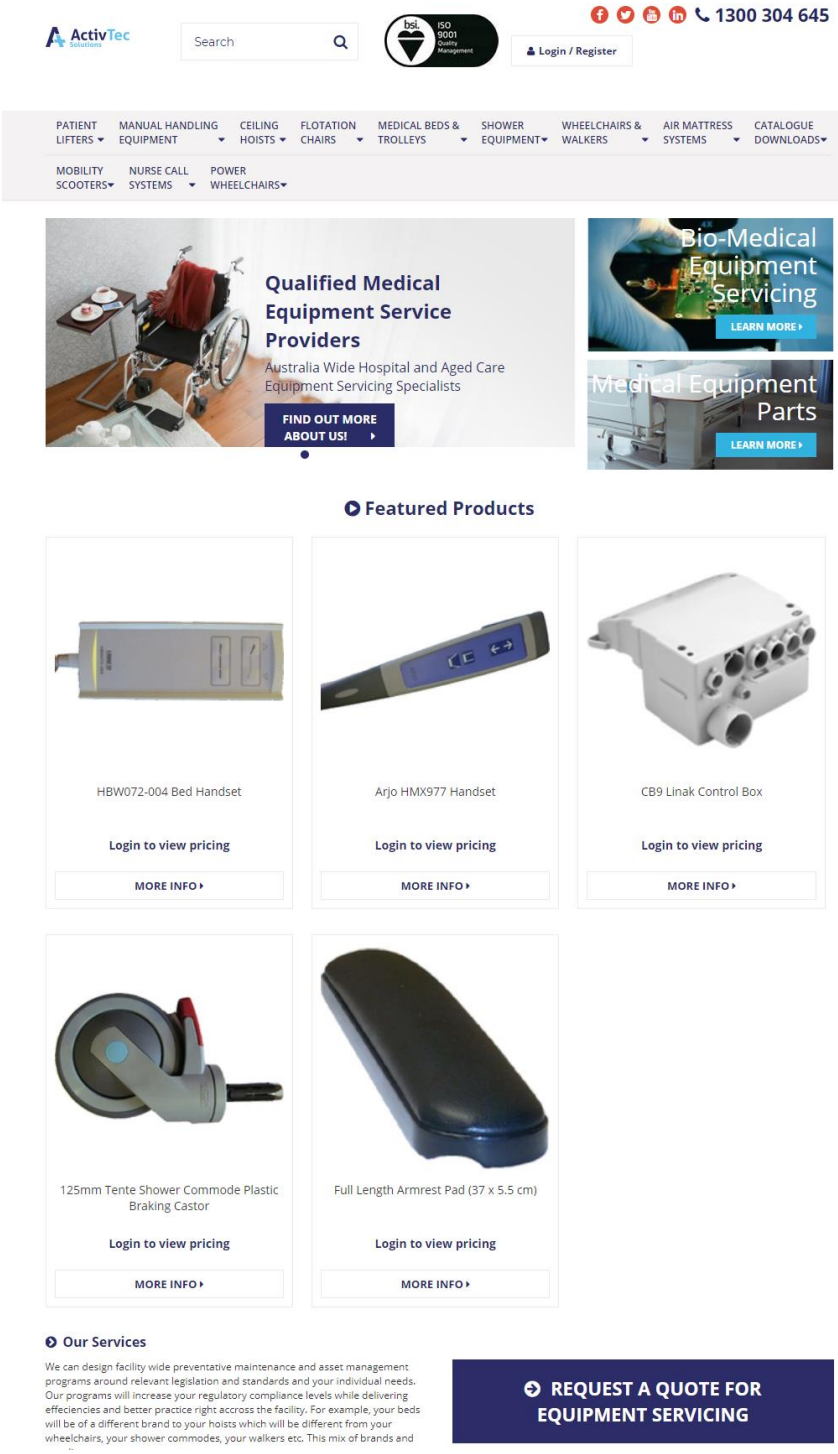
Website of the Business

Website address of the service: https://www.activtec.com.au/

Snapshot of the website:

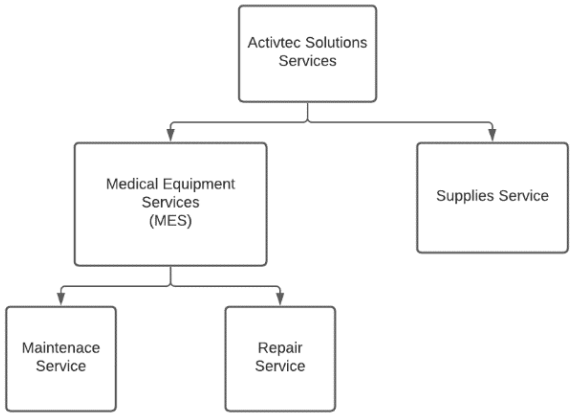


Overview of the Business

Activtec Solutions (AS) is an Australian family-owned company, renowned in the Victorian medical equipment sector for providing quality medical equipment solutions. The medical equipment that AS provides their services for include patient beds, wheelchairs, shower commodes, manual handling equipment, and others. AS constantly strives to innovate and support their customers and improve on client satisfaction. Their motto is “we are a company you can trust”.

The primary specialisation provided by AS is the maintenance and repair of a range of medical equipment at healthcare facilities. These healthcare facilities constitute of aged care facilities and hospitals. Catering for the biomedical engineering services in healthcare facilities, this service is conducted by the company’s *Medical Equipment Services* (MES) department. Two sub-types of services are provided by the MES department. They are *maintenance services* on functional medical equipment, and *repair services* on faulty or broken-down medical equipment.

The secondary specialisation provided by AS also caters for the biomedical engineering services in the same healthcare facilities, but it specialises in the supply of replacement spare parts for the repair of faulty broken-down medical equipment for the biomedical engineers (BME) of the to perform inhouse. This service is conducted by the company’s *Supplies* department.



The service provided by the MES department involves technicians responding to the job requests of biomedical engineering services in healthcare facilities, where they undertake onsite visits and perform maintenance or repair work on functional or faulty medical equipment, respectively.

The service provided by the Supplies department involves office and warehouse staff responding to the order requests of biomedical engineering services, where they perform supplies liaisons, purchasing processes and distribution of the ordered parts to said biomedical engineering services customers.

The company consists of a director and founder, who oversees the MES and Supplies departments of the business, as well as office and administration staff, including HR, marketing, and the accounting and finance departments. The MES department is managed by a technical services manager, who has a straight-line report to the company director and founder, and leads the MES department, managing a team of technicians. The Supplies department is managed by a purchasing manager, who has a straight-line report to the company director and founder, and leads the supplies department, managing a team of administration and warehouse staff.

Service of the Business to Implement the Proposed Database

The Activtec Solutions (AS) service that has been selected for the proposal is the Medical Equipment Service (MES).

The facilitation and provision user group consists of the company staff of AS who are associated with and use services of the MES department. They include the *company director and founder*, the *technical service manager*, and the *technicians*.

The consumer users of the service are the direct and only clients of the AS business. They are staff of the Biomedical Engineering departments who perform the inhouse maintenance and service of medical equipment at healthcare facilities, as well as outsource them to external contractors, of which AS is one. Each Biomedical Engineering department of a healthcare facility consists of a *chief biomedical engineer* and a team of *biomedical engineers* (BME).

Overview of the Service

A) Activtec Solutions side (Provider and Facilitator)

The company director and founder of Activtec Solutions (AS) manages the managers of the Medical Equipment Service (MES) department, the Supplies department, and other office and administration staff. The service department is managed by one technical service manager, who reports to the director and founder.

The staff who work in the MES department include the technical service manager and technicians. The technical service manager manages at least one technician.

Aside from the company director and founder, each of the AS employees are identified by their employee ID, name, their role, the department their roles fall under, and the ID of the manager or staff they directly report to.

Overview of <u>Medical Equipment Services</u> (MES) operations

The technical service manager is responsible for the assignment of technicians to AS jobs, and the technicians are responsible for performing the work on their assigned AS jobs.

If a medical equipment from a BME job is one that cannot be serviced, i.e. maintained or repaired inhouse by a BME, then the BME would log a job towards AS. This begins a cascade of events on the AS side.

These events begin with the creation of an AS job, then the assignment of a technician to that AS job, followed by the completion of that AS job by the technician through onsite visit of the corresponding facility where the medical equipment is located at, which then leads to the generation of a field service report (FSR) as well as the invoicing of the completed job towards the biomedical engineering department that requested the job. Finally, the process ends with the eventual receiving of payment from the biomedical engineering services department.

Creation of an AS Job

When a job is logged towards AS by a BME to request for a maintenance service or a breakdown repair of a medical equipment at their healthcare facility, an AS job is created in the AS system. A technician is assigned to at least one AS job. Once the AS job is tended to and performed by the technician, it is marked as completed.

An AS job is identified by a unique AS job number, and contains the following information: The date it was created, the technician assigned to it, the healthcare facility the work is to be performed at, the specific location of the medical equipment in the facility to help the technician locate it, the medical equipment asset number, the manufacturer's serial number, the model, the brand, the category of the AS job request, i.e. whether it is a maintenance service or a repair service. If it is a repair service, a description of the requested work, including what the reported fault is.

i) Generation of an FSR

Once an AS job is completed by the technician, a Field Service Report (FSR) is generated by the technical service manager. The FSR provides a summary of the completed AS job. Because of this, most of its data is inherited from its underlying AS job. This report is sent to the BME who requested the AS job.

An FSR is identified by a unique FSR job number, and contains the following information: The AS job number it refers to, the date the AS job was completed, the technician assigned to it, the healthcare facility the work was performed at, the specific location the medical equipment was located at, the medical equipment asset number, the manufacturer's serial number, the model, the brand, the category of the MES, i.e. whether it is a maintenance service or a repair service, the work performed by the technician, the service hours taken by the technician, and the parts used for the AS job, if applicable.

ii) Generation of a Service Invoice

After the generation of an FSR after an AS job is completed, an invoice is also generated by the technical service manager based on information from the FSR. It is a formal request for payment by the Biomedical Engineering department that requested the AS job.

Each Service Invoice is identified by a unique invoice number and contains the following information: The FSR number it refers to, the date the invoice was created, the Biomedical Engineering department that requested the AS job, the medical equipment's asset number, the manufacturer's serial number, the model, the brand, the category of the MES, i.e. whether it was a maintenance service or a repair service, the service hours taken by the technician and the total labour cost, the parts used for the AS job and their prices, if applicable, and the total cost payable by the Biomedical Engineering department.

Information on Parts

AS has a warehouse which stocks parts for almost all the medical equipment they provide their services for. Parts are allocated for the MES or the Supplies departments. For the MES department, parts are used in some AS jobs. For the Supplies department, parts are stocked for sales to their BME customers so that they could perform their own inhouse maintenance and repairs.

In the AS system, a part typically exists in multiple amounts in stock and is identified by their unique item number. Each stock also has the following information: The initial purchase price, the invoice price (to be shown in sales quotations and invoices) , the manufacturer, and a description.

B) Healthcare Facilities side (Consumers)

Each healthcare facility has one Biomedical Engineering department. Each Biomedical Engineering department is led by one chief biomedical engineer, who manages one or more biomedical engineers (BME), depending on the size of the department.

The chief biomedical engineer and BMEs are identified by their unique employee numbers, their names, the department their roles fall under, and the name of their manager.

Overview of Medical Equipment

Each medical equipment in a healthcare facility is identified by its unique asset number and serial number, and contains the following information: the model, the brand, the specific location in the healthcare facility, the date it was commissioned, the category of the equipment, and the equipment status, i.e. whether it is active or inactive.

Overview of BME operations

All the medical equipment of a healthcare facility is managed by the BMEs of their respective Biomedical Engineering department. BMEs are responsible for maintaining and repairing medical equipment or for arranging such work to be performed by external contractors such as AS. Some of the medical equipment are maintained and/or repaired by BMEs, whilst others may need to have either or both maintenance and repair work performed by external contractors, either because BMEs are unable to perform such tasks, or that they are limited in their man-power to do so.

For a medical equipment, whenever the time comes for it to be maintained or repaired, a BME job is created by a staff of the Biomedical Engineering department. From this, one or more BMEs are assigned to, or assigns themselves to the BME job. This begins a cascade of events on the BME side.

i) Creation of a BME job and who performs it

If the BME job can be completed by a BME or multiple BMEs, then they would perform the work. Otherwise, they would be performed by an external contractor such as AS. In such cases, the BME would log a job request towards AS for it to be attended and

completed by them. Once completed, the BME would receive an FSR and invoice from AS, and then the BME job is marked as ‘completed’ by the BME.

Each BME is assigned to one or more BME jobs. Each BME job is related to one medical equipment. Some medical equipment is not linked to any historical BME jobs since they may still be new and have not had any maintenance requirements or had with any faults to be repaired yet.

Each BME job is identified by its unique work order number, and contains the following information: The date it was created, the asset number of the Medical Equipment, the employee ID of the BME assigned to the job, the specific location of the medical equipment in the facility, the description of the request, the category of the request, i.e. whether it is a maintenance or repair request, and the status of completion, i.e. “in progress” or “completed”.

ii) Attachment of a Field Service Report and Service Invoice

Each BME job, after completion by an external contractor such as AS, has one FSR and one invoice attached to it. BME jobs that are in progress and are to be completed by an external contractor do not have any FSRs or invoices attached to them yet. BME jobs that are in progress and are to be completed by BMEs, or have already been completed by BMEs, do not have FSRs or invoices attached to them.

Identified Problems of the Business

Manual process with logging AS jobs, generation of FSRs and Invoices

Currently, the only way for a BME to log any AS job request towards AS is via email. The email would be sent to either the technical service manager, an administrator, or a technician, depending on which AS personnel the BME is in close association with. There are no single, known personnel across the board in which such information is to be forwarded to. BMEs who have not used AS's service before, or do not know any AS staff, are left lost and bewildered as to how to log a AS job request with them.

This not only appears unprofessional on the AS's behalf, but also inefficient, as it is a manual process. To further add to the inefficiency of this process, the validity of all the emails must rely on the fact that they contain all the bare minimum information so that an AS job could be created. These information include: The healthcare facility the work is to be performed at, the specific location of the medical equipment in the facility to help the technician locate it, the medical equipment asset number and manufacturer's serial number, the medical equipment's model and brand, the category of the MES, i.e. whether it is a maintenance service or a repair service, and if applicable, and a description of the requested work, e.g. what the fault is, if it is a repair service.

Often times, a BME does not provide all of the necessary data, resulting in multiple back and forth emails and communications between the AS staff and the BME to clarify and obtain all the required information - all so that an AS job could be created in the first place. The AS staff find that they need to regularly spend significant amounts of time outside of their primary work to fulfill these tedious and mundane tasks, which is very wasteful and time consuming for them. The staff productivity and cost burden have become unsustainable.

Sometimes, a BME might log an AS job request, unbeknown that an already existing AS job for the same service has already been logged by another BME at the same facility, resulting in unnecessary data duplication. This occurs since there is no electronic record of data to notify and prevent BMEs at the same healthcare facilities from logging similar or the same AS job requests, and there is no way for them to view their colleagues' past and present job requests with AS. Consequently, multiple onsite visits by technicians might be conducted for the same AS job request, thereby causing great losses in time, resource expenditure and manpower.

Furthermore, it can become highly frustrating for the BME, when, after logging an AS job request via email, to not receive any responses from the AS staff acknowledging the request, causing the BME to be unsure of the status of the AS job. Even when an acknowledgment email is received by the BME, they are still left in the dark, being highly uncertain of when the AS job is to be attended to, or whether it has already been completed. The frustration can rapidly escalate when the job is urgent.

Each time the technical service manager wants to create an AS jobs and assign them to the technicians, it takes hours to collate all the existing AS job requests from BME emails in their inbox and from other AS staff.

Up until now, all past and present AS job requests have had to be collated together into an Excel spreadsheet by the technical service manager. All assignments of AS jobs to technicians, completion of AS jobs, and reporting have had to be done through reference of the excel spreadsheet. This is a manual process, is subject to high risks of human error, and is very time-consuming.

The manual handling processes simply do not stop there. The FSRs and invoices, with data being derived from the completed AS jobs, also need to be generated manually by the technical service manager by reference to data stored in the Excel spreadsheets of the AS jobs. From there, data of the FSRs and invoices would then be stored in their own Excel Spreadsheets. Again, as it is a manual process, there is significant scope for human error originating from mistakes in data inputs and transfers from one report to another. To add on top of that, the service manager would need to manually email each BME the FSR and invoice for the completed AS job they requested. These processes are staggeringly time-consuming.

Lately, a probe into the company deliveries and customer satisfaction levels has been prompted and requested by the marketing team, in a bid to align the services of the company with its mission, visions and values. Without an online and database system to gather feedback from the BME customers every time a job is completed, this goal proves to be a difficult feat.

As the company expands its business and accumulates more AS job requests from BMEs across more healthcare facilities, these manual processes have become increasingly taxing on time, money, and manpower for the business. As the company gathers a larger client base and gradually enters into more commercial grounds, the stakes for maintaining the company image and public relations through prompt and quality deliveries have dramatically increased, but aspects of which, have been greatly hindered because of the limitations caused by the manual processes.

As such, the pressure for the company to implement a system for BMEs to log AS job requests, for receiving automatically generated FSRs and invoices, and for BMEs to provide their feedbacks to the company's services following the completion of each AS job, has become an ever more imperative solution to AS' underlying problems inherent to the manual processes.

Based on other well-known medical equipment platforms in the healthcare sector that BMEs use to log service jobs for, such as high-output companies like Philips healthcare and GE healthcare, AS could certainly adopt similar online systems for logging jobs, as well as to update the BMEs on the statuses of the AS jobs, generation of reports, and more.

This solution will enable AS to prevent manual handling and avoid missing data and data duplication. It will consequently reduce on staff costs, facilitate maintenance services for its BME customers, better public image, assist on customer satisfaction analyses, and ultimately, enable AS to generate more revenue.

Objectives, Scopes and Boundaries of the Proposed Database

Objective

The main objective is to develop a database and software system that would provide automation for the manual handling processes. The sub-objectives are as follows:

1. To facilitate the creation of AS job requests by BME customers
2. To ensure that all the necessary data are entered for the creation of an AS job, and that no missing data prevail
3. To avoid data duplication, redundancies, and inconsistencies in AS job requests
4. To enable the technical service manager to view the job list and efficiently assign AS jobs to technicians
5. To provide fast and appropriate response times to onsite service of medical equipment
6. To provide helpful updates to BME customers on the AS job requests
7. To facilitate the generation of FSRs from AS jobs
8. To facilitate the generation of invoices from AS jobs
9. To create an avenue for gathering and analysing customer feedback
10. To prevent the risks of human errors from the manual processes of creating AS jobs, FSRs and invoices
11. To facilitate efficient administrative reviews of the business processes

Scope

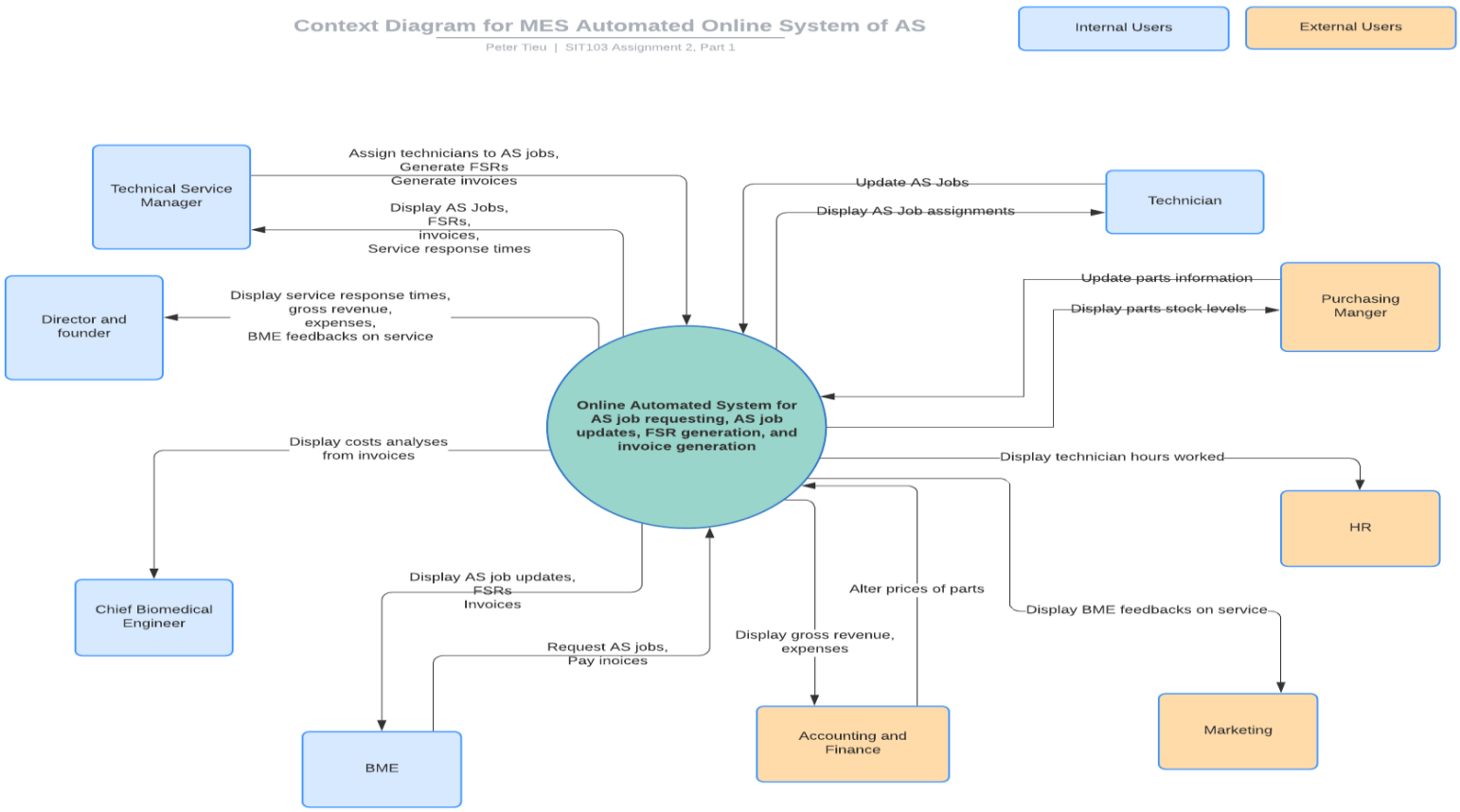
The current scope of the project is only limited to the MES department of the AS business, and not the Supplies department. For the current period, this new implementation is to only be made towards the MES department. It would be treated as a 'case study', for which, if highly successful in the long run, would provide scope for the Supplies service to adopt in the future.

1. The service manager would be able to view requested AS jobs, completed AS jobs, FSRs and invoices, and be able to assign technicians to AS jobs, as well as generate FSRs and invoices
2. The technicians would be able to view their assigned AS jobs and update the AS jobs
3. The director and founder would be able to perform analyses on AS job response and completion times, hence set KPIs for the MES department accordingly. They would be able to extrapolate expenses and gross revenues from the MES department to assist them with their strategic planning
4. The BMEs would be able to view the statuses of the requested AS jobs at their healthcare facilities, and the generated FSRs and invoices from completed AS jobs. They would also be able to send feedbacks to the company on every completed AS job
5. The chief biomedical engineers would be able to perform cost analyses from the AS invoices to assist with the supplier-costs budgeting for their departments

Boundaries

1. The purchasing manager from the Supplies department, who would view the stock levels of parts and update the parts information such as part numbers and pricing
2. The human resources (HR) staff, who would view information of technician hours worked, to gain better understandings of their work-life balances
3. The marketing staff, who would view feedbacks from BMEs on the MES service, to assist in modifying service provisions accordingly for maintaining public relations
4. Accounting and finances, who would view gross revenue and expenses from invoice proceeds for tax-time, and alter the prices of parts, to maintain and fulfill the business budgets

Context Diagram of the Proposed Database



Data Sources Accessed by the Users of the Service

Data for MES Process	Sources of Data	Users	Interface/external processes at the boundaries
AS Job	Emails from BMEs	Technical Service Manager, Technicians	Manual process - received from BME emails
AS Employee	Employee Contract Forms	Company Director, Technical Service Manager, AS Staff	Automated process - accessed from a database of employee information
Parts Information	Parts Inventory Spreadsheets	Purchasing Manager, Technical Service Manager	Manual process - acessed via a spreadsheet with information of the parts
Parts Used	FSRs	Purchasing Manager, Technical Service Manager	Manual process - accessed from the Technician's notes and Technical Service Manager's FSR spreadsheet
Technician Service Hours Worked	FSRs	Technical Service Manager, HR	Manual process - accessed from the Technician's notes and Technical Service Manager's FSR spreadsheet
Medical Equipment	Emails from BMEs	Technical Service Manager, Technicians	Semi-manual process - received from emails, but could already be in the database from previous AS jobs, and the technical service manage could access it for future AS jobs
Service Manager and BME Information	Customer Information Forms	Technical Service Manager, Technicians	Automated process - accessed from a database of customer information

Reports Generated by the Service

Report	Description	Users
Job Update	Provides an update on AS job's lead time and status after it is logged	BME, Technical Service Manager
Field Service Report	Details the job that was completed by the technician	Technical Service Manager, BME
Invoice	Details the total cost of the maintenance or repair service, which is a sum of the technician time costs and parts costs	Technical Service Manager, BME, Chief Biomedical Engineer, Accounting and Finance
Parts Used Report	Details all the parts used for each of the completed AS jobs, which are reflected in their respective invoices	Purchasing Manager, Technician, Accounting and Finance
Service Response Times Report	Details the completion lead times of all jobs - between the time an AS job is logged to the time it is completed by a technician	Technical Service Manager, Director and Founder
Technician Hours Worked Report	Details all the hours worked for each technician	Human Resources
Customer Feedbacks on Service	Details all the BME ratings and feedbacks on each of the jobs completed	Marketing