Awareness and use of Wi-Fi infrastructure in student's community: a case study Pondicherry University on campus students

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Abstract

Technology can be a boon to the learning community with new technology making an inroad to the teaching and research domain. Wi-Fi for instance has a tremendous contribution in the way students connect and access information. This paper looks into the level of Wi-Fi awareness and the problem face by the student community in the campus and their level of competence. The study involved a questionnaire survey of students (n=100) and revolves around the students residing in the campus hostel and as such the off campus students were ignored for the study. The parameter for the research was ICT literacy, Wi-Fi awareness, connectivity problem, usage, gadget preference. The outcomes of the finding suggest that although the calls for radical transformations in educational approaches may be legitimate it would be misleading to ground the arguments for such change solely in students' opinion and that the infrastructure indeed shows a great deal of benefit to the student in the way they connect online.The finding also identified the problem in WiFi hotspots and the coverage.

1. Introduction:

The "digital divide" is a term coined to address the inequalities of computer ownership and internet access and use (Servon, 2002) and information asymmetry is a problem when it comes to the deprive section being devoid of information at a right time at a right place. Technology can be a boon to the educational system in communication and teaching. Wi-Fi for intance can monitor an area as a group and communicate using centralized control or ad hoc configuration

and provide a low cost solution. With more and more of these wireless devices being mobile there is a constant challenge to provide high quality, reliable and secure communication between these devices. Wi-Fi hotspots offered free of charge in public places that anyone could use to access the internet (Powell Alison, 2008) thereby allowing the students access all the electronic information needs. The presence of the Wi-Fi within a define range of hotspot enables the student avoid the trouble of accessing through the cable LAN which restricts the student from mobility, WI-FI is proving to be the default Internet access technology.

This level of popularity and growth of WLANs has also introduced a new challenge in the way corporate and other networks are traditionally managed. The key challenge is around the manageability of WLANs alongside their wired counterparts without requiring structural changes to the overall management techniques or processes and without significantly increasing the total cost of ownership of network management. Unless significant progress is made in the WLAN management technologies and processes, WLANs will have difficulty in becoming one of the mainstream networking technologies in the enterprise and other deployments. This is because, network service providers of all kinds must offer a reliable and consistent network quality of service no matter how the networks are accessed, else they will be under scrutiny for not meeting their service level objectives, and they cannot provide that kind of service without a consistent and structured management practice across their wired and wireless network.

Wireless LAN?

A wireless LAN (WLAN) is a data transmission system designed to provide location-independent network access between computing devices by using radio waves rather than a cable infrastructure. In the corporate enterprise, wireless LANs are usually implemented as the final link between the existing wired network and a group of client computers, giving these users wireless access to the full resources and services of the corporate network across a building or campus setting. WLANs are on the verge of becoming a mainstream connectivity solution for a broad range of business customers. The wireless market is expanding rapidly as businesses discover the productivity benefits of going wire-free. According to Frost and Sullivan, the wireless LAN industry exceeded $300 million in 1998 and is projected to grow $1.6 billion in

2005. To date, wireless LANs have been primarily implemented in vertical applications such as manufacturing facilities, warehouses, and retail stores. The majority of future wireless LAN growth is expected in healthcare facilities, educational institutions, and corporate enterprise office spaces. In the corporation, conference rooms, public areas, and branch offices are likely venues for WLANs. The widespread acceptance of WLANs depends on industry standardization to ensure product compatibility and reliability among the various manufacturers. The Institute of Electrical and electronics Engineers (IEEE) rectified the original 802.11 specification in 1997 as the standard for wireless LANs. That version of 802.11 provides for 1 Mbps and 2 Mbps data rates and a set of fundamental signaling methods and other services.

OBJECTIVE OF THE STUDY:

The main objective of the present study is to

1. find out the student community awareness on availability of Wi-Fi connectivity.
2. better understand the student purpose of using Wi-Fi.
3. understand the minute problem face by the student community.
4. study the level of ICT know how of Pondicherry university students'.

WI-FI INFRASTRUCTURE IN PONDICHERRY UNIVERSITY

The main campus of the University has an area of 780 acres spread on either side of the East Coast Road with the large chunk on the landward side of the road. The land is an invaluable gift from the people and the Government of Puducherry for the establishment of the University. The land gently rolls down to the beaches and is interspersed with lovely woods. Cut by a picturesque and deep ravine, this idyllic campus is on the fast track to developing into an ideal breeding ground for innovation and creativity.

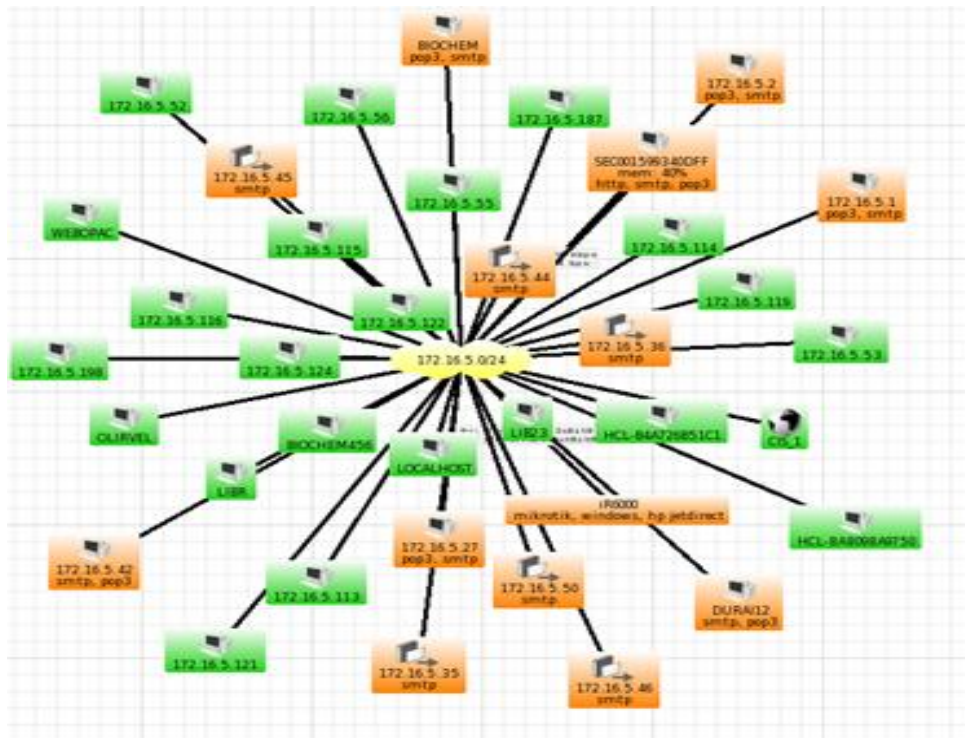**Local Area Network (LAN) of Pondicherry University.**

Figure 1: *Diagrammatic representation of Pondicherry University LAN*

The Pondicherry University terrain can be put into coastal area, with lots of grove and plantations. The structures in the university are stone Masonries with few exemptions like Department of Mass Communication. The campus is fully covered with thick groves as blanket which is the barrier for wireless connectivity. Considering this, suggestion were incorporated thereby using high power RF, based on the condition and situation, individual AP's were place in a structure to increase the serviceable area.

Design:

Since most of the buildings are very close, they were grouped into one unit and the whole campus into units. The list of which are listed below:

UNIT	LOCATION	TECHNOLOGY INSTALLATION

I	a) Administration building (Admin), b) Auditorium c) Bank d) Post office e) Landscape near Students Service centre (SSC) and f) SSC.	• The indoor AP's will be wall mounted using 3" G.I Pole. Since the AP's what we are going to use are AAP -Adaptive Antenna Polarity technology (a patent technology from ubiquity). • APP is antenna arrays with smart signal processing algorithms used to identify spatial signal signature such as the direction of arrival (DOA) of the signal, and use it to calculate beam forming vectors, to track and locate the antenna beam on the mobile/target. The antenna could optionally be any sensor. • Smart antenna techniques are used notably in acoustic signal processing, track and scan RADAR, radio astronomy and radio telescopes, and mostly in cellular systems like W-CDMA and UMTS.
Unit II	a) Management Studies both new and old block b) Mass media c) Physical Education Department and Adjoining Groves	• 12 AP's out of which 7 was wall mounted and rest pole mounted
Unit III	a) Boy's hostel, Grove's and the bushy areas	• Covered by PowerStation 2 external with 16 dbi Omni antenna • Hostel blocks have 30 and Odd AP's to cover the maximum region.
IV	a) Stadium and nearby bushy region	• AP's fixed on pole mount and the powered from nearest men's hostel block
V	a) DDE, MBA block and surrounding Block	

VI	a) Department of Mathematics b) Physics and c) The lecture hall	
Unit VII	a) Library b) The unit V, VI, VII covers all the major blocks	• 46 AP's and bullets is used
Unit VII	a) Vice Chancellors residence b) Cultural hall.	• We have used 3 AP's in VC's residence and 5 AP's in cultural hall.

Table 1: *Designing phase of Pondicherry Wi-Fi campus Network*

Phases of the project:

The basic design is based upon the hybrid of DSS &WSS. The Wi-Fi installation will cover 90-95% of the university area. The rest of the area will have s weak signal due to plantations and the reserved forest area inside the campus.

Each group of Buildings have OFC termination which will in turn terminated in a switch from which the AP's will be connected where AP's are powered using POE. The deployment phase is represented as follows:

Figure 2: *Wi-Fi Installations phase*

Product used in campus wide wireless in Pondicherry University

Sl.No	Product Description	Quantity
1	Ubiquity Nano Station 2	91
2	Ubiquity Power Station 2	21
3	Ubiquity Power Station 2 External	8
4	Ubiquity Bullet 2	18
5	Antenna	34

6	Special PoE	26
7	Poles	80 No's
8	STP Cat5e Cable	17 Boxes
9	Converter Plugs	125

Table 2. *List of Infrastructure Product used in campus wide wireless in Pondicherry University*

Security: Squid Authentication:

The goal is to integrate Squid with Server 2003 Active Directory through Samba (Winbind + Kerberos). The university is introducing "Win2K3" server as the authentication server. On the proxy servers only three files have to be edited which are "squid.conf", "krb5.conf" and "smb.conf". Besides that, Samba and Kerberos *rpm is* also installed. There is no need to restart the proxy servers or even squid proxy service for that matter.

The installation doesn't take more than an hour. As for granting privilege, users belonging to a particular group (***Inet Access Group***) in Active Directory will be able to have web access after authentication. Some users (especially Wired Users) are allowed to browse without authentication via squid acls. This Squid acls also prevents the User's abuse or user logging from many machines/IP at the same time (i.e simultaneous logins) will be prevented through.

METHODOLOGY OF THE STUDY:

The data was collected using a paper-based questionnaire. The aim of the questionnaire was to examine the extent of Wi-Fi technology use amongst this target group. The paper questionnaire was handed out at the end of a selected number students present at the university campus. Questionnaires were given randomly, based on student residing in the university campus. The survey was available for 3weeks and 100 members (N= 100) out of 3500 students in the

university responded to the invitation by completing the survey. All responses were anonymous and no personal details such as email or IP addresses were collected thereby ensuring privacy. The survey comprised of closed ended questionnaire organized around four topics. These were: (1) educational background, (2) facilities of Wi-Fi (3) purpose of usage, and (4) ICT literacy. For purposes of clarity, the discussion and results will be presented organized around these four topics with the results.

REVIEW OF RELATED LITERATURE:

The overarching research question guiding the literature review is: how does the literature on Wi-Fi use suggest as the appropriate frameworks and concept for describing and analyzing academic perusal. Internet usage rates per capita are now growing at faster rates in poor countries than in rich countries (Fink and Kenny, 2003). According to Johan Lundin (2010) over the past 10 years the capacity of a regular, commercial of the shelf laptop has certainly increased. Today, the difference in capacity between a desktop machine and a laptop is rather limited, at least in relation to the way that most of us use our computers. And at the same time, the weight and price have dropped significantly. It is difficult to get reliable and global data on computer sales, but 2005 is argued to be the year when laptops started to sell more than desktop computers (Singer, 2005). Given the widespread adoption of mobile technology among students, combined with increased possibilities for network access (such as WiFi connections in classrooms and across university campuses), and extended battery life, it is understandable that more and more students bring laptops to the classroom. In this sense, the students themselves make computers an important part in their educational activities. Today, teachers expect students to deliver papers written on computers, expecting them to be able to use spell-check, count words, etc. Students are expected to use the digital resources of university libraries, read e-mails, get information about schedules and upload their assignments online. And there has been an increase in the usage of consortia within the campus as the usage increases the cost benefit of electronic resources in the given institution will prove to be effective.

DATA INTERPRETATION AND ANALYSIS

Survey Goals and Rationale

The survey for this study was designed with the primary goal of better understanding the factors that motivates students to access Wi-Fi network in the university. It was also hoped that the survey responses would illuminate and highlights the problem associated in accessing wireless university network at a broader level. Specifically, the questionnaire explores whether students are aware of the Wi-Fi existence and the in-depth behaviors and purpose of the residential student using Wi-Fi network. The study is primary targeted at the students residing within the campus and having access to the connectivity.

Gender ratio of the population:

The demographics of survey participants varied in terms of age, education levels and the subject, but were otherwise homogeneous. Of the 100 survey respondents who identified their gender, all but three were male. Just five people reported their ages as between 20 and 29 years-old, as the study field concentrated only on the student's environment. Post graduate responded maximum with 85% which constituted 46% male and 39% female. M.Phil on the other hand constituted the second highest with the 10% and the last constitute the Ph.D scholars. The Ph.D scholar and M.Phil is the niche user of information as their information needs are diverse and therefore a further study is required on their perception on Wi-Fi technology.

Subject	Male	Female	Total
Post Graduate	46	39	85
Mphil	7	3	10
Ph.D	5		5

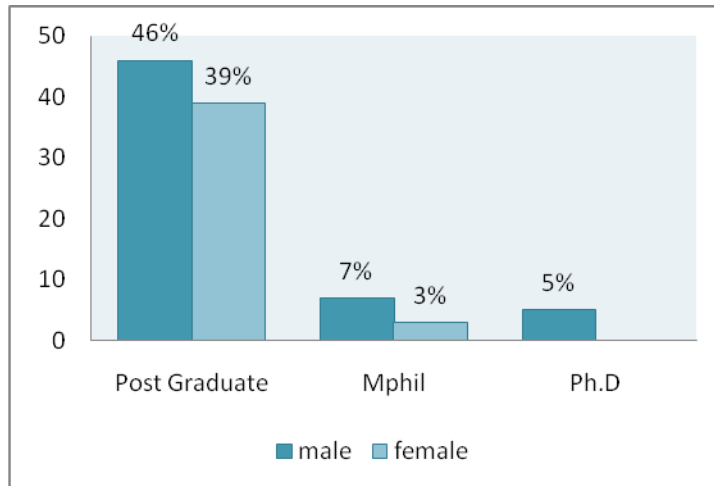Table3. Gender percentage of the sample

Figure3: Male/ Female respondent percentage.

The average age of the respondents were at 23 years as the given sample site is a university students. Here, the faculty perception and views were not taken into consideration as the study was confine to the students alone.

Computer use

Computer use among the students were ask for ICT awareness and interestingly 99% of the respondent except one said they have use or are using computer on a daily basis. This question helps us in building asking the desired information.

Respondent	Yes	No
MA	84	1
Ph.D	5	0
Mphil	10	0
TOTAL	99	1

Table 4: Respondent use of computer

School wise distribution:

The sample population in the case of subject were scattered randomly, of which there are 85 student are post graduate, M.Phil are 10 and PhD student constitute 5 in numbers. From the given population Social Science constitute the highest no participant with 69% of the total

population and humanities constitute a descent percent with 17% and lastly the science student group constitute the last with a total strength of 14.

Subject	M.A	PhD	M.Phil	Total
Humanities	16	1	0	17
Arts	0	0	0	0
Science	14	0	0	14
Soc.sci	**55**	**4**	**10**	69

Table5: School wise distribution of selected sample

Since, the questionnaire were distributed randomly, the output result prove to be domination by social science groups.
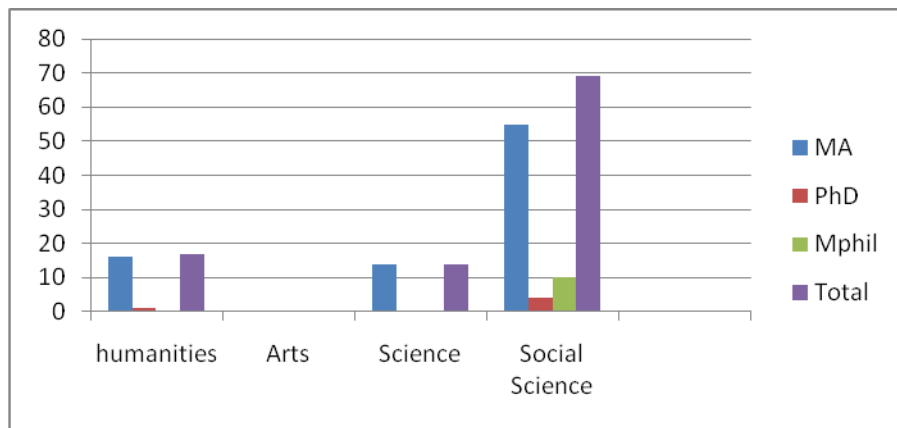

Figure 4: Percentile of subject wise distribution of the given sample.

Computer literacy and purpose of using computer:

	Ph.D scholars			
internet	**entertainment**	**R & D**	**acad.**	**Others**
3	5	1	2	**4**
3	5	1	2	**4**
2	3	4		**1**
1	3	4		**2**
2	3	4		**1**
11	19	14	4	**12**

Table 6: Purpose of using computer

Respondents opinion of using computer was analyze and it was very interesting to find that among the research scholars entertainment seems to be the purpose driven for using a computer followed by research.
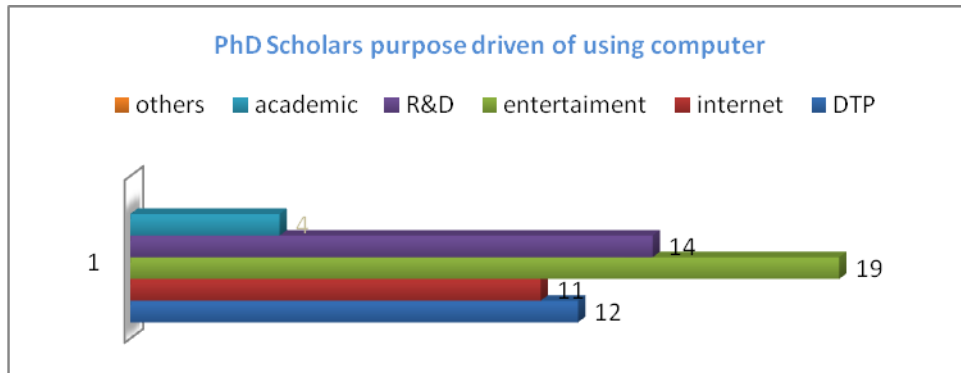

Figure 5: Diagrammatic representation of respondent purpose of using a computer

Awareness of Wi-Fi facility in campus:

Besides the computer literacy study, the respondent were asked on their knowledge on the existence of university Wi-Fi facility, and it was found that 62.9% of the Post Graduate were aware of the existence and 9.35% of the Post Graduate responded as not being aware of the facilities. On the other hand the scholars showed 100% of the facilities. Even though the sample population among the Ph.D scholar and M.Phil student is small in size, it proves that there is a high interaction and awareness program among the Research Scholars as information sharing and interaction are higher among scholars.

Responds	PG	Percentage	Research Scholars	Percentage	M.Phil	Percentage
Yes	74	62.9%	5	100	10	100%
No	11	9.35%				

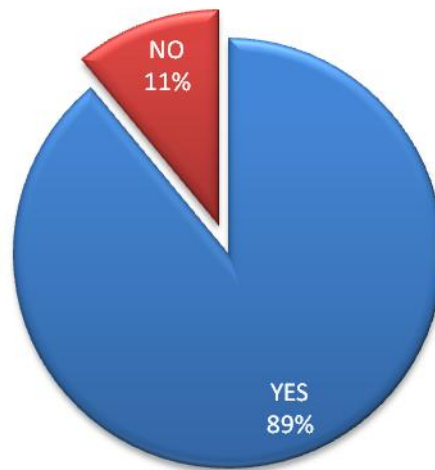Table 7: *Awareness of Campus WI-Fi facility*

Figure 6: *Percentage of awareness of Wi-Fi*

Usage of Wi-Fi:

From awareness study of the Wi-Fi, it was move to the student usage of Wi-Fi. Here, it was found that 85% of the total population sample have use Wi-Fi and have access to be as 15% of them have never use the facility and have no access to it.

Narrowing it down into different entity, it was found that the Post Graduate student constitute 84 respondent and the highest population out of which 59.5 % have responded to have used Wi-Fi and 12.75% of the population have responded negatively. On the other hand it was very interesting to see that Ph.D scholars and M.Phil student respondent 100%.

Research Scholar in a university is provided with different scholarships and as a result have better medium of accessing the resources in the campus.

Responds	PG	%	Research Scholars	%	M.Phil	%	Total
Yes	70	59.5%	5	100	10	100	85%
No	15	12.75%					15%

Table 8. *Use of campus Wi-Fi*

Location of accessing Wi-Fi facility:

Respondents were asked the location where they are usually surf the internet? There was a mixed responds on the part of the given sample s 12.1% of the total population had not

responded, were as majority of 66% of the total population responded to using Wi-Fi in the residential hostel and 20 % of the sample population did access in the library. Preference on location was given to hostel as this allows the surfer to have access to internet resources within his comfort zone. Thereby, allowing him to increase his time frame.

LOCATION	PG	PERCENTAGE	RESEARCH SCHOLARS	PERCENTAGE	M.PHIL	PERCENTAGE
HOSTEL	55	46.75%	4	0.2%	7	0.7%
LIBRARY	16	13.6%	1	0.05%	1	0.1%
Zero responds	14	11.9%	0		2	0.2%

Table 9: *Desired location of accessing Wi-Fi*

Preference of gadget:

GADGET	POSTGRADUATE (N=80)	%	RESEARCH SCHOLARS (N=5)	%	M.PHIL (N=10)	%
Laptop	58	49.3%	5	100%	8	0.8%
Palmtop	5	4.25%				
Others	13	11.05%			1	0.1%
No responds	9				1	0.1%

Table 10: *Medium of accessing Wireless internet in the campus*

Preference or the medium of accessing is one of the important factors that need to be address. From the present study, students were provided with questionnaire on their preference of gadget and there was a holistic response to the question with 71% of the total sample population prefers laptop as the favorite medium of accessing Wi-Fi were as 14 % uses other medium of gadget that was not enlisted, this being the presence of latest development of new gadget such as the presence of 3G enable phones or inbuilt Wi-Fi phone in the market. The research scholars who have access to gadget equipment have better statistic as compared to the Post Graduate students.
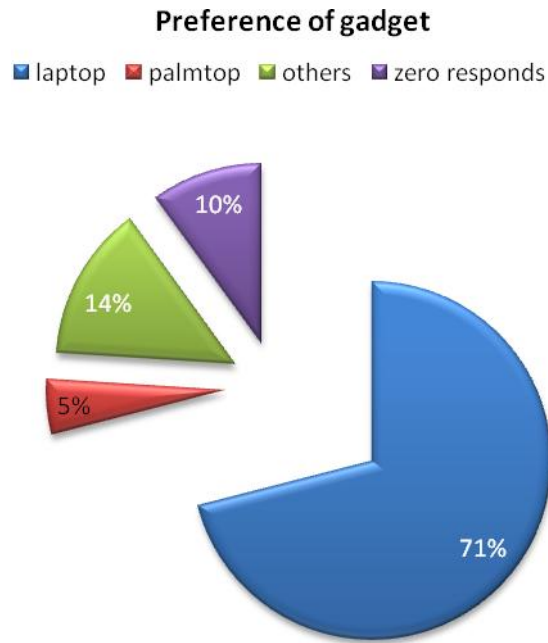
Preference of gadget

laptop   palmtop   others   zero responds

Figure 7 : *Percentile representation of gadget preference of students*

Ranking of Wi-Fi speed in the university campus:

Speed of internet really matters in a long run as maximizing the usage will indirectly have impact on the cost benefit of Wi-Fi installation. Higher the usage, higher is the benefit in accessing information.

Ranking	PG (N=80)	Percentage	Research Scholars (N=5)	Percentage	M.Phil (N=10)	Percentage	Total
Excellent	2	2.35%	1	20%			3
Very good	9	10.58%	1	20%	1	10%	11
Good	30	35.29%	2	40%	5	50%	37
Poor	28	32.94%	1	20%	4	40%	33
Very poor	13	15.29%					13
Zero respond	03	3.5%					

Table 11 : *Ranking of Wi-Fi speed in the university campus*

From the above illustration, it was found that only 2% of the students felt that the speed is in a excellent speed were as the maximum felt the speed to be an average, with 37% felt good and

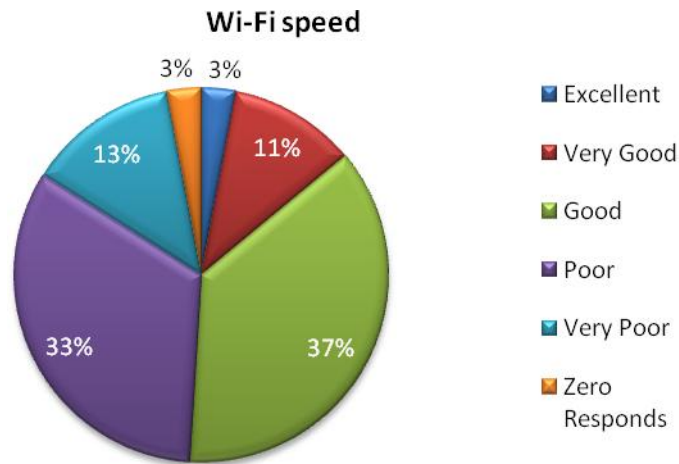33% felt that it was poor. This gave the opinion that there is a mix responds of good and bad internet speed.

Figure 8: *Ranking of Wi-Fi speed*

Problem face while surfing:

Responses on the technical problems face while surfing on a Wi-Fi shows an interesting view of the scenario. The Post Graduate with 55.25% respondent felt that they indeed have problems while accessing Wi-Fi and 11.05% felt that they don't have technical problem.

It was found that research scholars of both M.Phil and Research Scholar had no problem in surfing. Therefore the post graduate student fasces more problem while surfing.

Responds	PG	Percentage	Research Scholars	Percentage	M.Phil	Percentage
Yes	65	55.25%	04	0.2%	08	0.8%
No	13	11.05%	01	0.05%	02	0.2%
Total responds	78	66.3%	05		10	
Zero responds	07	5.95%	0		0	

Table 12: *Problems face while accessing campus Wi-Fi*

Assistance requirement of the respondent

Respondents were further if assistance to the problem is needed and 60% felt that assistance is needed and regular service is required so to meet their grievances. The following chart shows a better picture of what the respondent have felt. Maximum being the post graduate.

	Yes	No
Ph.D	3	2
M.A	60	17
Mphil	10	
Total	73	19

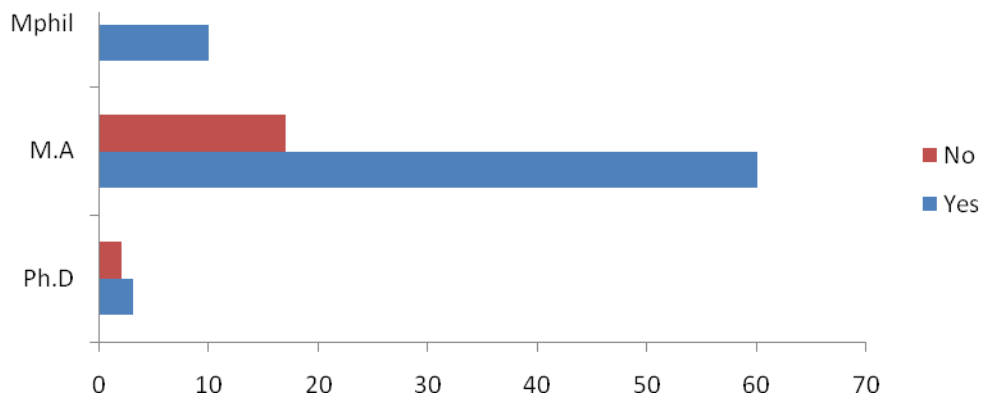Table 13: *Assistance required*

Figure 9: *Graphical representation of assistance required*

It was very interesting to see that M.Phil student required no assistance to their problem, which indicates that ICT literacy rate is high for M.Phil scholars.

Modes of assistance:

The respondents were ask on the best medium through which assistance can be provided and it was seen that that users orientation was the highest requirement of the respondent with 72% of the total population feeling the need of users orientation.

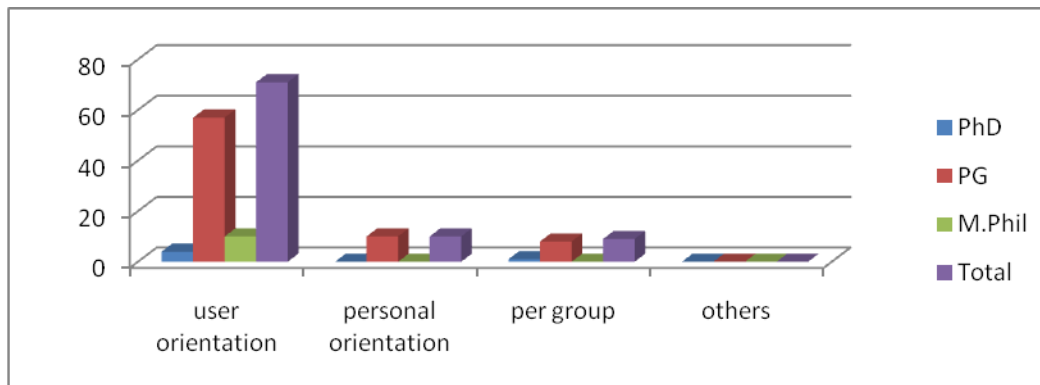|	Ph.D	M.A	Mphil	total
user orientation	4	58	10	72
personal	0	10		10
per group	1	8	0	9
others	0	0	0	

Table14: Modes of assistance

Figure11: Modes of assistance

Limitation of the study:

Although the study threw a few lights to the Wi-Fi facility in Pondicherry University there is always a room for improvement. An approach to Users awareness study is in itself a diverse area and therefore the study is limited to a given sample population. With limited time frame, coverage on the users view and cost benefit analysis was not incorporated. User's perception on familiarities and the technical aspect of the facility were avoided and was confine to awareness and the student usage of campus Wi-Fi. The demographic characteristics of year of study and college enrollment for the sample were similar to those of both university student enrolment to the hostel and the university student population. However, the small sample sizes

were subject to variance equality problems when analyzing results based upon groups. Male participants significantly outnumbered female participants.

While general conclusions could be drawn regarding results as applied to the residential student body, the sample does not reflect the attitudes of non residential students, which may be different, compared to those of residential students despite similar demographic variables. Documenting the disparity between commuter and residential students is an area for future research.

CONCLUSION AND SUGGESTION:

The findings of the study suggest that there is a high level of ICT awareness among student and that the demographics of survey participants varied in terms of age, education levels and the subject. From a sample population of 100 respondents, fifty eight (58) were male and forty two (42) were female with an ages ranging between 20 and 29 years-old. Post graduate responded maximum with 85% which constituted 46% male and 39% female. M.Phil on the other hand constituted the second highest with 10% and Ph.D scholars with 5% of the total sample group. Computer literacy among student of Pondicherry looks pretty good with 99% of the students stating that they have either use or are using computer.

Social Science constitutes the highest number of participant with 69% and entertainment was one of their main purposes driven in using computer. High percentage (79%) of the population is aware of the presence of Wi-Fi and 85% of the total populations have use Wi-Fi facility were a majority (66%) feels hostel to be the best location for surfing. It was also found that laptop seems to be the favorite gadget in accessing Wi-Fi. On being asked about the speed of the connectivity, 77% of the respondent were not happy with the speed and have come across technical snag and errors. On the other side of the story, the respondent (72%) feels that orientation on the use or assistance is required for better usage of Wi-Fi within the campus.

Today's environment is characterized by an increasingly mobile workforce and flatter organizations. Individuals are equipped with notebook computers and spend more of their time

working in teams that cross functional, organizational, and geographic boundaries. Much of these students productive learning occurs in meetings and away from their desks. Users needs are not confine to a define location but, far beyond their personal desktops. WLANs fit well in this working environment, giving mobility to students and much-needed freedom in their search for information. With a wireless network advantage, students can now have access to a wide range of information from any given *hotspots*— the cafeteria, library or a remote hostels. With this advantage universities can benefit from deploying a WLAN system, which provides a powerful combination of wired network throughput, mobile access, and configuration flexibility. The usage of the electronic resources will add up the increase in usage statistic of scholarly resources. Specifically, WLAN advantages include:

- Mobility that improves productivity with real-time access to information, regardless of student's field of study location, for faster and more efficient decision-making
- Cost-effective network setup for hard-to wire locations such as older buildings and solid-wall structures
- Reduced cost of ownership—particularly in dynamic environments requiring frequent modifications—thanks to minimal wiring and installation costs per device and user WLANs liberate users from dependence on hard-wired access to the network backbone, giving them anytime, anywhere network access. This freedom to roam offers numerous user benefits for a variety of work environments.

Given into account the findings, for better usage of Wi-Fi facility, it is therefore a need of an hour to better understand the problems face by the users in their daily use of the system.

1. Networking management system should be able to identify and rectify the errors of every hotspot in the campus.
2. Awareness should be conducted on the availability of the electronic resources of the university.
3. User's orientation in the first year of their enrolment should be conducted for familiarizing them with the facilities available.
4. Financial subsidy should be provided to the student and a M.O.U with local supplier should be provided for increasing usage and building ICT awareness.

5. Increase in the number of hotspot should be encouraged and better equipments for better signal should be installed.

6. High bandwidth should be provided so as to enable the students in downloading electronic resources.

7. Restriction to multiple sites and streaming videos should be minimized so as to enable high usage of the academic resource available.

Therefore, there is an urgent need on the administration part to incorporate some of the grievances of the student community and take into account the research findings of this small study. For, the presence of Wi-Fi within the campus is a boon to the university student in accessing electronic resources and for academic perusal. There is always a room for improvement.

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