

CHAPTER 5 : RESEARCH FINDINGS AND ANALYSIS

This chapter presents the findings of the study. The findings are tabulated in two separate sections for Internet Data Centres and Internet Data Centre Customers respectively.

In each section, the findings of each elements studied are discussed and analysed. In the final part of the analysis, the needs and expectations of iDC customers in general, are matched with the infrastructure and services offered by the iDCs.

Internet Data Centres

Out of the 15 short-listed iDCs in which official requests have been made, 9 participated in the survey, which represents 60% of response rate. Upon screening of respondents at the beginning of the interview, all 9 iDCs satisfy the criteria set out in the research, representing 100% of usable rate.

The summary of the findings can be found in Appendix D and the detailed responds of the iDCs respectively are shown in Appendix E.

Table 1 : Geographical and Environmental Analysis of iDCs

Geographical location	Frequency	Percentage
City	1	11.11%
Suburb	3	33.33%
MSC	5	55.56%
Environmental analysis	9	100.00%
Lightning protection	9	100.00%
Natural disaster free	8	100.00%

Table 1 shows that 56% of iDCs studied are located at the MSC as Multimedia Super Corridor provides among the best IT infrastructure backbone in Malaysia. Another 33% of iDCs studied are located at the suburb and 11% in the city, where the infrastructure backbone of the organisation is located especially in the case of Internet Service Providers cum iDCs. All

iDCs studied have located the data centres in the natural-disaster free zone with the appropriate lightning protection system installed.

Table 2 : Physical Infrastructure : Building Layout

Floor Space (sq. ft.)		Frequency	Percentage
<5000		3	33.33%
5001-10000		2	22.22%
>10000		4	44.44%
Organised Racking System			
Open rack	Standard	2	22.22%
	By demand	5	55.56%
Locked rack	Standard	8	88.89%
	By demand	1	11.11%
Private Caging	Standard	3	33.33%
	By demand	6	66.67%
Structured Electrical Cabling			
Under floor trunking		8	88.89%
Overhead Tray		1	11.11%
Raised Floor		8	88.89%
Dedicated areas for:		8	88.89%
Internet access nodes		9	100.00%
Server racks		9	100.00%
Testing and staging		6	66.67%
Temporary storage		7	77.78%
Tape room		9	100.00%
Network Operating Centre (NOC)		8	100%

Table 2 summarises the building layout of the iDCs studied. It was found that about 67% of the iDCs studied have total data centre space of more than 5,000 square feet with 44% of that more than 10,000 square feet. All iDCs practice organised server-racking system with 89% of iDCs having locked-rack as a standard practice. Most iDCs interviewed emphasised that the racking system can be customised base on customer’s individual request. 100% of iDCs interviewed have structured electrical cabling for ease of maintenance and fault detection, all except one practice under-floor trunking system with raised floor that reduces the static charge effect on the servers. Most of the iDCs studied have the data centre layout that resembles the basic blueprints of most of the international iDCs. 100% of iDCs studied have

dedicated area for server racks, testing and staging area, and network operating centre; 78% of iDCs studied have temporary storage area and tape room.

Table 3 : Physical Infrastructure: Basic Facilities

Facilities		Frequency	Percentage
Separate electrical feeder(s) from the utility provider		6	66.67%
At least 2 means of electrical distribution in the Data Centre		9	100.00%
Voltage surge suppresser		8	88.89%
Harmonics filter(s)		6	66.67%
UPS availability		9	100.00%
UPS standby duration (minutes)	1-30 min	6	66.67%
	31-60 min	1	11.11%
	>1 hr	1	11.11%
UPS blackout alert		9	100%
Genset availability		9	100%
standby duration (hrs)	1-10 hrs	2	22.22%
	>10 hrs	7	77.78%
automatic changeover		9	100.00%
24-hour CCTV monitoring		7	77.78%
Access Control type	Card	8	88.89%
	Finger print	3	33.33%
	Iris scan	0	0%
	Others	0	0%
Security guards	Compound	9	100.00%
	Building	5	55.56%
CMS (intrusion alert)		2	22.22%
Heat & smoke detectors		9	100.00%
Portable fire extinguishers		9	100.00%
Gas-based fire suppression		8	88.89%
Remote BOMBA alert		0	0%
Air Conditioning with redundancy		9	100.00%
Air Conditioning Temperature 18 – 22°C		9	100.00%
Humidity 45% - 50%		4	44.44%
Staff Facilities - Rest area		8	88.89%
Staff Facilities – Pantry		8	88.89%
Staff Facilities – Personal safety		9	100.00%

Base on the checklist on iDC basic facilities from the utilities, only 67% of iDCs studied have separate 11kV electrical feeders from the utility provider, in this case, Tenaga Nasional Berhad. However, all of the iDCs studied has at least two means of electrical distribution board at the data centre with Uninterruptible Power Supply (UPS - at least 30 minutes operating duration) and Generation sets (Gensets at least 6 hours operating duration) for electricity supply backup. 89% and 67% of the iDCs installed voltage surge suppresser and harmonic filters to ensure the "cleanliness" of electricity supply into the data centres.

On the aspect of building security, 78% of the iDCs studied installed 24 hour CCTV monitoring at the data centre. All of the iDCs studied have 24-hour security guard at the compound, 56% placed the security guards at the entrance of the building as well. 89% of the iDCs use security card as the major access control system into the data centre, only 33% of the iDCs use biometrics access control system. All iDCs practice international standard fire control system with gas based fire suppression and smoke detector system.

To ensure constant appropriate temperature at the data centres, all iDCs studied maintain the data centre temperature within the optimum range of 18 – 22°C with temperature auto-control air conditioning units with at least one set of redundancy. However, only 44% of the iDCs studied confirmed they have appropriate monitoring tools to ensure that the humidity of the data centre is maintained at optimum range of 45 – 50%.

All except one iDCs provide sufficient facilities such as rest area and pantry for the use of their personnel. 100% of iDCs studied are committed in providing a safe environment for their personnel especially for those who work at night.

With reference to the iDC blue prints of several international players, appropriate designed physical infrastructure is important in providing state-of-the-art, scalable Internet facilities and data centre. By averaging the percentage of iDCs complying with the elements (physical infrastructure)

studied, it is found that in general, majority of 88% iDCs studied provide the required physical infrastructure.

Table 4 : Services Offered by iDC

Services Offered	Frequency	Percentage
Co-location	9	100.00%
Web hosting	8	88.89%
ASP	5	55.56%
Total Solutions	8	88.89%
Value added - customised	8	88.89%

Table 4 summarises the services offered by iDCs studied. All iDCs studied offer co-location services. All except one offer managed services such as web-hosting, total solutions and customised value-added services. However, only 56% of iDCs studied offer Application Service Provider (ASP) services. Most iDCs interviewed claim that as long as there is a demand, they will be able to provide any IT services required by the customers through strategic partnership and alliances, which includes help setting up e-businesses and e-portals for the customers.

Table 5 : iDCs Customer Segment

Industry		Average percentage
Brick & Mortar	Government bodies	7%
	Education	5%
	Banking	4%
	SMI	29%
	NPO	10%
	Tourism	8%
	Software House	11%
	Hardware House	4%
	MNCs	9%
	ICT Service Provider	5%
Dotcoms	e-portal	7%
	ASP	13%

The iDCs studied did not want to reveal the actual number of customers they are servicing. Most iDCs offered only a rough estimate of the percentage of their current customers (over the total number of customers). Hence, the

analysis was done on the basis of what iDCs have revealed only. The percentage of customers of each iDCs were summed and averaged to provide a general overview of the customers of iDCs studied. Small medium industries (SMIs) are the majority of iDC customers at 29%. The second highest category of iDC customers is the Application Service Provider, which consists of 13% of the customers. The next highest category of iDC customers is the software house (11%), followed by Non-profitable organisation (10%), Multi-National companies (9%) and Tourism industry (8%). The iDCs interviewed were asked if they have any target market in their marketing and sales strategy. Most iDCs claimed that their services are offered to any organisation that would like to make a web or electronic presence on the Internet, at the least. However, different services are targeted to different segments of customers as the services serve different needs. For example, co-locations are normally acquired by big organisations that have in-house qualified IT personnel but require a more secured IT infrastructure and bandwidth. Web-hosting, total solutions and customised solutions are mainly acquired by small and medium organisations that do not have the expertise in managing IT software and hardware by themselves.

Table 6 : System & Network Infrastructure: Connectivity

Connectivity		Frequency	Percentage
Multiple carriers – telco	1 TELCO	5	55.56%
	> 1 TELCO	4	44.44%
Multiple carriers – ISP	1 ISP	2	22.22%
	> 1 ISP	7	77.78%
SLA with telco	SLA	6	66.67%
	UNERSTANDING	2	22.22%
SLA with ISP	SLA	5	55.56%
	UNERSTANDING	2	22.22%
Types of connectivity from telco	Fibre optic	7	77.78%
	ISDN	7	77.78%
	Copper line	2	22.22%
Number of internet lines available for clients	<3 LINES	2	22.22%
	UNLIMITED	7	77.78%
Internet connection speed from iDC to Telco	<11Mbps	4	44.44%
	>10Mbps	5	55.56%

Greater resilience of network access into the Internet Data Centre is gained by having multiple carriers of Telco and ISP. However, 56% of iDCs studied have only 1 telecommunication connection, namely from Telekom Malaysia Berhad. On the other hand, 78% of the iDCs have multiple Internet Service Providers to ensure minimal downtime to Internet connection. To ensure continuous service from the telecommunication and Internet service providers, some iDCs have signed legally binding Service Level Agreement (SLA) with the providers. 67% of the iDCs studied have SLA with telecommunication service providers, 56% have SLA with Internet Service Providers to provide 99.9% uptime. 22% of the iDCs interviewed have only understanding with the service providers to ensure as minimal downtime as possible.

78% of iDCs studied are connected to the telecommunication service providers through fibre optic and ISDN lines. 78% of the iDCs studied are able to provide unlimited Internet lines to their customers whenever required. The Internet connection speed ranges from 4Mbps to 155Mbps, with 56% of iDCs studied connected at more than 10Mbps.

Table 7 summarises the findings of iDCs studied from the aspect of system and network security. Firewall logs are monitored and analysed to detect any abnormal entry attempts, which might be able to stop intrusion attack into the network and system. 44% of iDCs studied have specialised personnel monitoring the firewall logs at least once a day. Two iDCs interviewed study the firewall logs once weekly, one other iDC interviewed only check on the firewall logs once in a month. Another iDC checks on the firewall logs base on prior agreement stated in the SLA. All iDCs interviewed have in-house specialist that looks into the security of system and network infrastructure of data centre. 22% of iDCs studied also employ external security teams on certain specialised products. Besides firewall, all iDCs interviewed also use other systems to detect unauthorised access into the data centre, namely IDS, Web Log Analyser (ANALOG), Tripwire, which in most cases are integrated into the central network monitoring system of data centre.

Table 7 : System & Network Infrastructure: System & Network Security

System & Network Security		Frequency	Percentage
Frequency of monitoring / analysing the firewall logs	Daily & more	4	44.44%
	Weekly	2	22.22%
	Monthly	1	11.11%
	Depends on SLA	1	11.11%
In-house network security team / engage 3rd party security service	in house only	7	77.78%
	in house and external	2	22.22%
Tools other than the firewall to detect unauthorised access	IDS	6	66.67%
	IDS and more or others	2	22.22%
Frequency in performing system backup	Daily & more	6	66.67%
	Weekly & more	1	11.11%
	Monthly & or by demand	2	22.22%
Number of people know about the administration password	3 or less	8	88.89%
	More than 3	1	11.11%
Tools used to guard & validate the authorization of data exchanges	SSL, VPN, MEPS	3	33.33%
	OTHERS	3	33.33%
Frequency in performing data backup	Daily & more	4	44.44%
	Weekly & more	0	0.00%
	Monthly & or by demand	3	33.33%
Do you store at least a copy of latest backup media offsite?	Yes	8	88.89%
Response time in the event of a disaster	Within 1 hour	6	66.67%
	Within 3 hrs	3	33.33%
Way to ensure scalability	Have bigger iDC space	1	11.11%
	Capacity planning	4	44.44%
	Constant monitoring by system; adopt latest technology	1	11.11%
	Use modular and scalable storage solution.	1	11.11%
	Not sure / No comment	2	22.22%
Do you implement Storage Area Network?	Yes	3	33.33%
	Planning	2	22.22%

System backup is important to restore any data lost due to unexpected system failure. 67% of iDCs studied perform system backup daily, weekly and monthly, with the tapes recycled every week for the daily backup; recycled every month for the weekly backup and every year for the monthly backup. Administrative password allows the holder to access into a particular network and system for the purpose of reconfiguration or editing. 89% of iDCs studied allow not more than 3 personnel to hold the password.

67% of iDCs studied offers data exchange services. They use security gateway such as VPN, SSL, MEPS, PGP, PKI, SSH Secured Shell etc. Data backup can only be done for managed services of iDCs or upon customers' request for co-location customers. 44% of iDCs perform data backup daily, weekly and monthly. 33% of iDCs only perform data backup once a month or upon customer request only. A copy of the backup is normally stored offsite to ensure the safety and availability of the data. 88% of iDCs studied complied with this criterion.

In the event of disaster, 67% of the iDCs studied claim that they are able to respond to the event within an hour. The other iDCs claimed to be able to respond to any situation within 3 hours as all iDCs have technical personnel standby 24 hours either at the data centre itself or within 50km from the data centre.

78% of iDCs studied claimed to have certain storage solutions and capacity planning to ensure scalability of the data centre. Only 33% of iDCs studied are implementing storage area network. 22% of the iDCs are in the stage of planning this system, upon considering the demand of their customers. From the interview, iDCs in general do not really feel the need of implementing storage area network if the simple storage system is able to cater the needs of their customers.

By averaging the percentage of iDCs complying with the elements (system and network infrastructure) studied, it is found that in general, majority of 73% iDCs studied provide system and network infrastructure required in an iDC.

Table 8 : Data Centre Management & Operation: Service Management Centre

Service Management Centre		Frequency	Percentage
Is the call centre staffed 24x7?	CC & NOC	6	66.67%
	ONLY NOC	3	33.33%
Do you have first level support for all alerts, incidents & problems, first level contacts for customers?	Yes	9	100.00%
Average response time to a complaint (minutes)	within 15 minutes	5	55.56%
	within 30 minutes	2	22.22%
	within 60 minutes	1	11.11%
	within 2 hours	1	11.11%

Table 8 summarises the findings on the service management of the iDCs studied. 67% of the iDCs interviewed claim that they have 24 by 7 operations at their call centre as well as network operation centre. Three of the iDCs studied have only network operation centre running 24 by 7. Their iDC Call Centres are still at the planning stage. All iDCs interviewed claimed to be well-equipped in handling any complaint reported, with 78% of them being able to respond to any complaint within 30 minutes.

Table 9 looks into the monitoring and maintenance services offered by iDCs. 78% of the iDCs use dedicated management and monitoring tools for all operational managed services. Most of the iDCs studied do not have proper reporting process in place. 56% of iDCs claimed that reports are given to customer only whenever an incident occurs. 33% of iDCs report to their customers at an average rate of once in a month or by request of the customers. One of the iDCs claimed that the reporting frequency depends on the customer type, services acquired as well as the SLA agreed upon.

In general, iDCs normally provide some basic monitoring and maintenance services on the servers at the data centre. Majority of the iDCs (89%) monitors the packet loss and log files of the system. However, hard-disk, CPU and memory usage monitoring are provided by 56% of iDCs studied as a default service offered. The monitoring of system performance as stated above sometimes violates the privacy and confidentiality of customers' data.

Hence, 22% of iDCs studied provide the above services only by customer request.

Table 9 : Data Centre Management & Operation: Service Monitoring & Maintenance

Service Monitoring & Maintenance		Frequency	Percentage
Do you have dedicated management and monitoring tools for all operational managed services?	Yes	7	77.78%
Frequency of reporting to the customers on the system's performance	daily or by demand	1	11.11%
	Weekly or by demand	0	0.00%
	Monthly or by demand	3	33.33%
	ad-hoc	5	55.56%
Basic Monitoring			
Packet loss monitoring	Yes	8	88.89%
	By demand	0	0.00%
View log files	Yes	8	88.89%
	By demand	0	0.00%
Hard disk usage monitoring	Yes	5	55.56%
	By demand	2	22.22%
CPU usage monitoring	Yes	5	55.56%
	By demand	2	22.22%
Memory usage monitoring	Yes	5	55.56%
	By demand	2	22.22%
Proactive Monitoring			
Trends monitoring		9	100.00%
Automated responses to given conditions		9	100.00%
New patches / service packs firewall monitoring for intrusions		8	88.89%
Frequency of meeting with iDC customers	daily or by demand	0	0.00%
	Weekly or by demand	3	33.33%
	Monthly or by demand	4	44.44%
	ad-hoc	1	11.11%
	Other department manage	1	11.11%
Ratio of customer/ iDC personnel: target / optimum	Target: 1 to <50 servers	5	55.56%

Proactive monitoring that is offered by the iDCs include trends monitoring, automated responses to given conditions as well as upgrading of new patches / service packs and firewall for intrusion monitoring. 100% of iDCs interviewed claimed to provide all the above value added services.

78% of iDCs studied conduct meetings with customer at least once a month or upon customer request. One of the iDCs does not hold meetings directly with the customers, but through the marketing and sales department of the mother-holding company.

Ratio of customer to iDC personnel is able to provide a general indication on the service support level to be given to the customers. However, this ratio can not be the only indicator of iDC service support level because a higher end of IT infrastructure also enables an iDC to provide higher service support level with fewer iDC personnel. Nevertheless, five iDCs interviewed claimed that the ratios should be around 50 customers to 1 iDC personnel.

In the last section of the interview, the iDCs studied were asked a few open-ended questions. Table 10, Table 11 and Table 12 summarise the findings.

Table 10 : Reasons Customers Outsource to iDCs

Reasons outsource to iDC	Frequency	Percentage
Cost reduction	8	89%
Better use of space	1	11%
Let experts do the job	4	44%
Focus on core competencies	6	67%
Complexity of IT architecture & software	6	67%
Reduced Business / Operation risk	4	44%
Specialisation	2	22%
Better e-business performance	3	33%
More secured infrastructure	7	78%
Healthier cash flow (factor of amortisation, peak initial capital investment)	3	33%

Table 10 summarises the reasons iDC customers outsource IT infrastructure and services to iDCs in general, from the iDC's point of view. 89% of iDCs

studied quoted that the main reason customers outsource to iDCs is huge cost reduction. Table 11 shows the estimated cost savings for iDC customers. 67% of the iDCs studied claimed that engaging in iDC services in general, would save up to 50% of operating cost at the customer end. Only one iDCs suggested that the saving should be in the range of 60 to 80%.

Table 11 : Estimated Cost Savings for iDC Customers

		Frequency	Percentage
Estimated customers' total cost savings after engaging in iDC services	<50% operating cost	6	66.67%
	>50% operating cost	1	11.11%
	no comment	2	22.22%

78% of iDCs studied have the opinion that customers outsource to iDCs due to more secured infrastructure available at the iDCs. 67% of the respondents agreed that the need to focus on core competencies and complexity of IT infrastructure and software drives customers to acquire iDC services. 44% of respondents feel the expertise as well as reduced business and operation risk for customers are among the reasons they outsource to iDCs. This, in turn, help customer to achieve healthier cash flow and better e-business performance which represent the opinion of 33% of respondents.

Table 12 : iDCs' Greatest Selling Point

		Frequency	Percentage
Greatest selling point of iDC interviewed	Competitive pricing	3	33.33%
	excellent & flexible services	5	55.56%
	great IT infrastructure	1	11.11%
	value for money	3	33.33%

56% of iDCs interviewed claimed that the greatest selling point of their iDCs is the flexible and excellent services offered to their customers. 33% of the iDCs studied claimed that competitive pricing is their main attraction. 33% of iDCs

also claimed that their great value of money services is their greatest selling point. Only one iDC agreed that excellent IT infrastructure gives it a competitive edge over the competitors.

From all the analyses above, most of the major elements in the questionnaire for iDC are satisfied by more 50% of the iDCs studied in general. Table 13 below summarises these elements with majority compliance (>50%) and elements with compliance of 50% or less.

Table 13 : Summary of Findings and Analysis for iDCs

Category	>50% iDCs complied	50% or less iDCs complied
iDC Geographical & environmental	Located at MSC	
	Located at natural disaster free zone	
iDC Physical infrastructure	Data centre size >5,000 squared feet	Data centre maintained at optimum humidity level
	Practice organised server racking system	
	Practice structured electrical cabling system	
	Provide dedicated area for specialised operations at data centre	
	Equipped with TNB supply through separate feeders with appropriate electricity supply backup and filtration	
	Equipped with CCTV for 24 hour security monitoring	
	Equipped with security guards at least at the compound of data centre building	
	Data centre maintained at optimum temperature	
Services provided by iDC	Offer co-location services and are able to provide any services required by customers	
iDC customer market segments	Majority of iDC customers are Small Medium Industries	

System & Network infrastructure	Subscribe only 1 telco service	Practice daily monitoring of firewall logs
	Subscribe > 1 ISP service	Implement storage area network
	iDC has SLA with telco & ISP	
	Equipped with internet connection speed > 10Mbps	
	Equipped with in-house security teams	
	Practice daily, weekly and monthly system backup	
	Allow < 3 personnel to hold administrative password	
	Offer data exchange services with appropriate data security systems	
	Able to respond to any event of disaster within 1 hour	
	Practice certain storage solutions and capacity planning to ensure scalability of the data centre	
Data Centre management and operation	Equipped with 24x7 call centre and network operating centre	Practice proper customer reporting process
	Able to respond to any complaints within 30 minutes	
	Equipped with dedicated system and network management and monitoring tools	
	Practice packet loss, log files, hard disk, CPU, memory usage monitoring	
	Practice trends monitoring	
	Conduct meeting with customer once a month	

Internet Data Centre Customers

The iDC customers samples obtained in this study were solely based on the inputs from the iDCs interviewed. After long pursue, a total of 25 iDC customers name were given by the iDCs studied. Upon screening of respondents at the beginning of the interview, only 23 iDC customers satisfy the criteria set out in the research, representing 92% of usable rate.

The summary of the findings is shown in Appendix F.

Table 14 : iDC Customers Business Category

iDC customers Business Category	Frequency	Percentage
Government bodies	0	0%
Education	0	0%
Banking	1	4%
SMI	3	13%
NPO	1	4%
Tourism	0	0%
Software House	1	4%
Hardware House	0	0%
Retail shops	0	0%
Consultancy	1	4%
Others (Brick & Mortar)	4	17%
e-portal	7	30%
ASP	3	13%
others (dot com)	2	9%
Total iDC customers studied	23	100%

Table 14 shows a summary of iDC customers studied base on their respective business category. E-portals consist of the majority of the iDC customers studied at 30%. The second highest category of iDC customers interviewed falls to other category of brick and mortal businesses, such as multi-level marketing companies and businesses at 17%, followed by Small Medium Industries and Application Service Providers at 13%. These numbers are not similar to the market segment of what was declared by the iDCs studied (page 70), clearly due to the following reasons:

1. The iDC customers samples were solely dependent on inputs from iDCs interviewed-earlier.
2. The names of iDC customers were given by the iDCs interviewed, which may not be from the majority category of their customers segment.
3. The sampling design of this research is not based on random sampling, but solely base on the names given by the iDCs studied.
4. The samples of the iDC customers might not be selected randomly by the iDCs studied. The iDCs might just select a few of their customers that most probably will not threaten the business if ever the names would to be revealed to competitors.

Table 15 : Reasons to Outsource to iDC

Reasons outsource to iDC	Frequency	Percentage
Cost reduction	17	74%
Better use of space	9	39%
Let experts do the job	17	74%
Focus on core competencies	20	87%
Complexity of IT architecture & software	10	43%
Reduced Business / Operation risk	15	65%
Specialization	15	65%
Better e-business performance	11	48%
More secured infrastructure	18	78%
Healthier cash flow (factor of amortization, peak initial capital investment)	8	35%

Customers of iDCs were asked why they outsource their IT infrastructure or even, design, operation and maintenance of the system to iDCs. Majority of the iDC customers studied quoted the main reason is to focus on core competencies (87%), in which major part of IT management can be left to the experts. 78% of the iDC customers studied agreed that by outsourcing to iDC, they would be able to acquire more secured infrastructure. 74% of iDC customers also agree that reduced operating cost and the expertise of iDC bring better business efficiency thus profitability. 65% of iDC customers studied also quoted reduced business or operation risk and the need of IT specialisation skills as the reasons they acquire iDC services.

The above findings coincide with IDC findings in their research “*Internet Data Centers in Malaysia 2001: An End User Study*”. In this IDC research report, majority of the respondents in the survey quoted “less IT management” as the most important benefit in outsourcing to iDC, followed by cost savings and greater reliability.

Table 16 : Services Acquired from iDC

iDC services	Frequency	Percentage
Co-location	13	57%
Web hosting	6	26%
ASP	3	13%
Total Solution	5	22%
Dedicated hosting	1	4%

Table 16 summarises the services acquired by iDC customers. As explained in the earlier section, an iDC customer can acquire more than one service from the iDC. The combination of services for example, can be web hosting and total solution services, or dedicated hosting and value added services.

Majority (57%) of the iDC customers interviewed acquires co-location service from their iDCs. This is followed by web hosting (26%) and total solution (22%) services.

Table 17 shows the importance ranking of “Top criteria for choosing an iDC” given by the iDC customers studied. The most important criteria ranked by iDC customers is the availability of the services, i.e. the iDC customer is connected at all time – 24 by 7, 365 days a year. 91% of iDC customers studied agreed that security is the second most important criteria they look for after availability, in choosing an iDC.

65% of the respondents quoted responsiveness as the next important criteria they look for after availability and security of the services and IT infrastructure of an iDC. On the other hand, 30% of the respondents voted service support should come before responsiveness of iDC. However, majority (52%) of respondents agreed that service support ranks after responsiveness.

87% of iDC customers interviewed voted customisability as the least important of all 5 criteria listed above. Many of the respondents have the opinion that the services acquired from the iDCs are quite straight forward, and hence, less requirement on customisability. Furthermore, most iDCs provide flexible service packages.

In general the above findings are quite similar to IDC findings in their research "*Internet Data Centers in Malaysia 2001: An End User Study*", that shows the top criteria for choosing a service provider by iDC customers is the security of the data centre.

iDC customers were then asked to evaluate the services offered by their iDCs respectively base on a five-point Likert Scale. 8 basic criteria expected in iDC services were evaluated.

61% of the respondents are satisfied with the availability of the iDC services. 17% of the respondents are very satisfied with the availability of the services, whereas 13% are not satisfied. On the security aspect of the iDC services, 57% of the iDC customers are satisfied with this aspect of services so far. 52% of the respondents are satisfied with the responsiveness of iDC, and 22% of respondents rated it the average score. Majority (57%) of the iDC customers studied rated an average score on the customisability aspect of iDC services. 39% of the respondents quoted customisability at a satisfactory level.

Some iDC customers have Service Level Agreement with the iDC. 48% of the respondents gave an average score on satisfaction level of the SLA. 30% of the respondents are satisfied with the SLA with their iDCs. 100% of iDC customers studied are satisfied with the iDC services in general, where the outsourcing objectives are met satisfactory.

Table 18 : Satisfaction Evaluation of iDC Customers

Criteria	5-Point Likert Scale (%)				
	Very satisfied	Satisfied	No comment	Not satisfied	Very unsatisfied
Availability	17%	61%	4%	13%	4%
Security	17%	57%	13%	13%	0%
Service support	13%	52%	22%	13%	0%
Cost effectiveness	9%	57%	35%	0%	0%
Responsiveness	13%	52%	22%	13%	0%
Customisability	0%	39%	57%	4%	0%
Satisfaction on SLA compliance	0%	30%	48%	13%	9%
Meet outsourcing objectives	0%	100%	0%	0%	0%

Table 19 : Future Expectations from iDC

Services	Percentage
Remote administration	22%
Stronger technical support / iDC personnel	9%
Bigger bandwidth	17%
More competitive Pricing	4%
Higher availability / uptime	13%
Better customer support and be more responsible	22%
No comment / so far so good	39%

Table 19 summarises the answers given by the iDC customers studied on their future expectations from the iDCs. 39% of the iDC customers have no comment on the aspect or felt that the current service is good enough for the business. "The web-site is just informational", "Do not rely much on extra services from iDCs as we have strong in-house personnel", "The service is satisfactory so far", were some of the comments given.

22% of the respondents would like the iDCs to improve on remote accessibility into the data centre for customers' administration purposes. 22% of the respondents also hope that iDCs improve on responsiveness towards customers' queries and problems. They feel that iDCs should show more responsibility and ownership on problems faced by the iDC customers. 17% of

the respondents expect the iDCs to improve on the size of the bandwidth to ensure faster on-line connection. For some of the respondents that have experienced downtime in a few occasions hope that iDCs will look into the matter and thus improve on the service availability. 9% of the respondents also hope that the technical personnel in iDC will mature and thus improve in their technical skills as the industry matures. 4% of the respondents also expect iDCs will be more competitive in pricing in future, comparing to the iDCs in United States, as the industry matures.

Table 20 : Problems Experienced by iDC Customers

Problems occurred	Percentage
Lack of commitment in providing services	4%
Slow response time and lack of customer support	26%
Rely too much on 3rd party vendors - Lack of in house qualified personnel	9%
Slow on-line connections / Bandwidth problem	13%
Low security/ firewall	4%
SLA dissatisfaction	4%
Low availability	4%
No comment / so far so good	43%

Table 20 summarises the problems faced by iDC customers studied. 43% of the respondents are happy with the services offered so far. However, 26% of the respondents complained that the response time has been slow in several occasions, and the customer service support ,is not satisfactory. 13% of the respondents complained on the slow on-line connections or small bandwidth at the iDCs. 9% of the respondents feel that the iDCs do not have sufficient qualified and experience in-house personnel and rely a lot on third party vendors' services, hence, resulted in slow response time especially while handling problems occurred. Other complains include lack of commitment in providing services, not satisfied with the system and network security at the data centre, low availability and unfair conditions stated in the SLA or non-compliance to the SLA.

Clearly from Table 19 and Table 20, it can be seen that the 2 main areas which require improvement from iDCs as quoted by the iDC customers interviewed are as follows: (1) Responsiveness and customer support, (2) Bigger bandwidth to provide faster on-line connection.

Table 21 : To Outsource or not to Outsource to iDC

Would you recommend others to subscribe to iDC services?	Percentage
Yes, would recommend iDC services	96%
No comment	4%

96% of the iDC customers studied would recommend others to acquire iDC services, although taking note on some of the problems they have experienced. The reasons given are summarised in Table 22.

Table 22 : Reasons to iDC Customers' Recommendation

Reasons	Percentage
Cost effectiveness / cost savings with better cash flow bring to higher business efficiency	55%
Good IT infrastructure	23%
iDC Specialisation / expertise	14%
Good and flexible services	18%
Less hassle / problem / risk	23%
Focus on Core competencies hence greater business efficiency	14%

Majority (55%) of the iDC customers studied who would recommend iDC services to others, agreed that by outsourcing to iDC, business efficiency improves through cost effectiveness or savings that brings better cash flow to the business. 23% of respondents would recommend others to subscribe to iDC services due to the good IT infrastructure provided by the iDCs. 23% of respondents also agree that it is fewer hassles by outsourcing to iDC, with fewer problems to handle and lower risk to business operation overall. 18% of the respondents quoted good and flexible services of iDC as the reason to subscribe to iDC services, while 14% felt that subscribing to iDC services is leveraging on the iDC's specialisation and expertise for the good of their

business. This, in return, enables the iDC customers to focus on their core competencies, which bring to higher business efficiency.

Internet Data Centres vs Internet Data Centre Customers

From the findings obtained from the iDCs and iDC customers interviewed, several comparisons can be made to obtain an overview on services offered by iDCs studied and the services required by their customers in general.

Comparison 1

The customers of iDCs were asked in the questionnaire the reasons to outsource their IT infrastructure and services. Similarly, the iDCs' opinion of why their customers outsource was also sought. A comparison of both these aspects shows if the iDCs' opinion and their customers' reasons are indeed aligned.

Table 23 : Comparison of Reasons to Acquire iDC Services from the Point of View of iDCs and iDC Customers

Reasons outsource to iDC	iDCs' point of view	iDC customers' reasons
Cost reduction	89%	74%
Better use of space	11%	39%
Let experts do the job	44%	74%
Focus on core competencies	67%	87%
Complexity of IT architecture & software	67%	43%
Reduced Business / Operation risk	44%	65%
Specialization	22%	65%
Better e-business performance	33%	48%
More secured infrastructure	78%	78%
Healthier cash flow (factor of amortization, peak initial capital investment)	33%	35%

Majority of iDCs studied has the opinion that cost reduction and more secured infrastructure are generally the main reasons customers outsource the IT infrastructure and services to iDCs. On the other hand, majority of iDC customers studied quoted to focus on their core competencies and to acquire more secured infrastructure as the main reason. To reduce operating cost is among the main reasons, but not with the most respondents' opinion. This

shows that majority of iDC customers studied emphasis more on business efficiency and advancement in a bigger picture, instead of practising pure cost-reduction business measures, which paints a positive picture of the industry.

A general overview from the analysis above shows that iDCs studied have quite a similar point of view with what the customers generally feel. In other words, the majority of iDCs studied are able to provide the right kind of services required by their customers if they focus on the factors they think are the reasons iDC customers outsource the IT infrastructure and services to iDCs in general.

Comparison 2

Based on the findings from iDC customers on the ranking of “Top Criteria for choosing an iDC” and “Satisfaction Evaluation of iDC customers”, the following conclusion can be made:

Table 24 : Ranking of Criteria by Importance and iDC customers' Satisfaction Evaluation

Ranking by importance	Criteria	Majority score in 5-point Likert Scale (Satisfaction Evaluation by iDC customers)
RANK 1	Availability	Satisfied (61%)
RANK 2	Security	Satisfied (57%)
RANK 3	Responsiveness	Satisfied (52%)
RANK 4	Service Support	Satisfied (52%)
RANK 5	Customisability	No Comment (57%)

The findings from iDCs on the services and IT infrastructure they offer are reorganised in the following tables.

Table 25 : Availability Importance Score

Section in questionnaire	Items	Percentage of IDCs
A	Lightning protection	100%
A	Natural disaster free	100%
B	Raised Floor	89%
B	Separate electrical feeder(s) from the utility provider	67%
B	At least 2 means of electrical distribution in the Data Centre	100%
B	Voltage surge suppressor	89%
B	Harmonics filter(s)	67%
B	Resilience – UPS availability	100%
B	Blackout alert at UPS	100%
B	Genset (duration > 24 hrs)	78%
B	Genset automatic changeover	100%
B	Air Conditioning with redundancy at right temp	100%
B	Humidity 45% - 50%	44%
B	Rest area for staffs	89%
B	Pantry for staffs	89%
B	Staff Personal safety	100%
E	Multiple carriers for telco	44%
E	Multiple carriers for ISP	78%
E	SLA / understanding with telco	89%
E	SLA / understanding with ISP	78%
E	Unlimited internet lines available for clients	78%
E	Dedicated management and monitoring tools for all operational managed services	78%
E	Basic monitoring of packet loss (default or by demand)	89%
E	Basic monitoring of view log files(default or by demand)	89%
E	Basic monitoring of hard disk usage(default or by demand)	78%
E	Basic monitoring of CPU usage(default or by demand)	78%
E	Basic monitoring of memory usage(default or by demand)	78%
E	Proactive monitoring -trends monitoring	100%
E	Proactive monitoring-automated responses to given conditions	100%
E	Proactive monitoring-new patches / service packs firewall monitoring for intrusions	89%
	Average score in availability	85%

A huge majority of 85% iDCs studied offer services and infrastructure that ensure the availability of services. This coincides with the number 1 criteria set by the iDC customers, in which availability is ranked as the most important criteria for choosing an iDC. Majority of iDC customers is generally satisfied with this criterion.

Table 26 : Security Importance Score

Section in questionnaire	Items	Percentage of iDCs
B	Locked rack (by default)	89%
B	24-hour CCTV monitoring	78%
B	card access	89%
B	Security guards (compound)	100%
B	Security guards (building)	56%
B	CMS (intrusion alert)	44%
B	Heat & smoke detectors	100%
B	Portable fire extinguishers	100%
B	Gas-based fire suppression	89%
	Monitor / analyse the firewall logs daily or more	44%
E	In-house network security team / 3rd party security service	100%
E	Use also, other than the firewall to detect unauthorised access	89%
E	Perform the system backup daily or more	67%
E	3 or less people know about the administration password	89%
E	Use MEPS or others to guard & validate the authorisation of data exchanges	67%
E	Daily or by demand perform data backup	78%
E	Store at least a copy of latest backup media offsite	89%
	Average score in security	80%

Majority of iDC studied (80%) offer services and infrastructure that provide the required system and network security. Security is ranked as the second most important criteria in an iDC from iDC customers' point of view. More than 50% of customers are generally satisfied with this aspect of services as well.

Table 27 : Service Support Importance Score

Section in questionnaire	Items	Percentage of iDCs
F	Call centre / NOC staffed 24/7	100%
F	first level support for all alerts, incidents & problems, first level contacts for customers	100%
F	weekly or more & by demand - frequency of reporting to the customers on the system's performance	22%
F	at least monthly or by demand - conduct meetings with customers	78%
F	Ratio of customer/ iDC personnel	56%
	Average service support score	71%

On the aspect of service support provided by the iDCs, it was found that an average 71% of iDCs studied offer services and processes that comply with this requirement. iDC customers ranked service support as the second least important from the 5 basic factor expected from iDC services. Relatively, iDCs studied was found not putting extra effort on this aspect of services. Nevertheless, more than 50% of iDC customers studied are satisfied with the service support received thus far.

Table 28 : Responsiveness Importance Score

Section in questionnaire	Item	Percentage of iDCs
B	Under floor trunking	88%
B	Dedicated area for Internet access nodes	88%
B	Dedicated area for Server racks	100%
B	Dedicated area for Testing and staging	100%
B	Dedicated area for Temporary storage	75%
B	Dedicated area for Tape room	75%
B	Dedicated area for Network Operating Centre (NOC)	100%
E	Within 1 hr- response in the event of a disaster	75%
E	Within 30 min -average response time to a complaint	75%
	Average responsiveness score	86%

Responsiveness was rated as the third most important criteria in an iDC. Most iDCs studied shown effort in ensuring quick response time to any queries or problems. An average of 86% of iDCs studied offer services and processes to meet this criterion. 52% of iDC customers are satisfied with this aspect of services.

From all the analysis above, it can be concluded that generally, majority of iDCs studied is emphasising on the right elements voted by majority of iDC customers interviewed as the important factors they look for in an iDC.