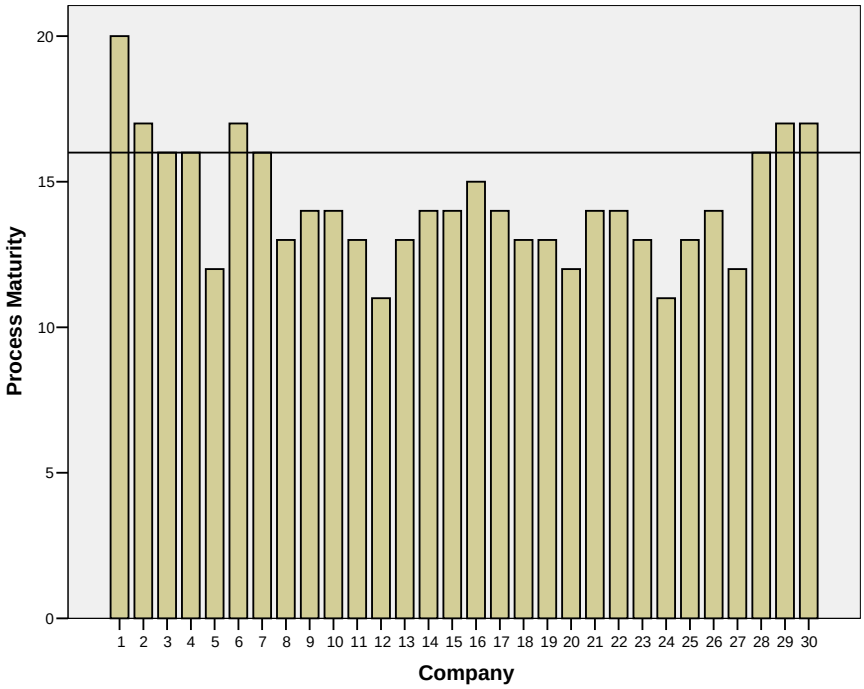

Figure 12: Process Maturity level of responded companies

There were only 5 companies who were having more than 16 for the value of process maturity. Therefore out of the 30 respondent companies only one sixth of them were having an above average level of process maturity. The process maturity is one of the key areas that need to be considered to improve the profitability of the industry and to increase Sri Lankan offshore software development industry as an attractive outsourcing destination.

Statistics	Billing utilization (%)	Staff Attrition rate (%)	Project risk	Net profit margin (%)
N	30	30	30	30
Mean	.6827	.1537	2.9290	.0697
Median	.6650	.1450	2.7300	.0555
Mode	.65	.13	2.00(a)	.05
Std. Deviation	.05199	.03935	1.37123	.04792
Range	.22	.13	4.60	.23
Minimum	.60	.10	.80	.00
Maximum	.82	.23	5.40	.23
Sum	20.48	4.61	87.87	2.09

Table 8: Descriptive statistics for Profit model variables

The mean value of the billing utilization is 68% for the responded sample. This is a fairly a very low value and it is not adequate to improve the profitability of the offshore software development industry while maintaining the ever increasing salaries of the software professionals. The central tendency is very high and most of the values of individual companies fall very close to the mean value.

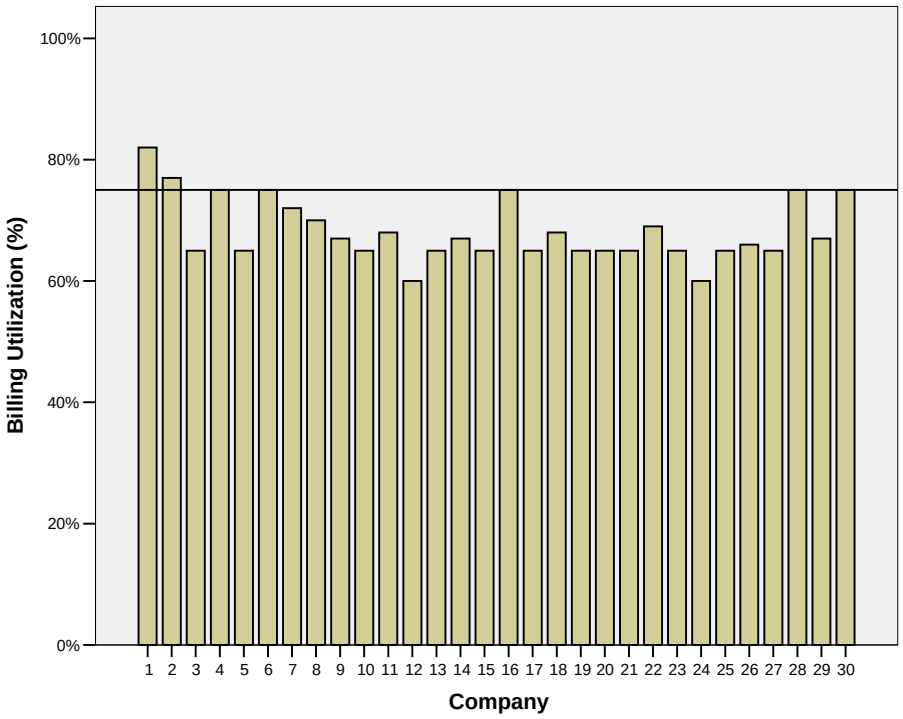

Figure 13: Billing Utilization of responded companies

Only one company was maintaining billing utilization over the 80%. There were 7 companies who were maintaining a billing utilization on or above 75%. Therefore billing utilization of the industry is not attractive and this will affect the profitability of the industry.

The mean value of the staff attrition rate is 15.37% with a standard deviation of 3.9%. The staff attrition rate is also very high and should be addressed quickly. This is another parameter that is eating out the profitability, stability and sustainability of an offshore software development company.

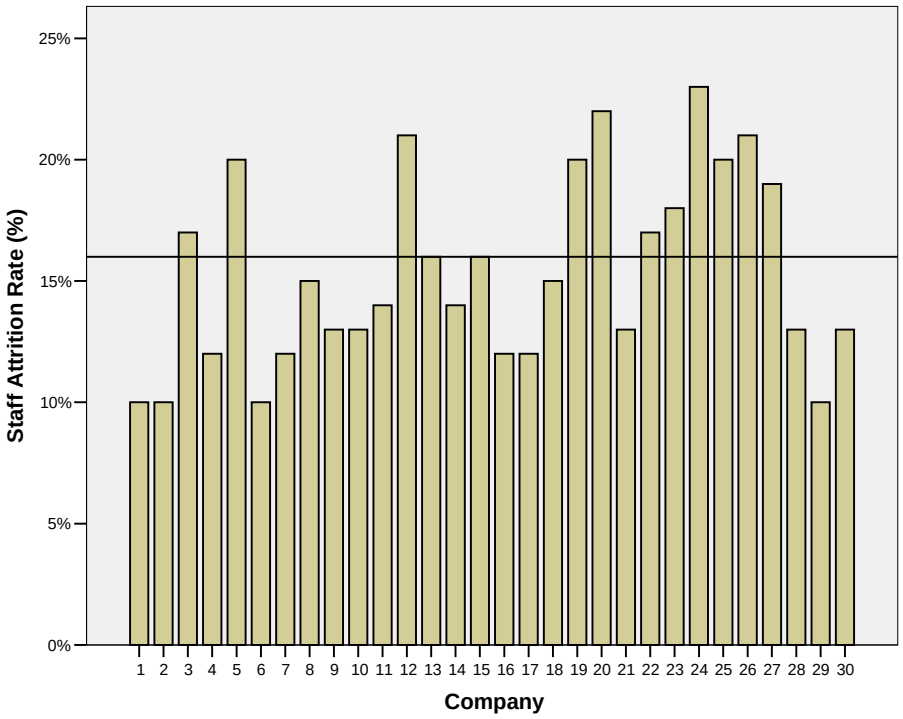

Figure 14: Staff attrition rate for the responded companies for year 2006

According to 2007 IT workforce survey report staff attrition rate in the offshore software development industry in private sector software development companies was 16%. There were eleven companies in the responded sample that was having a staff attrition rate higher than the industry average where the maximum value was 23%. Staff attrition rate was more than 10% for all the companies. This is a very high figure that would create many issues in future for industry growth and the stability.

The two parameters were considered to assigning a value for Risk. They are portfolio risk of the projects undertaken per year and the cost and schedule overruns of past projects or assignments undertaken by the company. The calculation of project risk is shown in Appendix E. The mean value of the risk for the responded sample was 2.9 and the standard deviation was 1.4. Therefore it was evident that the project and the portfolio risk of the offshore software development companies were largely varied from the mean value.

The net profit margin for the responded sample is 7% and the standard deviation was around 4%. Therefore net profit margins of individual companies were varying from the mean value. Most of the companies earned a net profit margin of 5 %.

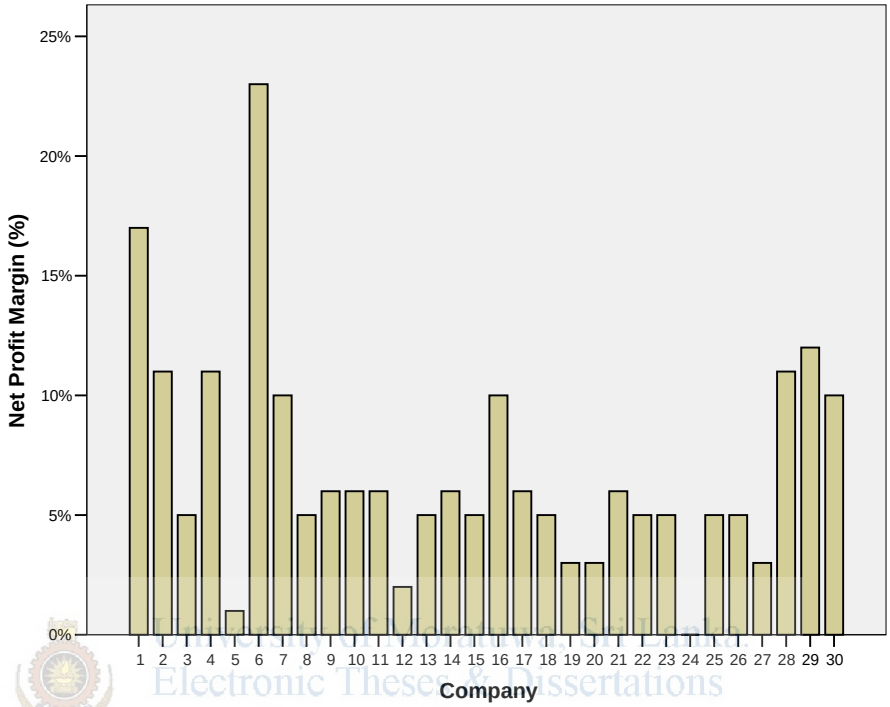

Figure 15: Net profit margins of the responded companies for year 2006

There were 9 companies out of the 30 responded companies who were earning a net profit margin over 10%. There were 24 companies who were maintaining a net profit margin on or above 5% of the annual revenue and 6 companies were having a net profit margin less than 5%.

Statistics	Value(US $ millions)
N	30
Mean	8.09324
Median	3.71855
Mode	2.5843
Std. Deviation	16.55384
Range	90.9281
Minimum	0.9097
Maximum	91.8378
Sum	242.7973

Table 9: Descriptive statistics for Business Value model variables

The mean value of business value for the selected sample is US $ 8.09 million. The minimum value of US $ 0.91 million and maximum value is US $ 92 million. The very high range between minimum and maximum values causes a very high standard deviation. The total business value of the 30 respondent companies was around US $ 242.8 million.

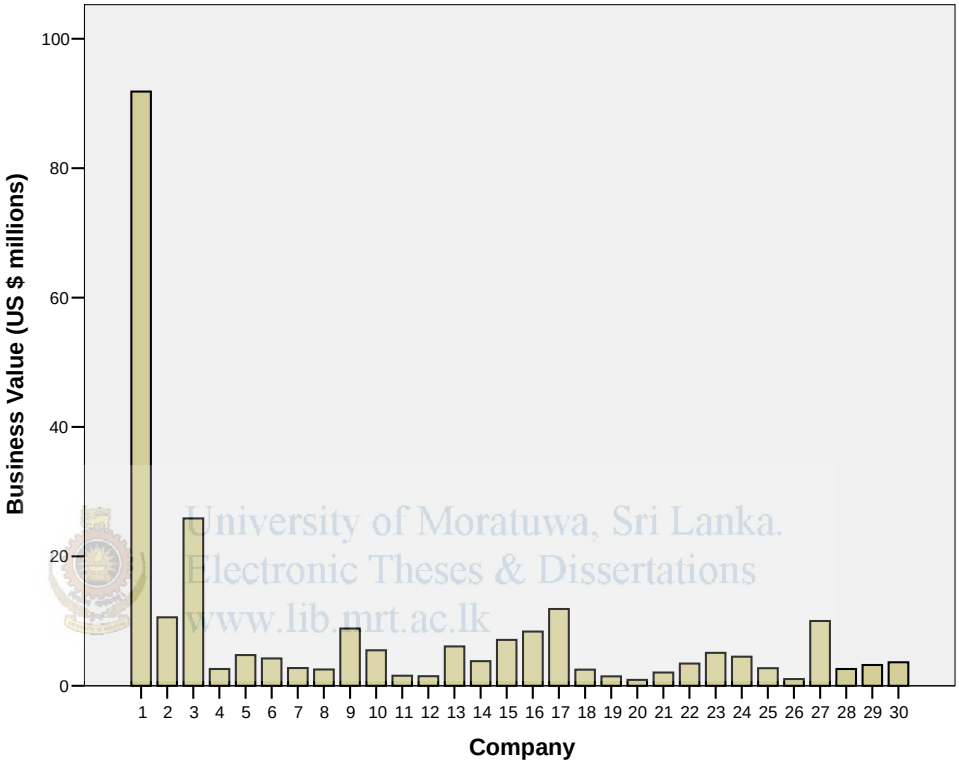

Figure 16: Business Value (million US $) of respondent companies for year 2006

The business value distribution of the sample companies is summarized in the table below. There is one exceptional company having a business value of US $ 92 million that is the largest offshore software development company in Sri Lanka.

Business Value (US $ millions)	Number of Companies
<1	1
1 -2	4
2 -5	14
5-10	6
>10	5

Table 10: Business Value distribution summary of the sample companies

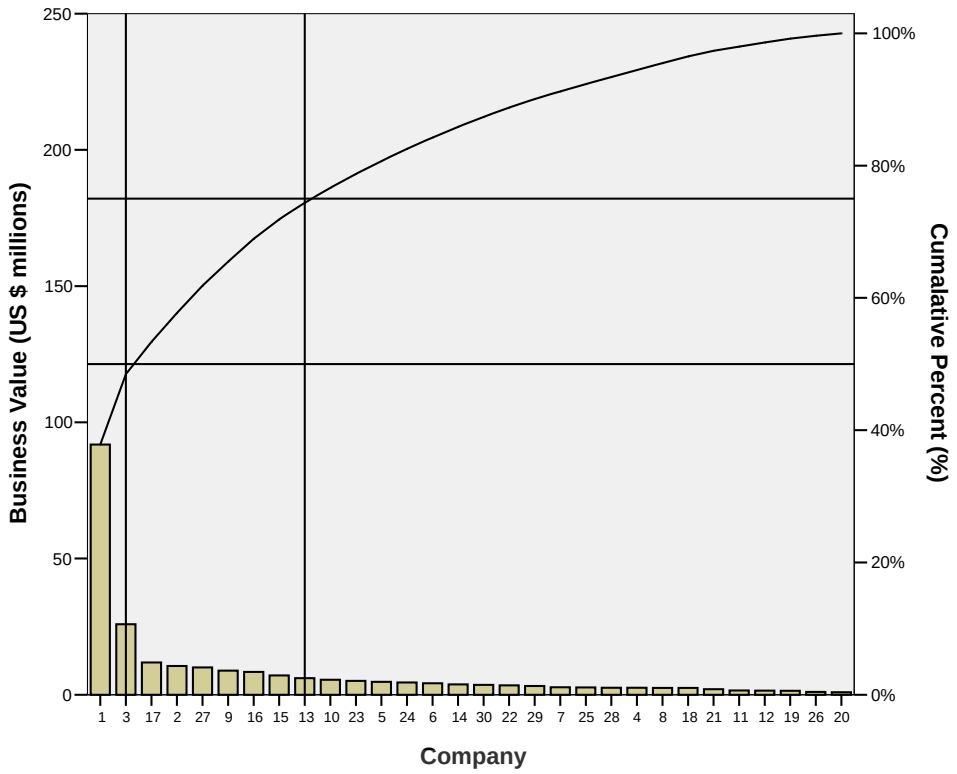

Figure 17: Pareto analysis of Business value (US $ million) of responded companies for year 2006

The 50% of the cumulative value of the respondent sample were represented by 2 companies. 75% of the cumulative value of the respondent sample was represented by 9 companies. This graph shows the imbalance of the offshore software development industry in Sri Lanka, where a few players dominate the entire industry.