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DESIGNING AN IT SUPPORT FUNCTION FOR TURKU UNIVERSITY OF APPLIED SCIENCES' "BRING YOUR OWN DEVICE" IMPLEMENTATION

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DESIGNING AN IT SUPPORT FUNCTION FOR TURKU UNIVERSITY OF APPLIED SCIENCES’ “BRING YOUR OWN DEVICE” IMPLEMENTATION

The aim of this thesis was to design an IT support function that can provide support for students’ devices. This thesis was commissioned by Turku University of Applied Sciences in wake of a “Bring Your Own Device” implementation that is in the works.

The design chosen was a combination of the classic tiered support approach, and a newer approach which focuses on IT support employees collaborating with each other, as opposed to working on their own. The reason this method was chosen is that it takes the positive aspects of the tiered approach (budget-consciousness and efficiency), while collaboration eliminates the negative aspects (monotony and lack of learning). This design was chosen as it accomplishes the goals set for the support function: a good first-time-fix percentage, fast resolution time, and good customer service.

KEYWORDS:

Help Desk, Service Desk, Bring Your Own Device, Computer Support, Tiers, Collaboration

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LIST OF ABBREVIATIONS (OR) SYMBOLS

BYOD – Bring your own device.

TUAS – Turku University of Applied Sciences.

ITIL – Information Technology Infrastructure Library.

ITSM – Information Technology Service Management.

FTF – First Line Fix.

1 Introduction

1.1 Background

At the time of writing, the Turku University of Applied Sciences (TUAS) was in the process of planning a Bring Your Own Device (BYOD) learning environment and a new method to support these BYOD devices was needed in order to handle the large number of computers that would require support. With increasing laptop ownership among students, TUAS decided to move forward with a plan to increase software usage in education and has a plan to set a requirement that new students possess a laptop that can run the required software. The current IT support implementation could not handle the number of computers that roughly 8000 students will bring over 4 years, so a new one was going to be designed. This thesis was written in partnership with TUAS’ project organization “the FIRMA”.

1.2 Thesis Goal

The goal of this thesis was to design an ideal computer support function for Turku University of Applied Sciences, which would provide fast and effective support for the students’ laptops in a BYOD learning environment. In this thesis, an ideal BYOD support function is defined by its cost effectiveness, and the quality and reach of the support that it will provide as well as its accordance with ITIL (Section 3.1).

1.3 Roadmap

This thesis gives an overview on how the BYOD implementation would function, some of the issues that may arise from it and why TUAS needed a computer support structure for it. From there it continues to an analysis of the technical side of the BYOD implementation, identifying characteristics of a computer support department. The main body of this thesis consists of a look at the current support model and a new support model that may deal with the large number of incoming computers in a more efficient way.

2 Overview of the BYOD Implementation

2.1 What is BYOD?

The basic idea of a Bring Your Own Device learning environment is to take advantage of the numerous software and internet-based learning resources while allowing financial resources to be directed from purchasing laptops for students, to providing excellent resources, such as increased internet speed and costly software, to the students. Even existing TUAS resources, such as Optima, can be used to greater effect when the whole class has their own device. The BYOD learning method can take teaching and learning in a whole different direction by taking advantage of resources that need a device to access.

2.2 Types of BYOD Implementations

When choosing the type of the BYOD implementation, the resources that the device will access need to be identified. The most general level is access to web-based resources only. If the device can access the Internet, there should not be any issues with the type of device or operating system. In this case, an accepted device could be a smart phone, a tablet, or a laptop with any operating system.

Going into tighter regulations, the requirement could be access to general software and large amounts of word processing. In this case a laptop would be necessary as tablets and phones offer very restricted applications and tedious word processing capabilities. The operating system requirement is not too strict as the majority of software has versions for Apple OSX and Microsoft Windows. Linux-based operating systems could be considered too. However, popular software, such as the Microsoft Office 365 Suite, may not be available on Linux.

The strictest level is when a specific device is required. This can be a Windows computer, an Apple computer, a tablet computer, but everyone is required to have a specific device. Commonly this implementation is used when highly specific or custom-made software is required. This is not an ideal BYOD implementation as the required device may be expensive, and the cost of the device should definitely be taking into consideration if implementing this type of BYOD.

2.3 Is Turku University of Applied Sciences Ready for BYOD?

This is just a quick surface analysis of whether TUAS is ready for they BYOD implementation. According to a survey done by Jasmi Hänninen at Lahti University of Applied Sciences, three important services that the University of Applied Sciences need before moving to a BYOD environment are printing, cloud based services, and access to the University of Applied Sciences' programs and applications. (Hänninen 2015 16-17) Currently TUAS provides access to the Microsoft DreamSpark service where students can legally download various Microsoft software at no cost, software that, if all students had their own device, could be used to enhance learning in classes. TUAS also provides an Office 365 subscription so students can use the Microsoft Office Suite and 1 terabyte of cloud storage on the OneDrive service (Asp 2016) Printing is also available to all students as the school provides approximately 315 black and white pages for free. TUAS provides an amount credit to all students equaling the 315 black and white pages, and more pages can be bought for a small fee. TUAS provides the three most important services listed in the survey already, so it is ready to move on with the BYOD implementation.

2.4 Issues with BYOD

Perhaps one of the most difficult issues is what to do with the students who cannot afford a device that meets the requirements that the school sets. No student should be forced to give up their learning because they cannot afford a device. The simple solution to this issue would be that TUAS could provide temporary loaner laptops to students, which would need to be returned by the end of the day, or lend the laptops for the year for a fee. BYOD is an all-or-nothing learning method; everyone needs a device in order for it to be effective.

One of the main issues tarising with BYOD, and the one that is explored in this thesis, is how to provide support for the large amount and variety of devices that students will bring (Anttila 2015, 13) If TUAS makes it mandatory for students to have their own device, it has a responsibility to provide support when the devices or software does not work. TUAS should not however, have the sole responsibility for support, especially if the user is using a personal device. The support should only be responsible for diagnosing the issue, possible quick fixes, and handling software issues, not physical repairs. The onus for larger or costly repairs should be on the owner of device. The next section will provides important information that should be taken into consideration before designing a support system and from there, it will move into the actual design of the potential proposal for the BYOD support system and TUAS.

3 What is a Service Desk?

3.1 ITIL and ITSM

When designing a Service Desk or some other type of support function, the concepts of ITIL and ITSM are important. IT Service Management (ITSM), as defined by FitSM, is “Entirety of activities performed by an IT service provider to plan, deliver, operate and control IT services offered to customers” (FitSM 2016). Simply put, ITSM is the service that provides the support, be it a help desk, a call center, or an online-based support. Information Technology Infrastructure Library (ITIL) is a set of five publications by a company called Axelos that outline the best practices for ITSM. The five publications are (Axelos 2016)

- ITIL Service Strategy which aims to understand the needs of the ITSM’s customers and how to provide effective service to them.
- ITIL Service Design which aims to design a cost-effective and practical ITSM.
- ITIL Service Transition which is the building and trial of the ITSM
- ITIL Service Operation which provides the services of the ITSM
- ITIL Continual Service Improvement which aims to gather feedback in order to improve the service that is being provided.

3.2 Types of ITSM

There are a few main ways that can company can provide support for its users or customers. The two that described in this section are Call Centers and Service Desks. Call Centers are ITSM models in which the communication and handling of the issue occurs remotely. The customers call the call center and describe their issue to the employee on the other side. The Call Centre employees will then identify the issue and either talk the user through the steps required for the fix, or they can remotely connect to their computer through software, and fix the issue themselves. Call centers can reduce the cost of providing support a lot, since the work can be outsourced to locations where salaries are lower. The quality of the support is however lessened, as it may be challenging to identify the issue and providing a fix over the phone to inexperienced customers may not always work and can be frustrating for them.

Service desks are ITSM models that customers can bring their devices to. A customer will bring their device to the service desk technician, describe or showcase their issue, and then come pick up the device when it has been serviced. The advantage to this is that better support can be provided, as a better description of the issue can be given and physical access to the device is available. This can be more expensive to run, as a local presence is need, but customers do not have to travel long distances.

3.3 Defining a Service Desk with ITIL

Using the framework of ITIL, we can shortly describe the ideal service desk as a service, tailor-made for its users, which provides an effective and cost efficient way to provide IT support. The service desk can then be improved through feedback gathered from the users, employees, as well as statistics concerning the help desks function, for example, the time taken to solve the issue, how many tickets get escalated, how many can be solved with the customer when they bring the machine in, etc. The BYOD support function will be based on the best practices outlined in ITIL.

4 Current Service Desk at TUAS

Currently Turku University of Applied Sciences does have its own service desk. It operates as an email support, phone support, and can visit locations, so customers have a number of different options for support. However, TUAS was looking for a new support system since the number of computers that are under the jurisdiction of the service desk will greatly increase. An employee of the current service desk was interviewed for the purpose of this thesis to provide an accurate overview of the design and function of the service desk.

4.1 Design of the Current Service Desk

The customers of the current service desk consist of mostly the employees of TUAS but some students also send in inquires. A quote taken from TUAS' intranet, "Service Desk provides support and instructions, when you need help with IT devices, software or information systems that are used at TUAS." (Asp 2017). In this context, it refers mainly to the TUAS' own IT resources primarily but they are happy to help any students with their own devices. The service applies a tiered support model so the tier 1 technician will handle most of the tickets. First Line Fix (FTF) is an important metric to measure since it will give an idea of the skill levels of the technicians at tier 1, and the difficulty of the tickets that make their way to the service desk. The amount of FTFs should be quite high, because that means that customers are bounced around different employees less and is generally faster, both resulting in a better experience for the customer (Wiggins 2010). The resolution time of the tickets was usually only about a day, however since it is email-based support, it can be significantly slower as it depends on how fast the customer responds. While TUAS' Service Desk has an impressive resolution time, it will not be enough to handle the large amount or devices that will be added to the system when the BYOD will be implemented. Giving instructions through email may cause some difficulties to customers who are not very comfortable with being provided support through instructions for their own devices. Also, due to a lack customer experience, they may not be able to provide an adequate description of the issue they have.

5 Identifying Variables and Future Support Tasks

Before moving on to the potential support design, there are important variables to know beforehand. We need to identify various statistics; such as how many devices will be part of the BYOD implementation, and what kind of devices they will be (laptops, tablets, etc.). These are all important variables when designing a support model. We also need to predict the future, by brainstorming what will be the most common issues with these devices and the internal issues that will arise concerning the service desk. In this way the support function can be prepared to deal with most of the devices that need servicing from the first day onwards and have things running smoothly. Since this will be the first year of the support function, documentation is extremely important.

5.1 Why do we need a Support Function?

The goal of the BYOD implementation is to increase the learning potential of students through the use of software and Internet based resources. It is, however, possible that some of these resources do not work with a specific laptop, or there is some other issue with it, thus preventing the student from learning or participating in the exercise. If TUAS requires the use of laptops for learning, then it should also make sure that issues preventing students from learning are either quickly remedied or the students are given advice on how they should proceed given the severity of the issue. A service into which students can bring their device in on short notice and have it fixed or be advised on quickly is necessary.

5.2 Statistics

There are roughly 2000 new students coming in every year and the BYOD will take place for new students only, which means there is a ramp up period that the support system can take advantage of. Starting off slowly means that it will be easier to adapt to unforeseen issues and build good practices that will increase efficiency over the years, once the amount of serviceable devices reaches roughly 8000 students (TUAS 2016). This is a rather large amount of devices that will be in TUAS' domain. Fortunately, most of the devices will be Microsoft Windows based devices as they currently control roughly 85% of current desktop/laptop market in Finland. (GlobalStats 2016)

Apple's OS X is the second biggest market but only controlling a 12% share. Since these statistics also include desktop computers, a more reasonable share would be an 80%/20% division in favor of Windows, since Apples laptop line is more popular than their desktop line. Linux and the rest are rather negligible but nevertheless, it will be important to take this into account, as it may cause many support cases. Due to the minute share that Linux holds, it may be prudent that TUAS considers placing some restrictions on the acceptable devices that can be used for the BYOD. Unless there are only web-based learning resources being used, restricting the devices to only recent Windows and OS X operating systems would guarantee that most of the software will be compatible and that will decrease the amount of potential issues that can arise (Kekkonen and Arasmo 2016, 34)

In the case of tablet market share in Finland in April 2017, Apple's iPad iOS product line holds a 68.8% share, while the next largest is Samsung's Android based tablets at 23.63% share. Other manufacturers are roughly at 1% market share.(GlobalStats 2017)

5.3 Common Computer Issues

Being able to predict some of the most common issues before the support opens up will allow the support to be prepared right of the bat with necessary resources and knowledge. Connection issues are will likely be a large percentage of tickets but fortunately, in most cases, this is a relatively easy fix and most students will be able to do it themselves, with a set of instructions to follow. Another common service that will likely be provided is speeding up slow computers. This is usually done by scanning for viruses and malware, getting rid of programs that are constantly running or potentially harmful, and many other methods to make it run smoother. To reduce the load on the service desk, these simple instructions could be listed on Messi, the school intranet, so that students can look up their computer issue and find potential easy fixes that they can try themselves, before using TUAS' computer support. This is a simple way to reduce the amount of computers that are brought in for simple fixes as well as instilling students with the knowledge on how to fix these issues. Tablets and computer components especially can just stop working however. Whether due to age, stress, or some kind of physical damage to the device; these kinds of problems are much more difficult to fix and in most cases, going through the warranty process will be much safer and much more effective. Therefore, it is highly recommended that if a device is damaged and under warranty, the customer should get in contact with the seller or manufacturer before getting in contact with the support. Software issues, especially concerning the necessary TUAS' software, will not be covered by warranty and the support will attempt to handle it.

6 Design of the Support Function

Now that we have established why the current Turku University of Applies Sciences service desk does not adequately meet the needs of the new BYOD model, a new service desk model will need to be designed that takes into account the reasons why the current service desk does not work. The structure of the BYOD service desk will be a Tier 0/1/2 support model with a physical location in either the Joukahaisenkatu or the Lemminkäisenkatu campus. It will accept the students' devices in for servicing and, if it only requires a quick fix, can guide customer through it on-site. The following subsections contains a detailed design of the service desk, including how the work will flow through the service desk, roles of employees, physical requirements, and how the service desk would be incorporated into the current structure of TUAS.

6.1 Goals of the Support Function

Setting goals in a workplace is important in providing some guidance and motivation for the employees. It helps direct the energy of the individual employees into a direction that is beneficial to the support and its customers. Likewise, setting an overall goal for the workplace is important in directing the focus of all the employees, and identifying what needs to be accomplished at the workplace. The overall goal of the BYOD Service Desk would be to provide efficient and effective service to the customers, but this is quite a vague goal in that it does not explain how to reach efficiency and effectiveness.

One of the most important goals at the support, and in computer support in general, is “First Time Fix”(Mineart 2012). This means that diagnosing the problem correctly and fixing the issue happens the first time the customer brings in the device. In order to accomplish this, we need to be able to replicate the error, so finding out what the customer was doing when their error came up is crucial. Then we fix the issue and test it by attempting to replicate the error again. Not only will this save time in the long run, but it will also keep customers happy when they do not have to return because of the same error.

Another important goal for the BYOD Service Desk is a fast resolution time, so that the customer can start using their device, especially if it is needed in the lessons. The amount of devices that come to the support may vary by quite a large amount so it is important not to get overwhelmed by an excess of devices. If this happens, it is much easier for devices, peripherals, and accessories to become mixed up. At first glance, it may seem that it conflicts with the first goal, and it certainly can if employees try to resolve tickets too fast, but if applied correctly, it can actually increase the “First Time Fix” measure. If the employees do not know how to proceed, they should either ask their co-workers for advice, or escalate the issue to one of the tier 2 technicians.

The final main goal that the Service Desk will focus on is customer service. The BYOD Service Desk will be a free service that the students will use so it will not make any revenue, but that does not negate the fact that customer service is important. TUAS’ have a responsibility to provide a service for the students and it should be done to the best of abilities. The BYOD Service Desk will also employ trainees and they will need to learn proper customer service etiquette. The customer service quality can be measured through questionnaires sent to the students who have brought their devices in for support, since we have a record of their e-mail addresses. If customer satisfaction measures below satisfactory, steps can be taken to bring up rating to a minimum of satisfactory.

6.2 Potential Customer Interviews

In an effort to gather some data on what the BYOD Service Desk should focus on, 15 students from various campuses belonging to TUAS were asked to assign a rating of importance to features and characteristics. The ratings ranged from 1-5 (1-Not Important, 5-Very Important) and the characteristics focused on the basics:

- The speed of the BYOD Service Desk. This question attempts to figure out whether customers prefer that the device they brought in be fixed and returned quickly, with the caveat that testing the fix is cut short and the device may actually not be fixed. Out of 15 responses, the average response was 4.13/5.
- First Time Fix. This question is essentially the opposite to the speed. The customers were asked if they prefer to have their device returned slower but to

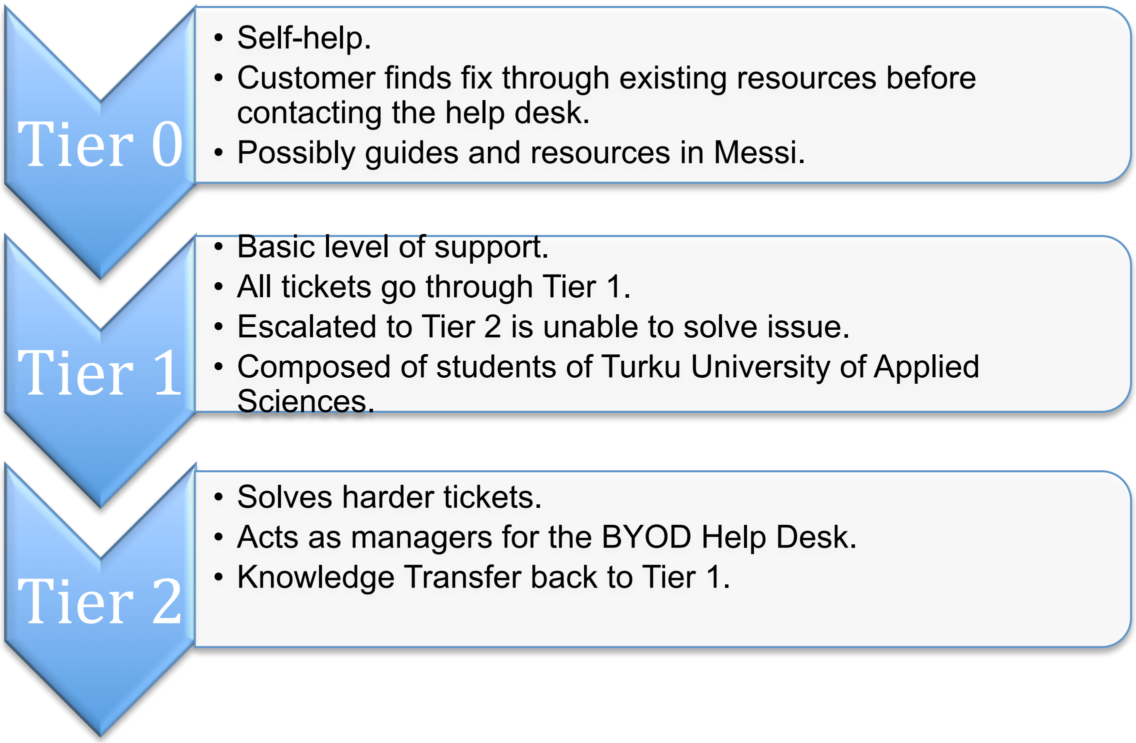
be sure that the device has been serviced properly. The average response was 4.47/5

- Convenient Location. The BYOD Service Desk will have a physical location, possibly multiple if necessary, so it is important to identify whether or not customers desire a convenient location or will they be able to put some effort into bringing in their device. A convenient location received an average of 3.7, meaning that most users would be prepared to put effort into getting to the help desk if they needed it’s services.
- Phone and Email Support are both very common features in help desks, so it is prudent to evaluate whether customers would prefer to have them. Phone support scored a 3.33/5 and Email support scored 3.93/5. Email support scored slightly higher so it may be incorporated into the BYOD Service Desk.

In some situations, the BYOD Service Desk may only give instructions to the customer on how to solve the issue or what should be done to get the computer working again. Students were asked to rate how comfortable they are with following instructions to repair their device or solve their software issues (1-Not comfortable, 5-Very comfortable) and scored a 3.27/5. This is quite a low score, which would indicate that, while students most likely can follow instructions, they may be hesitant to.

6.3 Tier 0/1/2

When discussing “Tiers” in the context of computer support and service desks, it refers to the escalation of the work to more knowledgeable people. If those involved in the lower tiers cannot solve the issue at hand, the workload will be escalated to the next tier that contains those who have the expertise necessary to solve the problem. Conventionally the tiers go up to the tier 3 which handles the cases that tier 2 cannot, or it can include the management personnel of the help desk. In such a small help desk however, two tiers will be enough. The main advantage to the Tier System is that employees with less experience can handle a great amount of the work, and the more difficult cases will be escalated to those with more knowledge and experience. This in turn helps keep the budget lower, as employees with less experience come with a lower salary.



Tier 0

- Self-help.
- Customer finds fix through existing resources before contacting the help desk.
- Possibly guides and resources in Messi.

Tier 1

- Basic level of support.
- All tickets go through Tier 1.
- Escalated to Tier 2 is unable to solve issue.
- Composed of students of Turku University of Applied Sciences.

Tier 2

- Solves harder tickets.
- Acts as managers for the BYOD Help Desk.
- Knowledge Transfer back to Tier 1.

Figure 1. Summary of the proposed Tier Support System for TUAS.

6.3.1 Tier 0

Tier 0 support is not technically a part of the service desk but it still lies partly under its domain. Tier 0 is the customer finding information on how to solve their problem before contacting the service desk. (Lennon and Kelly 2014) This can be done through the use of various resources to look up the symptoms present and identify the issue and fixing it. The service desks role will be to compose instructions on how to fix some common and simple issues. Once the service desk has been established and been running for a time, these common and simple issues will be evident. The guides will be published in Messi in the existing IT Services section both in English and Finnish, with Finnish being the priority due to the larger number of Finnish students. Naturally, finding information and following instructions can be daunting for some students, if they do not possess some amount of pre-existing knowledge in the area so, while customers may be reminded of the guides, their device will absolutely be serviced.

6.3.2 Tier 1

Tier 1 support is the basic level of support that will handle most of the cases. Tier 1 will accept the machine into TUAS' service, compose the necessary documentation, and start working on the machine. (Ikola 2014, 12) Depending on the total workload, tier 1 should consist of a minimum of 3 employees to ensure the fast service and return of the devices. The working method will be rather free-form in that the employees can choose to work on their own or as a collaboration. This encourages the sharing of knowledge among the employees and keeps a higher morale. Since information technology is a large part of the learning that goes on at TUAS, Tier 1 support will consist of students who either need places for work placement or, they can earn credits for some number of hours of work. The service desk budget can be kept lower and students can gain degree-relevant work experience. Many Tier 1 supports include email and phone support in addition to in-person support, however due to the upcoming concentrated student population into the Joukahaisenkatu and Lemminkäisenkatu campuses, which are approximately 200 meters apart, in-person support will in most cases be enough. It is understandable that not all students will be at these two campuses, so the service desk will also operate email-based support

6.3.3 Tier 2

Tier 2 support is the first step of escalation. When the employees in tier 1 are unable to solve an issue, it will be moved up to the employees in tier 2, who have a greater pool of experience to draw knowledge from. (Ikola 2014, 12) These fixes may take more time to solve but the amount of cases that reach tier 2 should be quite small. Therefore, at least at the beginning of the service desk and during the ramp up period, two tier 2 support employees will be needed. Providing support for devices will not be their only role; the tier 2 employees will act as managers for the service desk. Their job description will be composed of the following tasks:

- Acting as tier 2 support. The employees chosen for this task should have prior experience acting as a computer service technician. This ensures that they have the necessary knowledge to tackle the harder support cases that tier 1 cannot handle. After they have solved the case, a knowledge transfer can occur from tier 2 to tier 1, by teaching the employeess at tier 1 how to solve the issue. A large issue concerning the classic tiered support is that there is very little knowledge transfer, but since both tiers are in the same room, knowledge transfer and sharing can be easily facilitated.
- Tier 2 managerial role involves the interviewing and hiring of tier 1 employees from those who apply. Unless there is a large surplus of enthusiastic candidates, this will mostly be a formality and screen that they have the basic necessary skills to work in an IT service role. The managerial tasks will also include the supervision of the tier 1 and making sure that things are running smoothly. One of the most important tasks will be to handle communication and reporting to the school about how the service desk is operating and if any changes need to be made.

This position requires experience in providing computer support, knowledge of the help desk, and a large amount of general computer knowledge. That is why, ideally, the employees in this position would be working at the help desk for longer than the tier 1 employees need to. If we divide the school year into four quarters, tier 2 employees would work for two consecutive quarters, while tier 1 employees would work for one quarter. The durations are not set in stone, but in order to keep someone experienced in working at the service desk, the times should be followed particularly for the tier 2 employees.

6.3.4 Controversy with the Tier Approach

There has been some controversy concerning the classic help desk tiered approach, calling the method outdated or “dead” (Johnson 2013). (Johnson 2013) uses two main points to argue that the tiered customer support does not work; it is bad for the engineer, and it is bad for the customer. In the lower tier, the engineer will be solving the same problems day after day and my get bored and burnt out really fast. The harder cases they just escalate and likely do not hear about them again, so they learn nothing and are essentially stuck as tier 1. This can lead to the organization having a quick turnover rate of tier 1 engineers (Platz 2014). The reason why it is bad for the customer relates mainly to phone- or chat-based support, but in short, the customer would have to explain the issue to multiple people and could cause frustration. (Johnson 2013) suggests that collaboration is the way to combat these problems, especially the monotony that tier 1 can be. In the potential BYOD Service Desk, collaboration amongst the tier 1 employees will be encouraged, as everyone will be in the same room. They can work on their own and if need be, ask for help and discuss about methods of solving the issue. The tier 2 employees will be there to help if tier 1 cannot figure it out, and then do a knowledge transfer to tier 1 so they can learn.

6.4 How This Design was Chosen

When this thesis topic was chose, several different support models were considered; a forum based support, an email based support, and the chosen model, the physical help desk support model. Below are the pros and cons of forum and email based support functions.

The forum support model is an idea based of the numerous forums where anyone can ask questions or bring up their computer problems, and users or employees can answer them; such forums as “www.answers.microsoft.com”, www.reddit.com/techsupport”, and “www.bleepingcomputer.com/forums”. This type of support can lead to an inconsistent quality of support. For any single problem, there can be multiple diagnoses and the customer usually needs to try multiple fixes before he lands on the right one. This is exacerbated by the fact that many customers cannot give proper or useful descriptions of the issue and users do not need to have any qualifications to give advice. The advantage to using this method is that there is very little cost associated with it, and potentially a large number of users that could give support.

The other support model passed upon was a classic email based support. Email support is great when the user-base is spread out over a large area, but in the case of TUAS, the students will mainly, in the coming years, be focused into the two neighboring campuses, Lemminkäisenkatu and Joukahaisenkatu, and a campus in Salo. However, with such a large user base, the support would need to employ a large number of people, or else there may form a long queue of tickets waiting to be opened up and answered. Email support can be quite slow also, with some people checking their email maybe once or twice a day; it may take a couple days to find the solution for a simple problem.

6.5 Work Flow

The way a device moves through the BYOD Service Desk is an important process to identify before the opening day. The goal of the process should be to provide an efficient path with minimal steps and a focus on documentation, in order to keep the integrity of the information passed from the customer to whoever works on the device, and to make sure that no device gets lost in the help desk for long periods of time. This section covers a step-by-step path that a device will take when someone brings it in, and some highly important security and privacy issues that will need to be implemented.

The first step of the process will be the reception of the device. Whoever is receiving the device will gather some general information about the student and ask for a detailed description of what the error is. It is not enough that the user just gives a description because more often than not, the user cannot give a proper description. The employee has to know the right questions to ask and when to ask them so a detailed description of the error can be composed. The employee should be asking open-ended questions to get a general idea of what the error could be and the different symptoms, and closed-ended questions to narrow it down and reduce the amount of useless information. The employees will then make a form which includes the contact information for the customer, an explanation of what the error is and what the customer wants done, and finally a description of the machines physical features and what the customer left at the service desk. This ensures that computers, peripherals, and accessories do not become mixed up and the customer cannot claim that the Help Desk lost something that they never actually brought us. From here, the device moves to the back of the work queue as it is good practice to work on devices that in the order that they come in. This prevents employees from leaving computers that they do not want to work on. In some cases, a device can be moved up in the queue if it has some type of urgency, it is something that will take a small amount of time to fix, or does not require constant focus (e.g., virus scanning). This will be up to the discretion of the manager, but under normal conditions, it is first come first serve.

The second step, the diagnosing and servicing of the device, is done first by the tier 1 technicians. They will take whatever the oldest device, by the time it came to the service desk, and claim that as their own device and start the documentation and work process. The technicians will document everything they do to the device so that the technician does not repeat steps and if the device gets moved to another technician, they will know what has been tried. The technicians will be working together in the same room; therefore, they can communicate and ask for advice and, if needed, transfer the device. If it is transferred, the new technician will start the documentation process under his own name. It is good practice to scan the device for malware and viruses before connecting to the wireless network or inserting any external media devices (e.g., USB-sticks). In the beginning of the BYOD Service Desk, it may be prudent to keep the servicing of the devices to just the quick fixes, in order to see how many devices it receives, and the general workload. If the workload is reasonable, the support can adapt to fixing the harder cases.

Once the device has been serviced, the documentation sheet should contain all the steps taken and what the fix was. The user will need to be notified by either an email or text message, depending on customer preference, that their device is ready for pickup. Once the customer comes to pick it up, the employee will check their ID and have the sign the form they filled out when they dropped off their device to acknowledge that they have received the device back from us. The form will be saved in order to prove that the Service Desk have given back the device and so that, if the device comes back to us with the same problem, we can look back at what was done before.

6.6 What the Support Function Needs

Firstly, the BYOD Service Desk needs a location where it can fix computers and where customers can drop them off and pick them up. As most of the courses in TUAS are being concentrated into the Joukahaisenkatu and Lemminkäisenkatu campuses, the location should be in either of them. It should as close as possible to the largest concentration of students. Ideally it would be two rooms connected to each other so that employees can work without constantly being in the customers' view, and reserving one room to receive and return devices and working with the customer.

Secondly, the BYOD Help Desk needs some computers. Often, when servicing a device, it is necessary to download and test some software or fixes before applying it to a customer's device, as it is sometimes inappropriate to do the testing on customer's computers. The advantage of having test computers is that it does not matter if something goes wrong, as the computer can be reformatted or a fresh operating system installed, and it contains no important documents or files.

Lastly, it needs a large variety of accessories and peripherals. It needs keyboards, mice, and monitors for testing some hardware problems. It needs an assortment of cables (USB, video, audio, charging). The specific items that a help desk needs is quite difficult to predict beforehand, so reserving a small budget that the BYOD Service Desk can dip into when they need something minor would be useful.

6.7 Security and Good Practices

Basic security and good practices for an IT support department was touched upon in the previous section but it is necessary to go further in depth and examine how the service desk can protect itself and it's customers. The section will also cover some general considerations which are important to keep in mind when handling other people's devices and provide the best service possible.

6.7.1 Security

Viruses and malware are an increasingly large issue in the age when most people have multiple computers and other devices capable of handling personal information and transmitting data. All these devices are susceptible to malicious programs that attempt to hijack the user's personal data, payment information, or attempt to use their computers resources for the software owner's personal use. Fortunately, most users do have some kind of protection for their devices, but it is still all too common to see devices with outdated protections or none at all. Often these programs are designed to spread to as many devices as possible, in order to have a large pool of devices to draw information or resources from. That is why it is important that before establishing any kind of connection with the device, it needs to be scanned and checked that the protections are up to date. TUAS' network has very effective security to prevent the spread of such malicious programs but storage devices do not. Before connecting any kind of storage device to the computer, the computer needs to be scanned. The only exception is in the case where there is a multi-tool USB, such as a Hirens Disc. It contains many virus-scanning utilities that will scan the devices storage and do a self-scan. This removes the viruses from the customer's computer and, if it has spread, from the USB stick as well. Not only will it clean up the computer, it will protect the other computers at the service desk.

Another important avenue of protection comes from the legal side. We move a lot of computers and accessories around and a small may get mixed up or get lost. More often than not, the lost item will get found, but if it does not, the Service Desk needs take responsibility for it and try rectify the issue. It is possible that someone will claim that the employees have lost something the customer brought in, either mistakenly or with ill intent. This can be pretty much eliminated by listing everything the customer brought in on the form we have them fill out, and signing it to confirm that the list is correct. When they pick up their device, they sign again, confirming that we have returned everything that they brought in.

6.7.2 Documentation

It has been touched on before but documentation is one of the most important aspects that, if neglected, can cause chaos at the service desk (Robertson 2007), BYOD Service Desk. The employees document their name, phone number, email, what is wrong with their device, and the items that they left us with. All these details are important when it comes to meeting the goals of great customer service and effective performance. The form where the employees fill out this information will be kept with the device at all time so that it can be referenced easily. All of the steps taken to service the device will be recorded on the form as well. This is a crucial step because it will save a massive amount of time if the device is handed over to someone else or escalated, and it will also help reverse any steps we made, that didn't result in anything. There are some general service steps that almost every device will go through and the form will act as a kind of checklist can be consulted to see that the necessary measures have been completed. If a device with a similar issue comes in, an employee can look back at past cases to see the steps that resulted in the fix being successful.

Ideally there would be a database, a ticket system, where all the cases would be stored. Employees would input all the customer details and the steps they took, and add a one or two-word descriptor of what the error was. It can be something like "Network Error", "Display Error", "Operating System Error"; thus it will be easy to search for similar errors from the database. The database will also be a backup of the physical forms, or vice versa, so that if one becomes compromised, there is still another copy.

7 Conclusion

The goal of the thesis, as outlined in section 1.2, was to design a support function that is suited to the potential upcoming BYOD implementation. With up to approximately 8000 new devices coming under the domain of Turku University of Applied Sciences, the current service desk would not be able to keep up and service the devices in a timely manner. One possible way that it can be handled is through a hybrid tiered and collaboration help desk model. Taking the positive aspects of each model, an efficient model can be implemented. From the tiered model, we take the efficiency, budget-consciousness, and a clear hierarchy. From the collaboration model, we take the learning and higher tier 1 morale. Using this method, the support function should be able to provide support for devices in a quick and effective way, in order to minimize the time that students are without devices. This service desk was designed with the best practices defined by ITIL in mind.

During the planning phase of the potential help desk design; there were various other designs that were considered. One such design was an Internet or intranet forum, where users could post the symptoms of their various IT-related problems and other users or admins could try giving advice on how to solve it. This was eliminated, however, since the inexperience of users could lead to issues describing the problem, trying to follow the advice, or users giving bad advice. There would be very little quality control and it is possible that users wouldn't be bothered answering any questions. Another model that was considered was an e-mail based support; users would explain their issue and the employees would attempt to diagnose and solve the issue, and e-mail back the fix. This model did not adhere to the goals set for the help desk, specifically providing support in a timely manner. The decision to discard this model was further described through the interview in chapter 6.1. Users may not be comfortable applying fixes through instructions, thus rendering the help desk useless. TUAS needs a more reliable method of providing support than the forum or e-mail support, and the physical help desk model is the correct approach to follow.

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Appendix 1

Survey Questions and Results

1. How important is it that the Help Desk returns your device fast?
2. How important is it that the Help Desk fixes your device on the first time you bring it in?
3. How important is it that the Help Desk has a convenient location?
4. How important is it that the Help Desk has a phone support?
5. How important is it that the Help Desk has an email support?
6. If you were to receive instructions on how to repair your computer, how comfortable would you be following those instructions?

Table 1. Presented data of the gathered survey of 15 students from Joukahaisenkatu and Lemminkäisenkatu campus. Jou = Joukahaisenkatu, Lem= Lemminkäisenkatu.

	Speed	FTF	Convenient location	Phone Support	Email Support	Following instructions for repair
1.Jou	3	4	2	4	5	2
2.Jou	4	5	3	4	5	4
3.Jou	5	4	5	3	4	5
4.Jou	4	5	5	4	3	3
5.Jou	3	4	3	2	5	4
6.Jou	5	5	4	4	4	3
7.Jou	4	5	3	3	5	4
8. Lem	4	4	3	3	5	3
9.Lem	4	5	5	4	3	2
10.Lem	5	5	4	2	3	3
11.Lem	5	4	3	3	4	3
12.Lem	3	4	4	4	3	2
13.Lem	5	4	4	2	4	5
14.Lem	4	5	4	5	2	3
15.Lem	4	4	3	3	4	3
	4.133	4.467	3.667	3.333	3.933	3.267