A High Level Design For Colworths Australia

SITP Inc.

Mind Space Invaders

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1. Management Summary

Technology are used in our daily life to make our work easier. Imagining how we have been shopping for ages, following the trend of the past, there has not been much change in the way we do shopping. SITP has envisioned a new way of shopping for a potential market leader Colworths Australia. The Australian market for retail is a huge playground with lots of potential for profitability. But for a profit there must be something new to the market for the customers to adopt to.

SITP is a IT and IS solution company providing feasible solution to its customers for many years and has great experience in this field. With the solution SITP provides the Colworths customers will be able to shop from the comfort of their home and even while shopping in-store will not have to make much effort. At the same time the customers will be saving time with faster order processing.

The solution that SITP is providing will have features of shopping via the app and through the ecommerce portal. Also, with the app the customers can walk in the store and without having to use a trolley can just scan the bar code and have their products ready to collect at the checkout. With the use of smart trolley, the customer can finalize their shopping as they shop as the trolley will be smart enough to identify each product and charge accordingly.

Applying the available technologies to the best combination and giving the customers a new and exciting shopping experience which will be the first one of a kind experience will surely propel Colworths Australia to the forefront of Australian retail industry.

2. Background and Company Profile

2.1. Background

SITP Inc. is an Australian Originated company and it expert in the developing, implementing a managing large scale IT projects. Its head office is located in Sydney and it works all over the Oceania Region. The STIP has been currently working on numerous projects across multiple industries that's runs independently. Our company provides the local based project team for each endeavor and keeps the diverse and multicultural environment maintained for working collaboratively to provide the best solutions.

2.2. Company Introduction

SITP Inc. creates and assign local based team for each project depending upon if the bid or tender is successful, it then has a partnership arrangements or act as local subsidiary company in the country of the project occurring.

Business Overview

Strategy:

SITP Inc. business strategy is to come up as the profitable IT industry not only in the Oceania Region but across the world.

Vision:

To become a leader in IT industry by providing the best workable solution to the clients in affordable cost.

Mission:

To provide the affordable and reliable IT solution to our clients and maintain a good business relationship. Let the technology make people life easier.

Core Values:

- Maintain a collaborative work environment.
- Keep the diversity work.
- Focusing on the continuous improvement by generating more innovative and creative ideas.

Company Goals:

- Gaining a good reputation across the IT industry.
- Expansion of the company in IT industry.

2.3. Project Team

Team Member	Work designation	Contact Details
Mustafa Ali	System Designer 3 year experience of working as a system designer.	Email: Mustafa.ali@SITP.com.au Contact: 0432154929
Richa Vyas	Project Manager 5-year experience of working as a project manager.	Email: Richa.Vyas@SITP.com.au Contact: 0465847620
Ankur Passi	System Engineer 3-year experience of working as a system Engineer with SITP	Email: Ankur.Passi@SITP.com.au Contact: 0458479623
Yogendra Shrestha	Associate Devops Having 4 year of experience working as a developer.	Email: Yognedra.Shrestha@SITP.com.au Contact: 0498714412

3. Scope and Assumptions

3.1. Scope

Scope are in place to define what falls inside and outside the boundary of the project. Following are the in scope and out of scope aspects of the project.

3.1.1. In Scope

The list below is the in scope for this project and define the responsibilities of SITP Inc. as part of undertaking this project, however the list can be revised as new changes are introduced.

1. Collecting requirements from the staffs of Colworths Australia namely General Manager and Client Project Manager. Also, timely meetings and consultation are to be carried out as required.
2. Manage the whole project from its inception and keep record of documentations of all the activities that are carried out.
3. Plan to manage the project after the delivery for ongoing improvements and maintenance.
4. Negotiate and deal with hardware suppliers to provide the required hardware components including SLAs with suppliers.
5. Negotiate and deal with software suppliers to provide the required software including SLAs with suppliers.
6. Integrate the Colworths Australia system with Colworths International servers and networks.
7. Supervision and installation of all IT and IS components in all the seven supermarket locations, distribution centers and Colworths, Ultimo Sydney office.
8. Necessary recruitment and staffing of skilled personnel as required to develop the project and maintain the systems after the delivery.
9. Development of mobile application and web interface for customers to interact and order products from, both in-store and online.
10. Design, develop and implement database infrastructure for the project.
11. Ensuring that the developed system is free of vulnerabilities to external attacks and data breaches.
12. Develop backup and recovery plans / strategies with proper documentation and instruction to counter the possible risks.
13. Consider the organizational impacts caused by the components of this project and consult with Colworths Australia management for suggestions and implementation of respective components.
14. Providing detailed information of the costs that are required to make this project a success.
15. SLA with Colworths Australia, hardware suppliers and software suppliers.
16. Conducting a pilot testing of the proposed solution and improving on the results received from the test before the final delivery of the project.
17. Provide necessary training to staffs for implementing and maintain the system.

3.1.2. Out of Scope

The following list is the out of scope for the project, however the list can be revised with agreement between SITP Inc. and Colworths Australia.

1. The project does not consider any cost that incur in staffing for management and administrative purposes that are not related with the project.
2. All office infrastructures that are not related with the project and IT solution.
3. Standard communication medium such as telephone, mobile phones and Internet.
4. Federal and state laws, ethical and privacy issues.
5. Supply-chain of Colworths Australia between different suppliers and Colworths International including delivery to customers.
6. Cost incurred when implementing the necessary IT infrastructure in every location including making changes to existing layouts and designs.

3.2. Assumptions

Assumptions are necessary to have clear understanding of scope and to finish the project on time and within the derived costs. The list below points out the assumptions of this project.

1. In the first phase only the seven stores in CBD of every state, distribution center in Sydney, Colworths Australia, Ultimo and Colworths International, San Francisco is considered.
2. For the pilot testing, all the costs that incur for and during the pilot testing will be handled by Colworths Australia.
3. The project will only provide a solution to communicate with the stakeholders involved in supply chain and not provide the supply chain solution itself. The transportation of goods from Colworths International to Colworths Australia is handled by Colworths International. The transportation of products from different suppliers in Australia to Colworths Australia is handled by Colworths Australia or the suppliers themselves. The delivery of goods from the Colworths store to the customer's location is handled using a third party delivery solution or Colworths Australia.
4. There will be unrestricted access to the employees of SITP Inc. who are direct and indirect part of the development team to the office premises any time of the day as it is anticipated that the employees will have varying working hours depending on the work load and employee preference.
5. The development team will have access to the server setup in place by Colworths International or part of the server required for development of the project. The access is assumed to be available during and after the completion of the project to support, maintenance and testing purposes.

4. Objectives

The objective of this project is to provide a new and exciting shopping experience to the Australian public with introduction of Colworths Australia. Incorporating latest technologies that are feasible to be implemented in public places, this project aims to enable the customers to shop in a friendly environment, avoid long queues in checkouts, assist them with easily finding the products in their shopping list, faster order processing and bringing the shopping experience to home through an interactive online presence.

To achieve the desired outputs, SITP Inc. is aiming towards the following goals:

1. Establish a hardware and network infrastructure for Colworths Australia through latest available technology.
2. Enhancing the supply-chain process between Colworths Australia, Colworths International, distribution centers, various suppliers within Australia and customers by providing effective communication channels.
3. Provide self-checkouts for customers by using smart trolley having payment options within the stores which will save them time and provide a better shopping experience.
4. Implementing robots in the warehouse or storeroom for processing the orders faster, again saving customers' time.
5. Introducing Colworths Australia mobile application and ecommerce website enabling the customers to shop from the comfort of their home.
6. Implementing RFID barcode scanner enabling the customers to shop with their Colworths Australia app in-store without having to carry the products or use a trolley and collect their items in checkout with efficient order processing.
7. Fulfilling the customer's needs and delivering the project on time.

5. Final Solution Overview

5.1. Solution Introduction

SITP Inc. is an Australian based organization located in Sydney. SIPT is an expert in developing, implementing and managing multiple ongoing IT projects across the Oceania region.

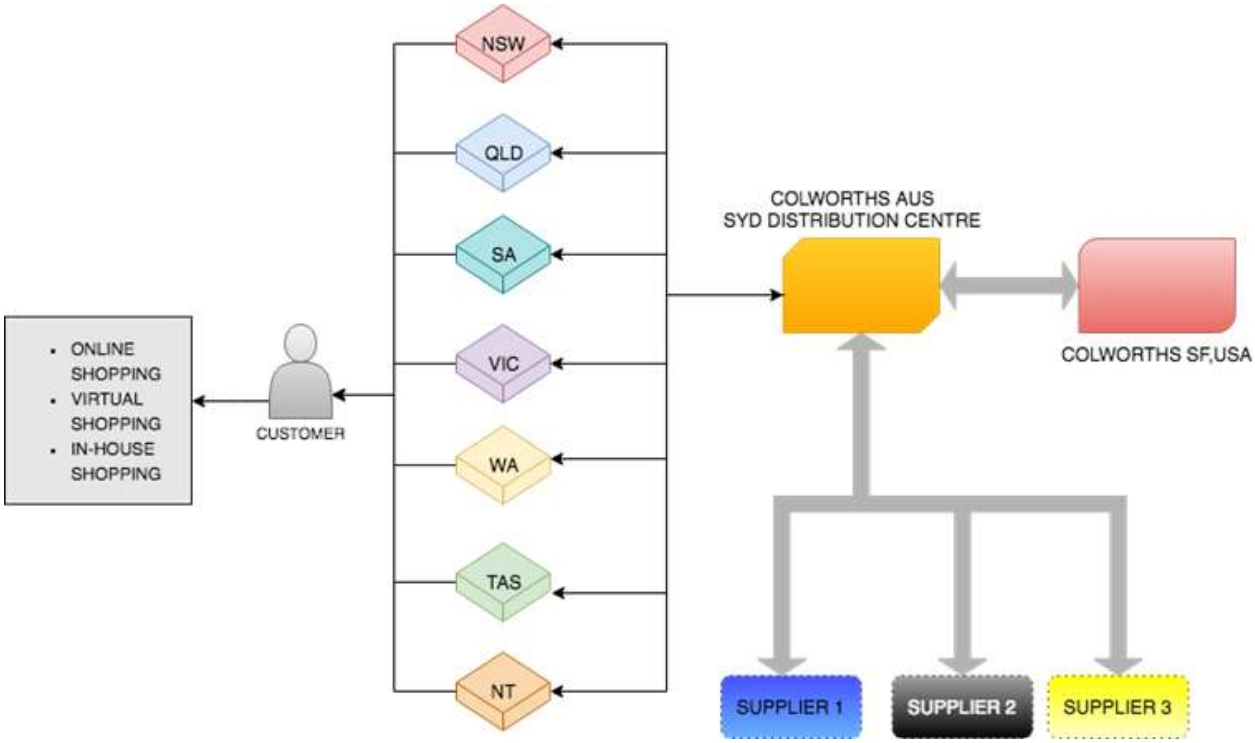
The final SIPT solution for Colworths Project consists of a SIPT Smart Shopping Idea which will enhance the conventional Colworths shopping experience to an easy smart customer shopping experience by leveraging beta-technology.

This supermarket 'will enhance and take the supermarket shopping experience well into the future and to this end are envisaging the project moving towards interactive stores and virtual stores' (Leveaux 2018). Additionally, it will 'take the new shopping experience directly into the family home as well' (Leveaux 2018).

In this proposed Colworths Supermarket Australia, you will be amazed by the implemented beta technology in action consisting smart trolleys and robots.

5.2. Solution High Level Description

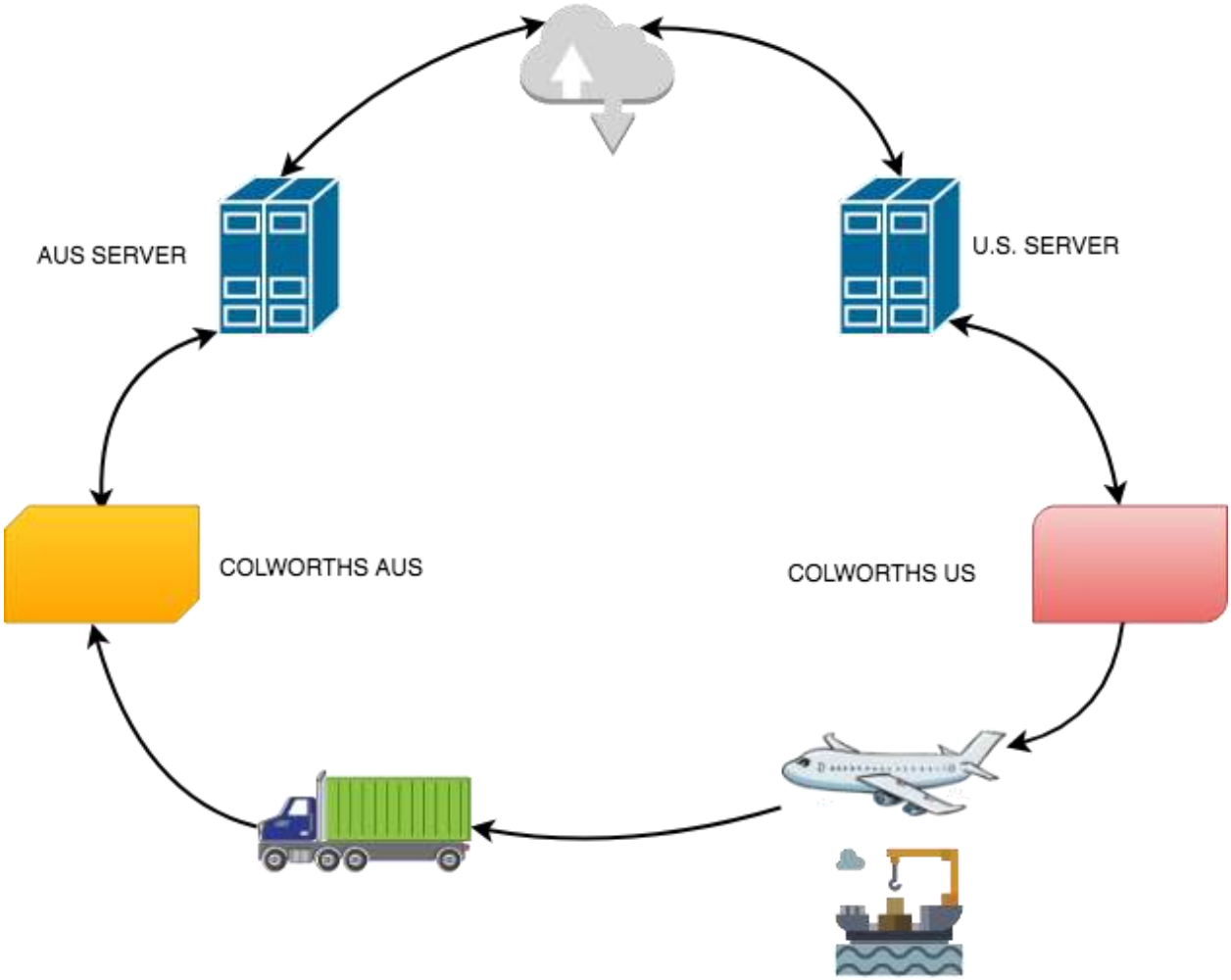
To understand the solution in depth lets first discuss the high-level diagram of our solution.

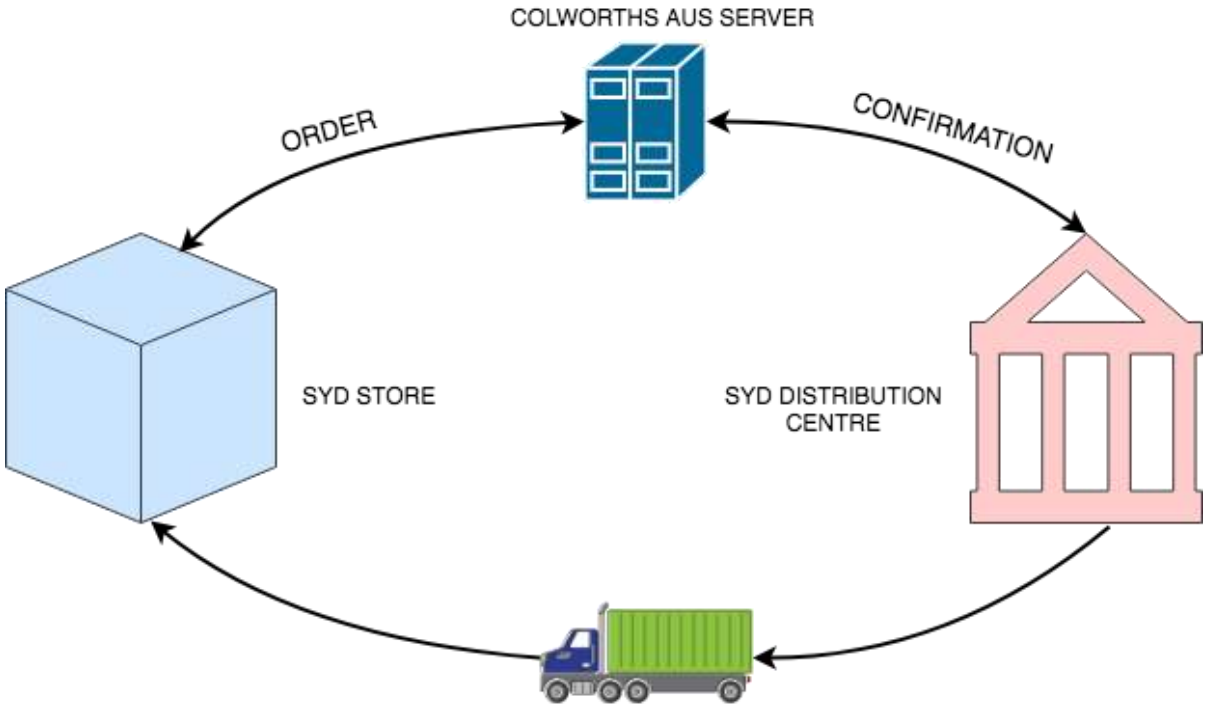


The above figure 1 provides a high-level overview of the solution for Colworths Australia. Firstly, Colworths San Francisco, USA Distribution Center will provide the promoted USA based products to the Colworths Australia Sydney Distribution Center and the Australian products are supplied by the local suppliers. Then when the business successfully runs and grows in the Sydney Ultimo supermarket, Colworths will expand to all of the major cities in each state of Australia namely as follows:

1. Church Street, Brisbane, QLD
2. North Terrace, Adelaide, SA
3. Collins Street, Melbourne, VIC
4. St George's Terrace, Perth, WA
5. Elizabeth Street, Hobart, TAS
6. Cavenagh Street, Darwin, NT

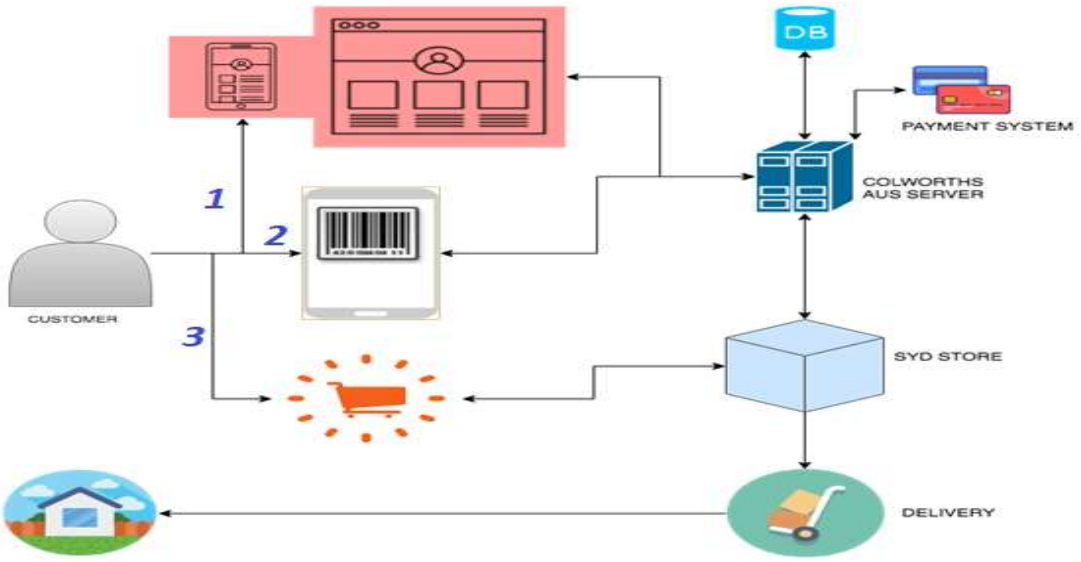
But the main distribution center of Colworths Australia will remain in Sydney where the USA based products will be received, stored and distributed.





Now let's move on further to the customer supermarket experience. Here the customers have interesting three types of shopping experience as follows:

1. Online Shopping
2. In-store Virtual Shopping
3. In-house Shopping



1. Online Shopping

   In this customer shopping experience, the customer can shop online through the user friendly Colworths online shopping app.

In this app customer can search and find products listed on the app. Add the product to the basket i.e. a shopping list. Continue shopping or buy the products. Lastly, they can checkout and pay via online credit card payment.
The Colworths shopping app will be directly connected to the Colworths Australia server and database.
Then the Sydney Colworths supermarket will prepare and pack the customer online order and deliver it to the customer's desired address.

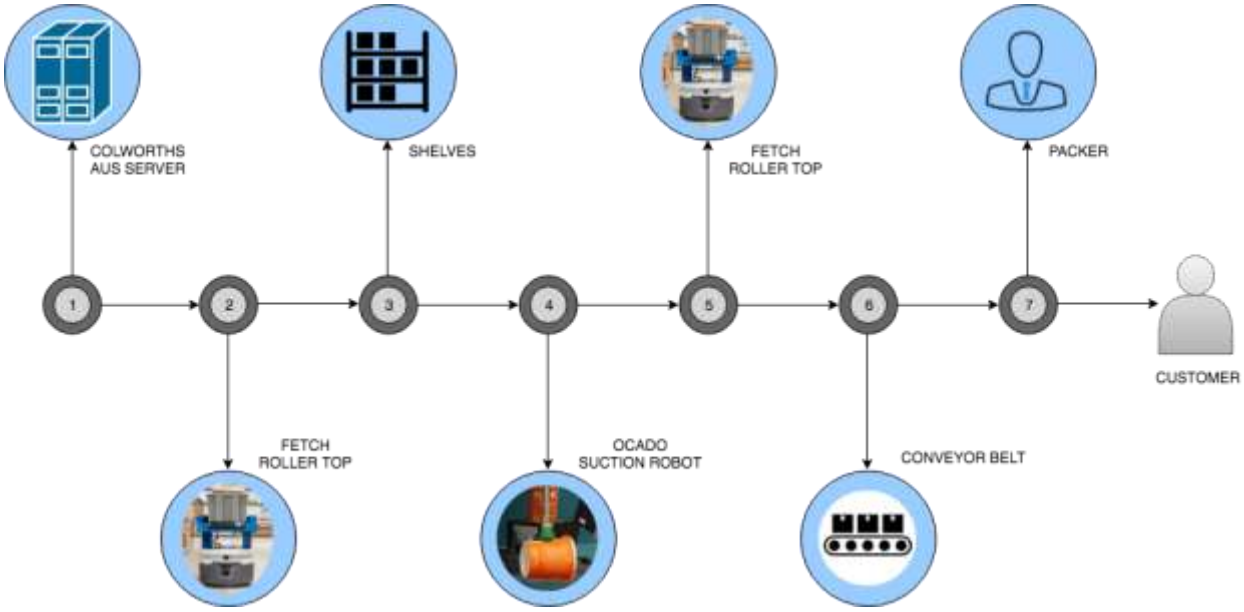
2. In-store Virtual Shopping

   In this in store virtual shopping experience, customer can shop in an exciting virtual setting. Here the customer can scan the desired items through the UPC scanner inbuilt in the Colworths online shopping app and the app automatically adds the items in the cart.
   The Colworths shopping app provides a map guidance to find the items in-store and also provide recommendations and ongoing offers.
   The customer can add, delete and edit the items in the app. In this virtual shopping experience, they can pay by two methods. First, the online card payment option through the app and the second option is paying by cash on the cash counter located in the store. Also, finally in the end you can collect the order from the counter neither less from what option you choose to pay or choose the option to deliver at the desired address.

3. In-house Shopping

   In-house shopping is especially made for the customer who like to shop in the traditional manner but Colworths provides a small twist of technology in it to support both the traditional and the future technology trends.
   In this shopping experience, the customer shops in the traditional manner but with a technologically advance smart shopping cart.
   This shopping cart has some cool features which will drop your jaws. This smart cart has the feature to follow you. Therefore, you don't have to worry about dragging a heavy trolley. This magical trolley has a technology working behind it which is Microsoft' Kinect.
   This smart cart also has an amazing feature of an interactive screen with a UPC scanners and it can be synchronized by the shopping list using RFID technology from your Colworths shopping app.
   Therefore, you can pick the items listed from your shopping list guided by the maps, scan and put them in the smart cart and pay when you are done as the smart cart is integrated with the online payment system including online, eftpos and cash. Therefore, it helps shoppers to get through a quick checkout.
   The smart carts are directly connected to the Colworths server and database.

Now let's have a detailed look at how the customer orders are handled in the warehouse. The below figure explains this in detail.



1. First the Colworths Australia server contains the customer order information.
2. The fetch roller top robot collects customer order data from the Colworths Australia's server.
3. The fetch roller top robot goes to the shelves where the customer desired items are located.
4. The Ocado suction robot sucks the items.
5. The Ocado suction robot then places the item on the fetch roller top.
6. The fetch robot takes the items to the conveyor belt and pushes the basket of items to the conveyor belt.

The packer packs all the items of the customer order and gives it to the customer.

6. Stakeholders

Following are the internal and external stakeholders defined for this project with their relative interest and concerns for this project.

6.1. Internal Stakeholders

Internal Stakeholders	Interest / Duty	Engagement Proficiency
Customers	Should be able to do shopping according to their needs and all of their information should be secured within the system and best customer service should be provided with appropriate help and documentation if need	There should be a clear understanding of all the customer requirements and the chief communication officer must create a proper channel between customer and to the individual workstation so that organization should be able to get timely feedback from them as to keep the system updated
SITP Project team	Providing the best feasible solution to the Colworths to not only make the SITP more reputable but also to build a long-term business relationship with clients by delivering project on time, best maintenance and being adaptive to business and scope changes according to timely needs	Managing the working environment maintain a clear communication channels, to get the best result out of the project. So that clientage can be increased across the Oceania region and future references can be made
Client Project Manager	Accessing the feasibility of the project solution and adding business value to the organization. Ensuring that project is on track and should be delivered on time without any drawback	Increasing the productivity and efficiency among the team members and making the best use of communication skills to get a clear understanding of problem
Assistant Manager	Managing the project under the directions of higher authorized person and Understanding the capabilities of the team member and assigning appropriate task to the best person for that job	Filling the communication gap between the project team and manager. Sharing the common knowledge that the project should be delivered on time.

Chief Financial Officer	Providing final approval of the budget for the project and making the funds available by making timely financial decisions	Create a budgeting structure
Chief Technology Officer	Ensuring that IT infrastructure is up to date and is adding value to business by increasing the productivity and efficiency of the organizational processes	Improving the IT/IS system
General Manger	Making polices for the organization and ensuring that right procedures are being carried out in organization	Maintains organizational code of conduct

6.2. External Stakeholders

External Stakeholders	Interest / Duty	Engagement Proficiency
Smartcart	Smart Cart provider	Provides innovative and effective technological hardware devices. I
Oracle	Database hardware provider	Provides Database management services and hardware with best prices.
Smartpay	EFTPOS terminal and services provider	Processing payments quickly and effectively
Cisco	Networking hardware and IP phone providers	Provides best services with reasonable price.
Ocado	Provides suction hand	Best online market for buying quality robots
Fetch Robotics	Fetch Rollertop robot providers	Quality warehouse robotic solutions with reasonable prices
Apple	Providing operating system	Quality software related tools

Google	Providing operating system	Quality software related tools
Microsoft	Providing operating system	Quality software related tools

7. Solution Technologies

7.1. Smart Carts

Name: Smart cart
Provider: SMARTCART

Overview:

Smart cart is still a beta technology and it has been tested in some supermarkets, but the technology provider is making some improvements in its features. As the basic idea behind the smart cart is to make shopping easy for the shoppers by helping them finding items in the supermarket from their shopping list, providing them an easy way checkout and alerting shoppers about ongoing offers or promotions.

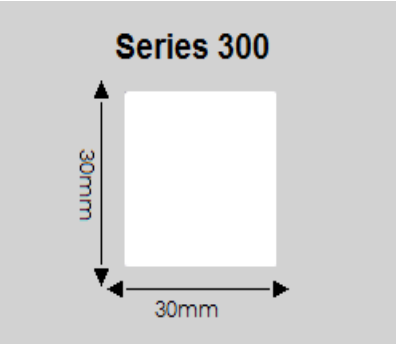
Working:

As the Conventional way of shopping is going through an upgradation process with the innovation in technology, therefore using a push cart just for carrying items is old school , SMARTCART has built a Cart which is smart enough to not only carry items for you , but shopper can add a shopping list by interacting with the LCD screen installed on it or through mobile phone Application , and the trolley with navigate to find items in the supermarket from the shopping list , it has an RFID reader which will scan the RFID on the product when the item is added to the cart and user will also get alert of offers on product through the LCD screen. After all the shopping is done the system will prompt the shopper to checkout by paying through EFTPOS terminal installed on it.

Benefits:

- Shoppers do not have to remember the items while shopping.
- Shoppers can easily find the items they are looking for in the Colworths supermarket.
- Shoppers will be notified for all the promotions and offers on the products.
- The items will be automatically scanned when they are added in the cart and the price will be counted towards the total.
- Providing facility of removing products from the list of purchased items and its prices will be deducted from the total amount.
- Shoppers can easily checkout though smart cart without waiting in the long queue for payment.

7.2. RFID tags



Name: Highest-quality RF EAS Labels Series 300
Provider: Easitag

Overview:

RFID technology is been globally accepted to provide the best solution for asset tracking, product authentication. The series 300 Adhesive RF label is compatible with all the 8.2 MHz RF technology system. This technology is perfect fit for the products in supermarket as they are disposable and can be printed with the in-house barcode for pricing and even merchandising messages. These RFID tags are very popular for providing automated self-checkouts and inventory tracking in the warehouse.

Working:

The RF label provided by the Easitag can be printed on all the products in the colworths, as the RF label are pre-printed with the dummy barcode which allows over-printing, so it will contain all the product's inhouse information such as prices and expiry date. Further the RFID reader installed in the smart cart will be able to scan and detect the RF Label which will be helpful for the cart to find the location of the product in the stores through Radio Frequency and once the product is placed in the smart cart it will get scanned and the price of the product will be added to the system displaying on the LDC screen attached to Smart cart.

Benefits:

- Provide automated self-checkout for the shopper as the RFID label on the product get scanned when placed in smart cart.
- Cart will be able to detect the location of product in the store through RF technology.
- The barcode printed on the RF label will contain all the information about product's expiry, price and promotional offers.

7.3. EFTPOS terminal

Name: EFTPOS Machine
Provider: Smartpay

Overview:

EFTPOS stands for Electronic Funds Transfer Point of Sale. As with the advancement n technology the debits and credit card are the most common and easy payment option at the point of sale (POS). There are only seven EFTPOS terminal providers and smartpay is one of those service providers. For the automated self-checkout on the smart cart there should be an EFTPOS terminal installed on each trolley as when the shopper is one with shopping they can pay by EFTPOS linked to the payment system by tapping their credit or debit card on it.

Working:

As when the shopper has scanned all of there item they wanted to purchase, the system will calculate the total price of the products and will prompt the shopper to pay. The shopper can pay by tapping their credit or master bank card on the EFTPOS machine and the total amount will be deducted from there bank account. The smartpay has their own acquiring bank, once the colworths is approved by the bank, they will issue a merchant id code and Smartpay will configure this code to the EFTPOS machine for taking easy payments.

Benefits:

- As this lowers the shopper risk of carrying large amount of cash.
- Shopper will be able to access payment methods like tap and go, Apple and Android pay.
- Enables shoppers to avoid long queue for payment.

7.4. Fetch Roller Top Robot

Name: Roller Top
Provider: Fetch robotics

Overview:

The Roller top robot provided by the Fetch Robotics is the best solution to transport the items to the conveyor belt for the packing process, as the height of the roller top robot is adjustable so that it can easily transfer the basket filled with customer ordered products placed above it to the conveyor belt without any external assistance, it will not only increase the efficiency and productivity in the backhouse order processing but also will decrease the employee workforce.

Working:

The Fetch Roller Top robot will be used in the backhouse for the order processing. The robot has a conveyor on top of it which can transport anything to the conveyor belt , but for colworths backhouse when a customer order something a basket will be assigned to that customer with customer id, which roller top robots will carry and will get filled with the customer ordered items from different shelves depending upon the product type and when the robot has collected all the ordered items in the basket it will move towards the conveyor belt at packing station and will then transfer the basket from conveyor to conveyor so that the customer order can be packed with the help of employee at each packing station.

Benefits:

- The Roller Top robot will make the order processing automatic which will increase the efficiency and productivity.
- Roller Top robot autonomously make there way to the conveyor belt.
- FetchLink controllers enable coordination of conveyor-to-conveyor handoffs.
- It provides a guaranteed millimeter level precision, to make the conveyor to conveyor interaction more reliable.
- The obstacle avoidance feature ensures the save collaborative operations around the people.

7.5. Ocado's Picking Robot on every shelf in backhouse

Name: Ocado's picking robot

Provider: Ocado Technology

Overview:

Ocado Technology has recently developed a picking robot which is still a beta technology and it has been going through the testing the phase in highly automated warehouses called as Customer Fulfilment Centers. The picking robot is designed for picking up the range of different groceries. The robot is capable of picking different shaped objects can work effectively in a fast pace of grocery picking process. The algorithm controlling the robot will ensures the location of shelves and an optimal grasp point of items within the shelves and further it will also be able to search for the free space in the delivery basket placed over the Roller Top robot so that it can pick and place multiple products in the same order.

Working:

The Ocado's picking robot is very much capable of working in a fast-moving nature of warehouse and it can process more then 260,000 orders per week. The picking robot will be attached to each shelf in the colworths backhouse, robot consist of a suction cup attached to an articulated arm. The arm consists of an air compressor which is capable of lifting the items regardless of it shape. Once the Fetch Roller Top arrives to the shelf the picking robot will transfer the items to the basket over the Roller Top robot according to the customer order, moreover there are sensors attached to the picking robot which will make sure to avoid the risk of crushing or damaging the items during picking process.

Benefits:

- It will reduce the employee workforce in backhouse order processing operations
- The robot can work more effectively and fast then the workers.
- It will avoid the risk of damaging or crushing the items while picking and placing items in the basket over Roller Top robot.

8. Hardware and Network Infrastructure

8.1. Overview

The accompanying segment gives point by point information about the hardware and network infrastructure which will be utilized to setup the Virtual supermarket. Picking the correct hardware equipment has lots of variables to consider and have to be very informed and attentive about our choices. It is very essential to bridge the gaps between our short term requirements and long term goals when we choose between the different types of hardware tools. While settling on the choices of choosing the correct hardware our own personal experience and expertise knowledge plays a big role in that. It is most likely that speed and performance should be taken care of the most when we finalize our infrastructure of a project.. Offsetting the expenses and implementation has been the important part for the SITP.

8.2. Servers

Dell EMC

Description: VxRack Flex system enables a tremendous scalable system. It is a Flexible system which can add computing power, storage capacity, network resources without being bound by any natural periphery or boundary. This system has a key design implemented which is networking that comes with the product as a total solution. The minimum configuration starts with 4 nodes only and consists of Top of Rack (ToR) switches and system controllers (Company 2018). Expansion is rather simple just by adding nodes to the rack.

VxRack system uses the ScaleIO software defined storage technology. This software uses local disks and local area network of existing system nodes to create and support a virtual Storage area Network (SAN) (Geek 2017). VxRack system is designed for implementing in networks where large number of users and transactions exists.

Oracle Spark

Description: Oracle SPARC M8-8 server comes from the well-known M processor series. It contains the state of the art latest processor M8 which was released recently. It provides wide key data encryptions and makes it stand out from the crowd with near zero performance drops. Because of the advanced M8 processors it is twice as fast compared to the competitors in the market for Java software, database and enterprise applications. It is an 8 processor system which is ideal for enterprise workloads and high performance at a lower cost. It has been designed to maintain maximum up-time with high scalability and resiliency. One of the most interesting advantage of this system is that it offers more than one physical domains. This allows a flexible solution which helps in segregate workloads or applications in a single managed system (Oracle 2018).
It has 32 core and 5.0 GHz SPARC M8 processor. It has sixteen dual inline memory module slots per processor and 8 TB maximum memories per system. This server has six AC power supply units which are hot swappable. It also comes with redundant hot swappable service processors which has automatic failover capability.

8.3. Network

We will use the Cisco products for the networking of our virtual supermarket system. The Cisco products for networking are of best quality and are considered the most reliable for use in the implementation of big projects as this one. Following are the Cisco products we will use in the networking.

Cisco integrated services router (3900 series)

Product: Cisco 3945 Integrated Services Router
Description: Cisco 3900 Series Routers are ideal for large business deployment purpose. They are high performing and are designed to meet today's business demand for large organizations (CISCO 2017a). They are the enabler for WAN connectivity. These will fit perfectly with our virtual supermarket. Cisco 3900 Series provides energy saving features that includes intelligent power management and will allow technical teams to control power to the modules based on time of the day.

Cisco Nexus switches (5000 series)

Product: Cisco Nexus 5000 series Switches
Description: Cisco Nexus 5672UP switch will be used for the VxRack system. They will play key role in handling traffic for the VxRack FLEX system. These 5672UP switches are known for high performance and high scalability. Needless to mention, these switches are able to operate on Layer 2 and Layer 3 They come with up to 48 10GE ports alongside 6 true 40GE QSFP ports (CISCO 2018b). It also has 16 unified ports and has a latency of 1 microsecond.
As for the operational efficiency these 5000 series switches comes with advance analytics tool kit with buffer and latency monitoring. Ease of operation is enabled by providing single point of management and programmability.

8.4. Other Hardware

HD quality CCTV cameras

Name: Raptor 12MP (1.5x4K) Dome Camera with IntelliPro ID12V2812MI Provider: SCW

Overview:

Equipped with video analytics, raptor 12MP camera is multi-featured HD camera that can be used at campus buildings to maintain security in premises of campus. As these cameras can provide HD quality videos and can be connected to NVR, watch on the virtual market can be maintained in best way, no matter day or night, which makes it best suitable for this project.

Advantages:

These cameras provide 12MB Ultra High Quality @ 12 FPS and with 4000x3000 resolution which makes surveillance very clear (SecurityCameraWarehouse2018). Cameras are dust, rain and sprinkler proof so they can be used in campus building, outside doors and parking as well. Lens can be adjusted from 98 degree – 30 degree to get the best vision of everything. Also, as these cameras are loaded with IR night vision, it makes images and videos in low light clearer. These cameras are loaded with IntelliPro Video analytics which consist of following features:
Face Detection - Alerts or records based on the detection of a human face.
Intrusion Detection - Alerts or records based on people, objects, or vehicles entering and staying in a set region on the view.
Region Entrance/Exit Detection - Alerts or records based on something entering or exiting a configurable zone.
Line Crossing Detection - Alerts or records based on if something configurable virtual line.
Unattended Baggage Detection - Alerts or records when baggage or other objects are left in set virtual regions.

Object Removal Detection - Alerts when objects leave a set virtual region.
Audio Exception Detection - Alerts or records based on audio loss, sudden increase of sound, or sudden decrease of sound.
Defocus Detection - Alerts if a camera becomes out of focus.
Scene Change Detection - Alerts or records based on changes to the scene, for example somebody intentionally moving the camera.

HD quality surveillance

Name: The Edge 20 Channel 4K NVR

Provider: SCW

Overview:

The Edge 20 Channel 4K NVR is to connect all surveillance camera at central place. It can take 1080p video resolution input and with supported algorithms of H.264 and H.265, high quality videos can be stored with lesser size than original file size. It has 16 HDD slots and each slot can be connected with Hard Drive up to 8TB which makes total storage capacity of this NVR to be 128TB, which is efficient to keep track of daily feeds in central place. Hard disks can be easily detached and new hard disks can be attached to keep backup of old ones. It allows 4K recording, which, when integrated with surveillance cameras, gives HD output (SCW 2018).

Advantages:

More than just storing 128TB of high quality videos, Edge NVR also supports remote footage download, making it available to different places than just inside campus. With functionality of backup with either NAS or eSATA, the data loss probability gets decreased drastically. The NVR supports all platforms, including Windows and Mac and also has smartphone apps, which gives user, the flexibility of choosing their own and consistent platform with full system. It can connect 20 cameras of 4K resolution @ 22 FPS and assign hard disk quota for each camera individually. Also, the NVR has incoming bitrate of 320Mbps, which makes connection between cameras and NVR much smoother than other devices. Recorder has integrated motion detectors, which, when integrated with cameras, can be used to keep close watch in the campus and parking. Also, the NVR can be setup so that the video will only be recorded if there's any movement. By doing this, it will save large amount of space in NVR's Hard Disk. Also, in night time, or in restricted areas, if motion is detected, NVR can send email to authority to confirm as well.

IP phones

Name: Cisco unified IP phone 7931G

Provider: Cisco

Overview:

The Cisco Unified IP Phone 7931G meets the communication needs of retail, commercial, manufacturing workers, and anyone with moderate telephone traffic but also specific call requirements. Dedicated hold, redial, and transfer keys facilitate call handling in a retail environment. Illuminated mute and speakerphone keys give a clear indication of speaker status. A pixel-based display with a white backlight makes calling information easy to see, and Extensible Markup Language (XML) services deliver a rich user experience. The Cisco Unified IP Phone 7931G offers numerous important security features plus the choice of IEEE 802.03 a f Power over Ethernet (PoE) or local power through an optional power adaptor.

Advantages:

The Cisco Unified IP Phone 7931G is designed to grow with your organization. A dynamic, soft-key activated feature set allows the phone to keep pace with your requirements through regular software upgrades. You can easily move phones, add new phones, and change existing phone arrangements; users can simply pick up their phones and move to a new location anywhere on the network. The Cisco Unified IP Phone 7931G also provides accessibility features for those with special needs.

Desktop

Name: Lenovo

Product: Lenovo Think Centre M900 Small Form Factor

Description: Lenovo Think Centre series is already in use with Customer Support staff. It is a high performance machine. The basic features are as below –
Small and Flexible
6th Generation Intel Core-i7 processor
Memory 8 GB DDR4
M900 series are pre-loaded with state of the art Lenovo's specially designed dust filters.
Built in management system allows IT staff to login to the system from remote locations and handle any workload.
It is a formidable machine which is built to military specifications. It can handle very humid environment, extreme temperatures, uphold system stability with vibration and solar radiation (Lenovo 2018).

Commercial Refrigerators

Commercial refrigerator, a self-contained refrigerator that uses or is designed to be used with a vapor-compression refrigeration system and whose compartments are all designed for the display or storage of food, beverages or flowers at temperatures at or above 0°C. It does not include a household refrigerator, refrigerated buffet table, refrigerated preparation table or walk-in commercial refrigerator.

Commercial refrigerator-freezer, a self-contained refrigerator-freezer that uses or is designed to be used with a vapor-compression refrigeration system and that has two or more compartments, at least one of which is designed for the display or storage of food and beverages at temperatures at or above 0°C and at least one of which is designed for the freezing and display or storage of food and beverages at temperatures below 0°C. It does not include a household refrigerator-freezer or walk-in commercial refrigerator-freezer.

Commercial freezer, a self-contained freezer, other than a household freezer or walk-in commercial freezer, that uses or is designed to be used with a vapor-compression refrigeration system and whose compartments are all designed for the freezing and display or storage of food, beverages or ice.

Conveyor Belts

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. In our supermarket the robots will use the conveyor belt to transfer products from one place to another as explained in the implementation section.

Automatic doors

Automatic doors are one of the best modern inventions. All we have to do is walk up to the door and it magically opens for us. An automatic door is a closing or opening structure that is used to restrict access to an entrance through the use of automated technology. Doors can come in many types, such as swinging, rotating and sliding.
The primary purpose of automatic doors is to allow for objects to pass through an area. However, they are also used to control the physical atmosphere, such as blocking wind from entering the building, or acting as a noise barrier. Some automatic doors have locking mechanisms that automatically open the door when a card is scanned or by scanning a fingerprint. Automatic doors can usually be found in many shopping malls and office buildings.

The doors are able to detect somebody through the use of various sensors. There are many types of sensors that can be used. Most automatic doors use motion detection or optical sensors to activate the closing or opening mechanisms. The sensors are installed at the sides of the door to track motion. Automatic door sensors are used in industrial and commercial environments to allow easy access to a building, especially for disabled people. This makes entry to a building safer and more efficient.

One type of sensor is the pressure sensor. Automatic doors that use a pressure sensor have a large area that is placed in front and behind the building. The large area acts as a weighing scale. If the weight exceeds the weight limit that is set, then the door will open. Pressure sensors can also be used as a secondary sensor. If the primary sensor were to fail, then the pressure sensor will activate. If the pressure sensor detects while closing there is some sort of resistance, the door will avoid closing on that object.
Another type of sensor is the infrared sensor but we will use the pressure sensor for automatic doors in our virtual supermarket whether they are the customer entrance doors or the internal doors of the warehouse.

9. Software

This section outlines the software that SITP and the end users will be using to interact with the system. It will provide details about the applications and operating system that will be used.

9.1. Applications

As part of developing a solution various types of software are used to make up that solution. The applications that SITP will be using for development of the Colworths Mobile application, ecommerce website and project management are as follows:

Integrated Development Environment are the applications that software engineers and programmers use to aid them writing the software. Every IDE will have their own set of features and capabilities. And depending on the task in hand, IDE are selected by the developers according to their preferences. The IDEs that SITP will be using as part of the development process are:

	Name	Description
	Sublime Text	Sublime text is a cross platform source code editor with support to many programming languages.
	Xcode	Xcode is IDE for the macOS environment for developing software for iOS.
	Android Studio	Android Studio is an IDE specifically for developing applications for the Android operating system used in Android mobile phones.
	Notepad++	Notepad++ is a popular source code editor and text editor for the Windows platform.

	Eclipse	Eclipse is an IDE popularly used by developers for writing code for the web interface using PHP language.
	Visual Studio	Visual Studio is a robust IDE used to develop computer programs along with web applications and mobile applications

9.2. Operating Systems

With the use of various types of applications that cater to different needs, we also need appropriate operating systems to run them. Again, depending on the preference of the developers and staffs who will be using the applications, following are the list of operating system SITP will be using:

	Name	Description
	Windows 10	Windows 10 is an operating system by Microsoft. It is mostly used by the users and clients. This operating system will be implemented across all the system used by SITP.
	macOS High Sierra	macOS High Sierra is an operating system by Apple. This operating system is used in Apple computers and used by SITP developers according to their personal preference. It is a requirement to develop iOS applications.

	Red Hat Enterprise Linux	Red Hat Enterprise Linux is an operating system by Red Hat Inc. This operating system is the most preferred operating system by the developers and is secure and reliable.

9.3. Other Software

Other software that SITP Inc. will be using for this project will be for project management and to manage the source code version control. Following is the list of software used for the above mentioned purposes:

	Name	Description
	Monday.com	Monday.com is a project management software by Monday.com Labs Limited used for collaborating with the team, distributing tasks and keeping track of progress.
	GitHub	GitHub is software used for managing source code and version control. This is a must for development purposes as developers will be working in different aspects of the project and this software helps to keep track of the codes along with the changes applied.

10. Data Management and Database

Data management refers to all the aspect of the project that is related with data design, architecture, storage, execution and implantation. This section will deal with the data architecture and data integrity. SITP will use the latest version of database solution provided by Oracle that is the Oracle Database Release 18c.

10.1. Data Management/Data Integrity

Data integrity refers to the fact that the data we use in the process of transaction are reliable, accurate and not altered in any way. Data is a crucial part of this business as there will we various types of data needed for transactions. Hence, it is important that the data is not modified in anyway. The data management that will be implemented will ensure that all the transactions that take place between the sender, the receiver and the system will be unaltered, reliable and accurate as intended. SITP will have security in place that ensures the data transmitted between the sender and the receiver is secure.

Even after having a secure and reliable data management strategy in place, an audit is necessary to conduct check and balances to ensure there are no breaches in the data policy and the security of data. So, for the data audit purposes, SITP Inc. will conduct audit every three months to ensure that all the precautionary and correct actions are taken to ensure that the data that are stored and retrieved regularly are indeed reliable.

The following strategy will be implemented to ensure the integrity of the data:

- Application of security measures
  SITP will apply the most trusted and secure data protection mechanisms and method to ensure the data are protected. The engineers and database administrators will ensure that the practices and policies that SITP uses will make the database secure. SITP understands that the staff can be a source of data breach in any organization. Hence, SITP will provide data knowledge to staffs as part of the training session to make them aware about the importance of sharing critical information like password and the consequences of it.
- Encryption
  Data encryption is a standard in any application that is dealing with transfer of data over the Internet. So, it is without doubt that SITP will incorporate data encryption in all the transactions that arises with every request from the applications. This helps to reduce the occurrence of data theft in case it takes place and ensures that the information is protected.
- Access control
  Only limited and authorized personnel from SITP will have access to the physical location of where the data will be stored. The place will have limited access and high security so that there is no physical harm to the infrastructure and no alteration of data can take place. The staffs who will have access to the infrastructure are the database administrator and network engineer. A strict policy of maintaining a log of access to the premises and no admission of data storage device will be implemented to address accountability.

- Audit
  As part of the assessment, audit will be conducted every three months on regular basis and on request to ensure that the data integrity is maintained and all security measures are in place according to the policies.

10.2. Backup Strategy

SITP will implement proper database backup strategy such that in case of any unfavorable situation the data can be recovered in full and without any alterations. It will be the duty of the database administrator to ensure that the database is backed up in scheduled time and in designated places. And, if in case there is a failure in scheduled automatic backup the available administrator will react in short notice to initiate manual backup.

As part of the data backup strategy, SITP plans to have the data stored in two locations. One in the premises of Colworths Australia and the other in Colworths International servers. This strategy will ensure that the data is secure and can be retrieved in case of accidental physical damage or data loss.

Regarding the backup, all the data in the Oracle 18c will be backed up two times in a day with automatic scheduled backup queries that will initiate in time. The data will be transferred to the Colworths International servers. In case of a failed backup the system will contact the project manager and the database administrator via email and SMS alert so that they can look into the issue. It is understood that the Colworths International will have its own data backup strategy in place such that the data from Colworths Australia that is being backup in Colworths International servers are again backed up in another location.

For the recovery of data, the database administrator will identify the point of extraction to for the database before initiating the recovery process. The Oracle 18c database is efficient enough to identify the recovery process and the daily transactions such that the data will be automatically synchronized after the recovery.

10.3. DBMS

The DBMS is the overall design and solution to the data management. As data is the lifeline for any organization, data should be managed efficiently and proper DBMS assists in managing such. The key aspects any DBMS are to create, retrieve, update and delete. But having other aspects as security and access control helps to ensure the data integrity which is important as identified in earlier sections. Correct and maintained DBMS will helps to ensure that the process are quick in transactions with minimum resource utilization. In due time there will be many transactions that will be taking place at a moment and if the database is not optimized then it can use the processing resources extensively causing failure in system. Considering this DBMS is an important part of the solution.

Oracle 18c will be the preferred solution for our DBMS purpose as it provides the latest features that we require to design, secure and implement the database for Colworths Australia. The Oracle 18c introduces features that can minimize the use of computational resource and conduct timely backups. It also has features like ‘Zero-Downtime Upgrade’ ensuring the database can be accessed even when there is an update process taking place. Considering our

experience with earlier versions of Oracle databases and the feature the current version provides, Oracle database release 18c is the preferred option for DMBS.

10.4. Database Management

With the launch of the system and Colworths and customers starting to use the system, terabytes of data will reside in the database. This is an evident scenario and with proper data management in place in the early implementation phase database management can be justified later. One of the tasks of the database administrator will be to regularly tune, optimize and apply patches to the database such that the database is in a healthy condition and performs at an optimal level every time.

Consumer data is a pool of knowledge for any organization upon which it can study and deduce potentially viable information such that it can identify the recent trends in the market and study the customers purchase habits to increase sales. SITP recommends that Colworths Australia implement Data Analytics to the data it collects over-time, both organizational data and consumer data, such that it can study its own progress, and the market trends and take actions accordingly to be a market leader with right decisions in the right time.

SITP also recommends that Colworths Australia consider using Amazon AWS S3 cloud services to back up its data. Doing this will ensure that the database backed in an additional location and the data in AWS S3 can be shared with analytics system or analytics companies to deduce results from. This ensures that the on-premises database will not be shared with external parties and the data security is maintained with achieving desired results.

11. Business Issues

11.1. Organizational Impacts

11.1.1. Overview

Let's discuss business issues which can be faced by this SIPT Colworths Australia Project. They are as follows:

1. Technology

Technology will continue to play an increasingly important role in retailing. Interactive apps, chat bots, augmented reality, beacons and robotics are at the forefront of newer customer-facing technologies in retail which are using some in our solution. But technology keeps changing all the time which will remain and issue in this technologically advancing era.
While the bells and buzzers of cutting-edge technology can be initially impressive, it's important for retailers to utilize the right technology for their business and customers. The most successful retailers continue to maximize the effectiveness of technologies related to their core infrastructure while also looking for ways to support their omnichannel efforts to ensure that all channels are integrated, provide a positive customer experience and enhance the brand. Smart retailers will also collect and analyze consumer data to drive decisions such as tracking sales and inventory.

2. Customer Preference

Consumer buying behavior is continuing to evolve as new technologies gain popularity and new demographic groups enter the marketplace. Convenience, experience and price will weigh heavily on buying decisions. Consumers want access to affordable products on their terms and will develop lasting relationships with those who meet these expectations. Successful retailers will continuously find ways to expand relationships with their customers, regardless of that customer's preferred channel. Retailers need to leverage technologies to better understand existing and target customers and maximize their omnichannel effectiveness.

Consumers in Generation Z, who already represent an estimated $143 billion in annual buying power, will require additional attention from retailers. These consumers tend to value authentic interactions with their brands, require competitive pricing, demand access to a vast amount of product information, and wish to see social responsibility and commitment from retailers. They are also more receptive to social media influencers than traditional advertising. Retailers who understand these expectations and build trust with Gen Z will create lasting relationships and brand loyalty.

3. Brand

Branding today is as much about how a retailer does business as it is the logo on the product they're selling; in today's competitive retail environment, differentiating a brand has never been more important. Successful retail brands understand who their customers are and build a community with them. Relationship building will be essential as younger generations, who value brand authenticity, begin to dominate the

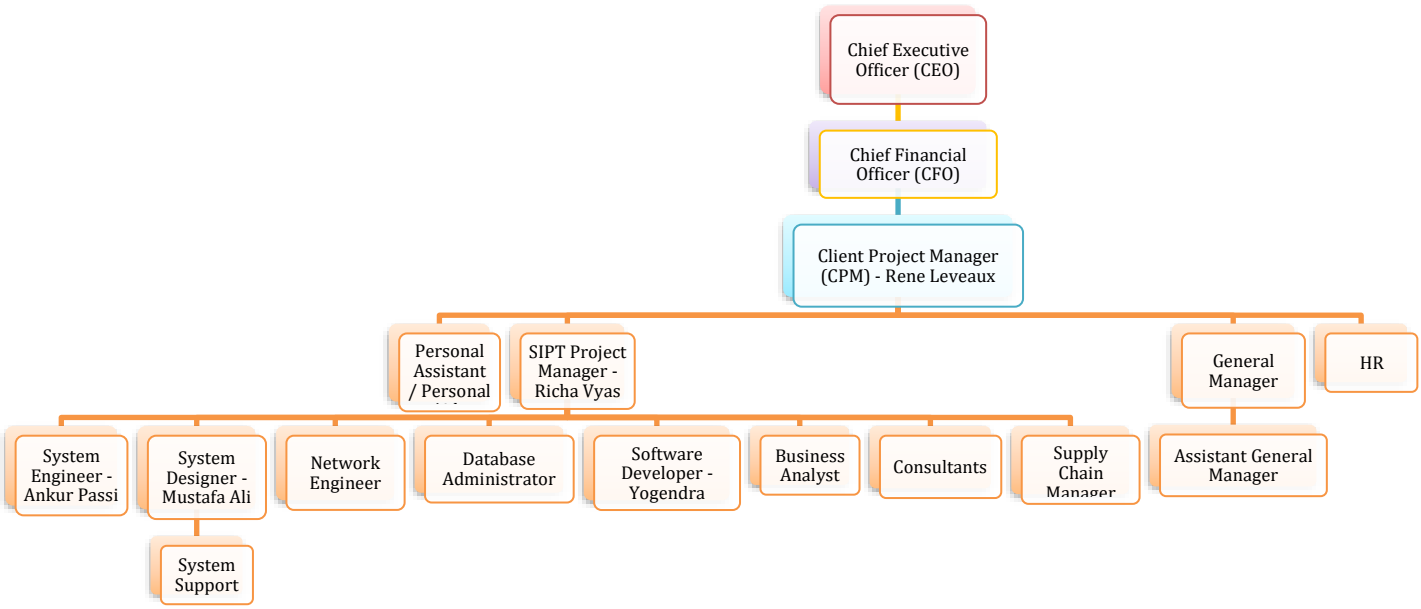
marketplace. Retailers who model their operations to accommodate the expectations of their customers will develop brand loyalty with today's empowered consumer. Therefore, for Colworths Australia it will be very difficult to build a brand as it will be new to the Australian supermarket industry and compete with the existing which have built customers trust from a very long time.

Nonetheless, brand risk in the digital age is significant. Brand awareness and loyalty can take years to develop but can dissipate quickly if retailers don't have appropriate safeguards in place to protect their brand. As retailers become more reliant on technologies that collect data to better understand their customers, they must be mindful of their responsibility to safeguard that data. Hackers will continue to wage cyberattacks on retail organizations on several fronts. Appropriate controls aimed at preventing cybersecurity issues, and well-designed and well-communicated incident response plans, will help mitigate, but not eliminate these risks.

4. Staff Reduction

Due to automation using robots in the warehouse of the supermarket, we will incur an issue of staff reduction which can be a business issue.

11.1.2. Organizational Structure



The Organizational structure shown in the above figure states that CEO is the head of the organization followed by CFO and CPM. Till this traditional hierarchical structure is followed but after this stage all work in an agile environment except the HR.

11.1.3. Business Processes

The Business Processes involved in the Colworths Australia Project are stated below.

Ideation>Concept Initiation>Marketing Review>Product Development>Product Validation>Manufacturing Validation>Start of Production>Market Launch>End of Life

New Product Development and Introduction
Product Portfolio Management and Season Planning
Enterprise Program / Project Management
Component and Standard Management
Product Development Management
Consumer Experience
Concept / Creative Design
Product Design and Development
Manufacturing and Operation
Quality and Regulatory Compliance Management
Supplier Quality and Sourcing Management

11.1.4. Change Management

Each organization faces changes and change can be good or bad. But we should be prepared for this change and describe the changes that might affect the organization and how to take responsive actions towards them. In this case we are following Kotter's model. (Armbrust et al. 2010) as follows:

1. Focus on the change business environment: Every change that are introduced into the project should be taken into action, even the policies and procedures are to be modified as the existing policies might not work along the new changes made. Finally, the new structure provides the base for future improvements (Rao 2015).

2. Communication: Every single change should be shared with the end user as they are the one who will go along the changes in future. We can then share these changes along various social media for receiving attention of other users. Communication helps to build a vision between employees and end user and helps to remove fear of the unknown.

3. Visionary: Every employee must have a clear focus and vision towards the project, so that the objective can be achieved on time and have better feedback.

4. Urgency creation: Examine and analyses the competitive position of our solution. This will help us to redeem the potential opportunities. A sudden change can always be introduced thus the response to the problem is crucial for both existing and future problems. (Sharma & Trivedi 2013)

5. Powerful Alliance: Form an active team to act as a coordinator who will have authority and proper knowledge and hold on the project. (Jonathan Hughes 2017)

6. Pluck off the obstacles: We remove both analytical and unreasonable causes or change by participation. Ownership is a major concern and introduced by people who are involved in this process.

7. Short-term wins: Every single contribution should be recognized and appreciated. This would help the employees to build positive attitude towards any change and inspire them to take risks which would help the organization in the long run.

8. Introduce the change in corporate culture: Provide a clear statement about the new procedures and map the success of the end-user. This helps to end the loop and extract the positive feedbacks from the end-users and can be left till any future changes are introduced.

11.2. Business Continuity

11.2.1. Overview

Business continuity planning is done to ensure that an organization can continue to function in case of disasters or other uncontrollable unfortunate events. Business Continuity Plan (BCP) lists the action items that can be executed to recover the system to an operational state within a reasonably short period.

Business continuity planning involves identifying potential risks, determining the impact of the risks on operations, implementing safeguards and procedures designed to mitigate identified risks, testing those procedures, and periodically reviewing the process to make sure that it is up to date.
The SIPT BCP includes 4 main steps:
a. Conducting business impact analysis for identification of time-sensitive or critical business functions and processes and the resources that support them.
b. Identify, document, and implement to recover critical business functions and processes.
c. Organize a business continuity team (which is a part of support team for SIPT) and compile a business continuity plan to manage a business disruption.
d. Conduct training for the business continuity team and testing and exercises to evaluate recovery strategies and the plan.
Activities of these four steps is shown in detail in the below image.

11.2.2. **Risks**

1. Process and control risks
These are risk sources within a focal firm and arise out of logistics and production processes as well as managerial actions (Christopher & Peck, 2004). These affect value adding processes and managerial tasks undertaken by a firm (Manuj & Mentzer, 2008). Christopher and Peck (2004) describe controls as the assumptions, rules, systems and procedures governing how an organization exerts control over the processes. Controls are the ‘’order quantities, batch sizes, safety stock policies and procedures governing asset and transportation management. Control risks occur due to failure in applying these policies or control measures appropriately.’’ Such risks vary from labour (strikes) or production (equipment failure, unreliable supply) to IT system failures (Ceryno et al., 2013).

2. Supply and demand risks
These risks comprise all risks emerging because of the actions of supply chain members (Juttner et al., 2002). These occur due to social and industry or market factors (volatility of consumer demand, supply constraints), political events and natural disasters (Chopra

& Sodhi, 2004). Juttner, Christopher and Peck (2003) state that these are external to a focal firm but are internal to the inter-firm network through which material, products and information flow. These risks affect supply and demand, and can disrupt flow of information or products between a focal firm and the market (Sadghiani et al., 2015). This relates to processes, control, assets and infrastructure dependencies of firms downstream and those directly connected to the focal firm (Juttner et al., 2002).

3. Environmental risks

These characterise all the potential risks triggered by socio-political, macroeconomic or natural events (Christopher & Peck, 2004). These are external to the supply chain network and may directly affect a focal firm or firms in the upstream or downstream.

4. Production risks

These occur when agriculture is "affected by many uncontrollable events such as extreme weather, pest and disease outbreaks" (Leat & Revoredo-Giha, 2013). According to Ogurstov et al. (2008), assessing catastrophic risks requires three dimensions; 1) the risk perception, which is the subjective perception of risk by decision-makers; 2) the risk attitude; the extent to which a decision-maker seeks to avoid risk or prefers to face risk; 3) the estimation of the probability and impact of catastrophes. In their study, Nyamah et al., (2014) examined different natural risk occurrences. The most likely to occur in Sweden are 1) Periodic deficit or excess rainfall; 2) Extreme drought; 3) Extreme cold; 4) Hailstorms; 5) Strong winds; and 6) Flooding. In addition, biological and environmental risks were identified such as; 1) Pests and diseases; 2) Contamination due to poor sanitation; 3) Human contamination and illnesses; 4) Contamination affecting food safety; 5) Contamination and degradation of production and processing methods. This output variability risk is one of the most important for farmers; empirical research into farmers' risk perceptions typically find that farmers are primarily concerned with production and price output risk, with price ranking highest in nearly all studies.

5. Warehousing risks

There are security and traceability related issues in food product storage (Srivastava et al., 2015). In an OFSC, product safety and quality are major concerns arising from poor temperature management and fluctuations (Raab, et al., 2008). Logistics plays an integral role in a food supply chain and actions of third-party service providers can be a source of risks such as product damages. The use of third-party logistics providers may affect quantity and quality during transportation (Cai et al., 2013). Grievink et al., (2002) posit that seasonality in material production, critical conditioned transportation and storage procedures results in complex logistical planning and difficult transportation in organic food supply and retail. Negligence in maintaining refrigeration facilities may compromise product safety norms and cause cross-contamination (Srivastava et al., 2015). Bogataj et al., (2005) contend that failure to maintain appropriate temperature controls in a supply chain will diminish the net present value of tasks and their benefit in a cold chain. A major fire outbreak poses a big risk to operations as this can lead to property loss and interruption of normal business (Axfood, 2016). When such a risk occurs, it can trigger supply risks for all partners further down in the supply chain network (Juttner, 2005). Failure of robots in the warehouse can also be a very vital risk.

6. Price risks

Tangermann (2011) notes that “typical variability of output in agriculture also causes prices to fluctuate. On the supply side, the time required to complete the production process, for crops typically a year, mean that output cannot be adjusted in the short run when the price changes.’’ On international markets, price fluctuations are even stronger because “world markets for most agricultural commodities are relatively narrow, with only a limited share of global production entering into international trade."

7. Financial risks

Leat & Revoredo-Giha (2013) describe these as the "fluctuations in interest rates on borrowed capital, or cash flow difficulties if there are insufficient funds to pay creditors.’’ Nyamah et al., (2014) further explain that this vulnerability may appear depending on how financial flows are managed and controlled. This could be the consequence of the general lack of interest of financial intermediaries in agricultural production (Willer & Larnoud, 2016). The financial strength of the supply chain partners is critical to avoid disruptions (Vlajic et al., 2012). The exchange rate can affect profitability.

11.2.3. Backup Strategy

It is very important to make back up strategies no matter how strong and reliable your system is. Even though we would go for pilot testing at a location near Wynyard station we would still need a strong back up strategy. Here we explain the few points pertaining to the back strategies.

1) When the system access fails

If the system access fails customers would not be able to use the smart carts or the UPC scanners. In that’s case there will be simple trolleys available for the customers and in place of UPC scanners the item barcode scanning can be done at the regular scanning machines.

2) Server goes down

If the server goes down due to any unforeseen reason the whole virtual supermarket could come to a standstill. To create a backup for this we should have a cloud recovery platform that would be activated as per the need and data will be pulled off from the offline network or virtual storage, cloud real-time operation and retrieval operation will be performed.

3) Robots malfunctioning

If any of the robots malfunction the whole process will get effected by that as there will be less robots on the conveyor or in the warehouse. There should be a couple of robots always present if any other robot malfunctions. The technicians will be available within 12 hours to repair the robot and activate it again as required.

4) Power supply

If there is a problem in the power supply of the supermarket it may cause the whole system static. There will always be a backup power supply generator to back up the power in the hour of need.

11.2.4. Disaster Recovery

Our project team has composed a disaster recovery plan to guarantee the duration of the basic tasks and business processes in the event of a sudden happening. The point of this arrangement is for giving a successful arrangement that can use to recoup all the operational procedures inside the time span with the assistance of saved records that are backed up off-site. The disaster management plan will direct with essential methods to bargain crises circumstances.

In the event that a calamity hits on any business procedure, the obvious advance will be to go for disaster recovery, in any case, the procedure will significantly be simpler to execute if there is an earlier arrangement as of now been produced. A productive disaster recovery plan will bring the whole virtual supermarket system back on track. These are the various stages to go through for disaster recovery:

Stage one: Transfer the tasks to the crisis Disaster recovery reinforcement activity site. The association will get a time of 24-36 hours to do so.

Stage two: Restore the urgent applications and system availability setup to recover the crucial operational and business capacities.
Stage three: Restore information on the database to the essential information offices and other PC arranged frameworks. Refresh the database and system as the recovery work is in progress.

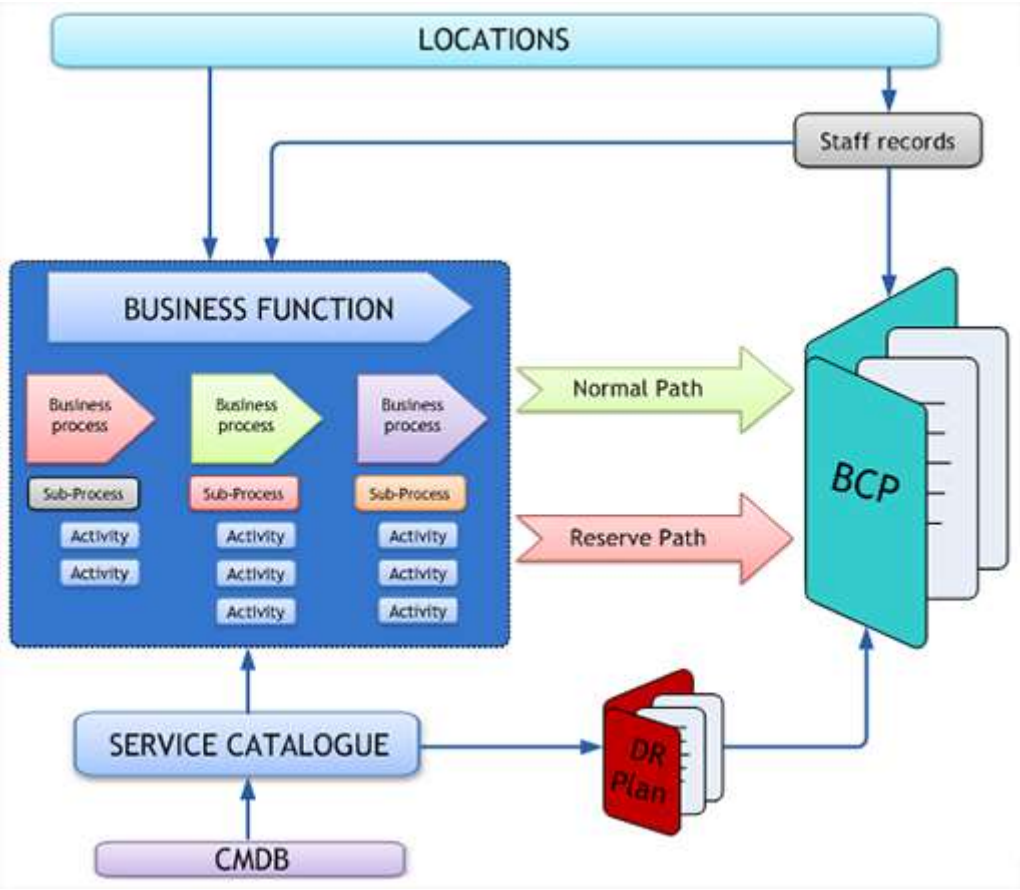
The recovery strategies plan is viable at the data center after repairs have been performed. All such stages if executed in a planned manner works well for the disaster recovery planning.

11.2.5. Business Continuity Strategy during Implementation

Having a Business Continuity Plan (BCP) for each branch and headquarters, including:

1. Business processes and Activities
2. Communication services to be used
3. Manual workarounds and ways of keeping records
4. Emergency scripts for communication with customers
5. Business applications and tools to be used
6. Disaster recovery capability – when to trigger
7. Instructions to put untrained staff straight into action
8. Disaster Response Team - when to activate an action

Here is how the main components of the plan implementation and maintenance fit together:



11.3. Staffing and Training

This section of the report will address the staffing requirement for the project and later discuss about the training required for staff.

11.3.1. Overview

Staffs with varying skills and expertise are required for the completion of the project as there are many aspect to the project. The staff needs are based on hardware, networking, database, software and business needs. More staffs are anticipated for the initial phase of the project and after the development has been finalized, it is envisioned that the staff numbers will be reduced focusing more only on the support, training and dealing with issues that arises along the way. In the initial phase of the project the estimated number of staffs required is 30 people.

11.3.2. Staff Requirements

Having network and hardware infrastructure in place is crucial for any project to start. So, the project will start with the implementation of the networks and hardware. Setting up the hardware is done gradually in different premises, so the same team of people will be working together. Later, when all the setup is completed, then the number of staff will be reduced for support only. Most of the staff will be required to maintain, develop, test and implement the software. So, the software team will be large as compared to others. And it will compromise of

business analyst, consultants and quality assurance. SITP acknowledges that the number of staff might not be adequate depending on the progress of the project. So, as contingency, additional staffs might be hired based on the expertise and need to complete the project on desired time.
The table below outlines the expertise and number of staffs required for the development and implementation of the project.

Expertise	Number of staff required
Project Manager	1
System Architect	2
System Analyst	2
Software Engineer	2
Network Engineer	2
Team Leader	3
Developers / Programmers	8
Database Administrator	2
Quality Assurance	3
Business Analyst	3
Consultant	2

After the completion and implementation of the project, number of staffs will be significantly reduced and the staffs required will only be for support which is outlined in the table below:

Expertise	Number of staff required
System Support	3
Team Leader	1
Network Engineer	1
Software Engineer	1
Database Administrator	1

11.3.3. Training Programs

Training the staff is a crucial part as they are the ones who will be using the system and run the processes. Immediately after the project is completed, training will start as it is important that the staffs know all the aspects of the system. The training will be conducted in phases. In the first phase the staffs from SITP will demonstrate and provide training to the managers and team leaders from Colworths Australia. In the second phase, 5 staffs from Colworths Australia will be chosen as advised from the management and SITP will provide training to the 5 staffs only. In the third phase, the 5 staffs who were chosen in the second phase will be providing training to different groups of Colworths Australia's staffs under the supervision of team from SITP. And with successful training being conducted in all of the above mentioned phases, the training will be handed over to Colworths Australia. However, SITP will access every training that are conducted and every three months assist or conduct trainings to the staffs

12. Project Management

12.1. High level overview of rollout

As Colworths Intl. seeks a new potential opportunity in the Oceania region and wants to establish a successful supermarket in Australia named Colworths Australia. The SIPT Inc. can successfully plan and rollout this stand-alone project successfully.

As the project is wide scaled, the SIPT Inc. recommends implementing this rollout in phases which will be explained further using PMBOK and agile methodology.
The high-level overview of this rollout has been explained before in the high-level solution description wherein we first open the Colworths Australia supermarket in Sydney as mentioned in the case study provided and then with the successful result of the Sydney outlet, Colworths Australia will expand to all over Australia.

Before the Sydney Colworths supermarket implementation, SIPT Inc. suggests running a pilot project in a different location within Sydney for market analysis and measuring the customer needs and check the initial project performance. In this way, indirect marketing can also be done in the process.
SIPT will make sure the project objective and requirements are met at each phase of the project. But as being an experienced company, we have noticed the requirements are not always the same throughout the project. Hence, we take the responsibility to meet the stakeholders consistently and satisfy Colworths Intl. changing needs if this is the case.

Hence, SIPT has proposed the most effective solution for the intended project covering the initial requirements of the project and once the tender is passed SIPT will immediately start the project following the project plan stated in this document.

The project will start with market analysis and requirement gathering for the pilot project in November 2018. Then the project is intended to run for 1 and half years i.e. till August 2020.

12.2. Project Implementation Strategy

The project implementation strategy is very crucial for the project's success. Here words are turned into action keeping the project strategic goal in mind. As this stage is very critical, mistakes can occur, and assumptions can go wrong as sometimes prediction and planning can differ from the real scenario. This section will briefly discuss the SIPT's project implementation strategy.

SIPT Inc. will built this Colworths Australia from scratch as Colworths USA wants to enter the Australian market. Hence, the implementation strategy is to launch a pilot Colworths store in Wynyard Station as Wynyard area is the hub for businesses with high public turnout in the mornings and evenings due to the fixed office hours. Therefore, is the best place for a pilot project to analyze customer needs, customer issues, project implementation and flaws.

By learning from the pilot project, we make changes in our implementation where needed.
Then we gather requirements, hire employees and implement Colworths Australia in Ultimo, Sydney.

We then spread Colworths Australia supermarkets in all the other major cities in Australia.

12.3. Project Plan

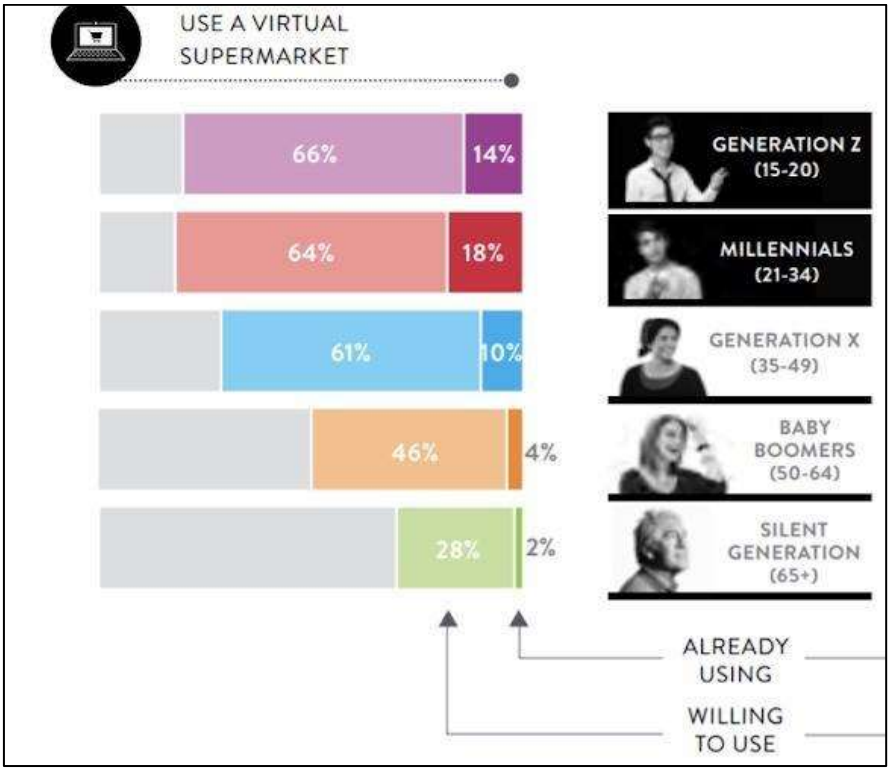
12.3.1. Phase 1 – Market Analysis and Requirements Gathering

This is the first stage of the Colworths Australia supermarket project. A good project always starts with a proper market analysis then gathers the initial requirements.

SIPT has done an in-depth market analysis using Nelson's 2015 survey report and BankWest's 2018 report for the Colworths Australia supermarket project.

As Colworths wants its supermarket following the future trends and implementing virtual stores. SIPT researched about the virtual stores and the results came out to be that "Globally 13% people are already using virtual store and 6-in-10 i.e. 58% are willing to use when available" states Nielsen's 2015 Survey Report
In this Nielsen's report many countries are included in this survey and interestingly one of them is Australia.

According to Nielsen's 2015 Survey Report Figure below provides the statistics for virtual store usage



Hence, people are currently using virtual stores but in less percentage as availability of virtual stores is very less.
But interestingly they all are willing to use virtual stores in high percentage in future.

Therefore, implementing virtual store is a smart idea and goes well with the market trend.

Now let's see how the Australian supermarket is.

"Australia has 2nd highest grocery shoppers and 52% Australians like self-checkouts" says 2018 Bankwest Report.

So now we know that it is safe to launch a supermarket in Australia as it is the 2nd largest grocery shopper and like self-checkouts which we are providing them in a more easy and efficient manner by providing smart carts.

Additionally, as mentioned before Australians use virtual stores and are willing to use in future which makes our platform stronger.
Now as the platform is set. We should gather the initial requirements of the pilot project which is the next stage.
This phase will take up to 3 months.

12.3.2. Phase 2 – Wynyard Station Pilot Smart Store Launch

Here in this phase we launch our pilot smart store anonymously at Wynyard station which will be a very small-scale implementation of the Colworths Australian supermarket.
Here we will not hire staff but keep volunteers which will have the chance to become a Colworths employee if performed well.
This pilot phase will run for 3 months.

12.3.3. Phase 3 – Analyze and Planning

This is a very crucial phase where we analyze the pros and cons of the pilot project and improve the cons detected.
In this stage we also plan for the implementation of Colworths Australia Ultimo branch.
The planning consists of everything from gathering materials from the suppliers to the training and customer support,

12.3.4. Phase 4 – Launch Colworths, Ultimo, Sydney

In this phase we finally launch our Colworths Ultimo branch for which we performed all of the above steps.

12.3.5. Phase 5 – Launch Colworths Australia Wide

Then finally in the end we will launch Colworths in all of the major cities in Australia due to a successful result from the Colworths Ultimo response.
Hence, this phase will only be implemented if Colworths Ultimo is a success.

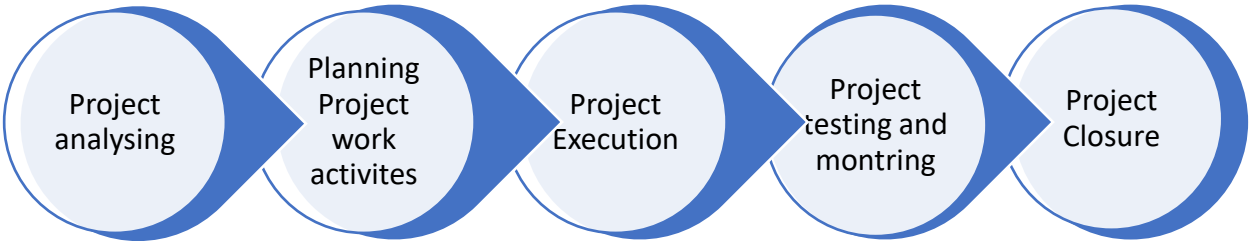
12.4. Project Management

Project management is the practice of managing processes, methods, skills and resources in order to achieve the project goals and objectives, furthermore it consists of different stages, like analyzing, planning, implementing, monitoring and controlling. Strategies are built by the project manager to handle the operations in all the phases of project lifecycle. For mega projects as Colworths large activities will be broken down into smaller chunks so that they can be easily measured, and the collaborative team work will be the strength of this project.

12.4.1. Project Planning

For the execution of proposed solution of Colworths supermarket following project planning phases are considered.

- Project market analyzing
- Establishing project work activities
- Project Execution
- Testing
- Project Closure.



SITP Inc. follows the above defined project management processes for all the similar projects undertaken by the company. As the company follows PMBOK project management methodology and having a consistent and pre-determined approach enables the company to finish the project with the 70 % less cost than the companies who does not have a pre-defined project management approach. Similar like every project management methodology before implementing the solution our company first starts with analyzing. The activities which are involved in the project analysis stage are scope analysis, stakeholder analysis, financial analysis and user requirement analysis as all of these activities are very much important at the current stage for proposing the most viable solution which not only meets the requirements of stakeholders, but it also add more value to the organization's business. Moreover, to create a proposal which is according to the provided business case study, effective communication channels will be defined to clearly communicate with the Colworths Int. so that if there is any misunderstanding or confusion that can be made clear and if there are any scope changes that can be discussed as well before proposal delivery. Additionally, the documents such as Gantt chart showing the detailed tasks allocation, network diagram, data flow diagram etc. have been added to the appropriates appendixes.

According to the management approach defined, each work activity will be tested and executed iteratively before implementation stage in according to meet the project requirements.

12.4.2. Project Timeframe

After analyzing establishing the work flow of the project the approximate time frame for the completion of this project have been decided which is approximately one and a half year, this includes the time of pilot testing and some reserve time as well. As the completion of the project mainly depends upon the initial planning phase, and most of which has already been done, so to be more precise it will take 540 days to complete the project. Furthermore, as the timeframe depends upon the assumptions and in scope work activities therefore if there will be any changes to the scope and assumption later at any stage of project execution the defined timeframe will be affected but still SITP management has also included some buffer time so that project can provide some effective result with in the duration of project completion. The customer support after the completion of the project will be provided by SITP Inc. for one year, and that time span has not been counted towards the project completion timeframe.

12.4.3. Project Monitoring

Project monitoring and control is a very important stage and it play a major role in the project manager's decision making process. As project monitoring involve the tasks which keep track of all the project related metrics, such as task duration, team performance, changes in procedures and also identifying the problems so that appropriate actions can be taken which make sure that the project is still on the right track and will meet the deadlines. It is the duty of the project manager to make proper communication channels so that if any decisions and changes in data are made, team should be aware of that and it will not only bring the efficiency among the team but also resources like time and budget can be saved from going waste.
SITP Inc will use appropriate monitoring tool and will diligently monitor and control all the processes, specifically any changes and modification in the processes will be focused by following the below given strategies in order to meet the project deadline.

- Performance of the team will be monitored for the given tasks
- Any unforeseen consequences that arise as the outcome of tasks will be documented
- Impact of Changes will be analyzed and change control will be enforced in all stages of project planning.
- Every schedule task will be monitored, and all the modifications will be documented.

To maintain the proper monitor and control checks following schedule will be followed by the SITP project team.

Team Meetings	**Purpose**	**Meeting Frequency**	**Stakeholders**
Kick off meetings	• Strat of the project • Team introduction • Meeting Stakeholders	once	• Project team • Project manager • Project stakeholders

Status check meeting	• Discussing task results • Updating new tasks	Daily	• Project team • Project manager
Problem review meeting	• Identification of issues • Defining risk mitigation strategies	Weekly if there are new risks identified	• Project team • Project manager
Change control meeting	• Document the changes. • Keeping team members informed about modification.	If necessary	• Project team members associated with it. • Project manager • Necessary stakeholder
Project progress meeting	• Reviewing project progress. • Checking the alignment of scope with project outcomes.	monthly	• Project stakeholders • Project manager • Project performance committee members.

Furthermore, monitoring and control following reports will be generated throughout the project cycle.

Project status report:

Project status report will be filled out daily and will be review by the project manager, as it will list all the tasks associated to respective team members so that if there are any tasks which are pending or not providing desired out can be reviewed and by looking to into the status of each task project progress be captured in the report.

Change request report:

Project change request report will consist of all the changes which are been requested by the circumstances. The request will be listed in the report with the appropriate reason for the change and what steps or tasks must be considered for implementing of that change. Additionally, it will also capture the impact of change on the project schedule and will be analyzed by the project manager and associated team member so that any unexpected delays can be avoided.

12.4.4. Project Human Resources

Human resource management is the most important aspect of project management as the people working on project – the project team is the major asset for any organization. It is the duty of project manager to closely monitor the human resources and ensure the effective communication between the team members, so proper communication strategies should be made by the project manager in order to get an effective and efficient output.
SITP Inc is very much concerned about the project human resources therefore following processes will be followed to incorporate the proper human resource management for Colworths supermarket project.

Staff Plan:

Staffing management plan will be made by the project manger in according to the needs and requirements of the project, and after analyzing the requirements by discussing with the stakeholders, appropriate team member will be considered by looking into there expertise and experience which can benefit the project and specific tasks will be assigned to respective team member in order to meet the project requirements and objectives. For the planning stage it is very much necessary to gather the right requirements otherwise resources can go waste.

Acquiring project team:

Once the requirements are properly analyzed, then the availability of resources are confirmed. The recruitment of the team members is done after the planning stage, so if the planning is not done properly then recruited team members will not be able solve the issues with there skills because the skills required for eliminating that problem will be lacking. Therefore, to find the best matched applicant against the vacancy, competence mapping will be done which will check is the candidate is competent enough for the task or not.

Creating project team:

After the recruitment of the team members proper briefing will be provide to them about the tasks and roles they have to perform so that they can effectively contribute towards the project objectives. The project manager will be responsible to have a follow up on their competency matrix. Furthermore, to make a team rather then bunch of individuals collaboration workshops will be held between the team members they will be introduced to environment in which they have to work. There could be some informal meetings held outside the workplace which will not only help to create the bonding among the team members, but it also will ease the pressure of work.

Managing project team:

For the management of project team, project manager will check every team member performance and will provide necessary feedback so that they can improve, furthermore project manager must have to build some rules which every team member will have to follow, and those rules will help in avoiding internal and external conflicts, cultural issues etc. Proper communication channels or tools will be provided by the project managers, as to maintain the flow of information among all the team members and it will help to avoid any issues associated to miscommunication. Project manager will be held responsible if any issues remain unsolved and it is impacting the project outcome which can lead to project failure.

12.5. Project Risks and Risk Management

Every project is prone to risk and it is certain that this undertaking will have some. However, SITP will do the best to foresee and undermine every possible risk that it can identify from the expertise of its staffs and from past experiences. SITP has identified four risks namely hardware, software, data and fraud risk for this project which are later discussed below.

Risk management is a crucial part of the project as it helps in mitigating any risk and ensures that the project is run smoothly and delivered on time. Risk management for Colworths Australia project is divided into four steps for every risk that arises. The four steps of risk analysis are identification, analysis, control and monitoring as defined below.

- Risk Identification –
  In this step the potential risks are identified. Currently, the risk identified are hardware, software, data and fraud risks as mentioned above. Moreover, more potential risks can be identified by brainstorming and keeping track of past risks. Keeping track of risks in the identification phase will ensure the same risks are easily identified in the future and that they do not affect future undertakings.

- Risk Analysis –
  Here, the risk that have been identified during the identification process will be broken down further by categorizing them in regards to what type of risk it is, what department or aspect of the project it affects and what impact the risk is likely to pose on the project.

- Risk Control –
  Based on what type of risk it is, the risk are treated accordingly. If it possesses a low level of risk it is then avoided or minimum resources are expended to resolve it. Further, the risks can be transferred or mitigated.

- Risk Monitoring –
  With the delivery of every steps with the project, risk related to it is reviewed, updated and documented.

12.5.1. Hardware Risks

Hardware for this project is the most crucial part as without finalizing on hardware the project cannot continue. Since, our main focus on this project is to provide the customers with a state of the art shopping experience with the latest available solutions, the hardware that we implement in this project should work seamlessly without any interruptions.

To make this project a success, we will be implementing hardware from different supplier for customer to make order and process the order. Also, the networking components are provided from various suppliers. In this case, the greatest risk in terms of hardware will be compatibility. Other risks associated with hardware are internal damages due to power failures, burn outs, defective pieces, accidental damages and external damages.

High degree of care and analysis will be conducted before any decision of applying any hardware components are made. If the hardware component raises any risk then the risk will

be dealt according to the severity as defined earlier in the risk management processes to ensure there is no delay in the project.

12.5.2. Software Risks

Similar to hardware, software are a crucial part of any project. Software are used by all the staffs to coordinate and carry out the completion of the project. And, any issues and problems related to software can cause delay in delivery of the project. So, SITP will be using software from reliable providers that have been tested and deliver desired results. Having said that, there is always a possibility of the software being used causing problems as risks. Some of the issues that SITP may face during the project are the software not being compatible with the database, defective, not producing desired results, recent updates to the software not compatible with hardware.

Software risks are less likely to occur, but some changes in the software and small bugs can cause huge impact to the project. Software risks that are new to the project team might mean they can take more time to mitigate or eliminate. However, we will follow the risk management strategy to solve any risks associated with software.

12.5.3. Data Risks

In this project it is anticipated that we will be dealing with huge amount of data during development, testing and after the launch of the final product. Data is the most important aspect of any business. Without data hardware and software are deemed useless and have no value. SITP will be dealing with transaction data, user data, financial data and enterprise data in the undertaking of this project and understands the need to protect the data from theft, loss and damages. The risks related with data can be significantly reduced by implementing regular data backups for data loss, enforcing strong firewall and adopting security measures to deal with data theft and implementing proper data management techniques to mitigate risks related to data integrity.

12.5.4. Fraud Risks

Fraud risks are the less anticipated and most likely to occur risk that arises in any type of project. Fraud risks can be caused by various parties that are involved in the project. They can be external vendors or some time internal employees. Whilst ever caution will be taken to minimize the occurrence of this risk by partnering with reputed vendors and working with experienced professionals, fraud risks occur. So, to minimize the effect of such risk, SLAs and OLAs will be in place to expect desired results from vendors and employees respectively.

12.6. Support

12.6.1. Overview

Customer support services will be provided by the SITP customer service department and all the issues related to the technological operation will handled by the customer support team and will be resolved depending upon the request priority. Furthermore, all the staff of customer service department will be available 24/7 Aest and for increasing the efficiency of support service SITP will also provide email and call communication service and customer can report the issues through emails or call to be fixed on urgent basis. SITP Inc minimum response time to any reported issue will be one day also it could exceed depending upon the severity of the issue to provide the guaranteed high-quality customer service.

12.6.2. Implementation Support

As Implementation phase is one the most critical phase in the project development lifecycle and project success and failure mainly depends upon it. There can be some uncertain risks involved while implementing therefore SITP project team is always aware of the risks and have the implementation managers that will build effective strategies as soon as the risk is identified, with the help of implementation support, team will try their best to mitigate any risk associated with the design, software or hardware implementation and inefficient management etc. Furthermore, the implementation managers will completely try to utilize the provided resources to identify the risks beforehand, so that it cannot affect the project output and project can be completed within the scheduled period.
SITP implementation support team will mainly focus on the project management implementation and infrastructure implementation and will also use the latest project management tools available for assistance.

Project management implementation:

Latest available tool such as Knight Spear's which monitor and track all the tasks and project progress with the help AI Work Coach Isabella, further it will help to make sure that none of the tasks delay due to improper management.

System Infrastructure implementation:

For the implementation of System infrastructure, SITP have assigned system consultants that always has some backup and disaster recovery strategies so that the impact of risks can be reduced to minimal level.

12.6.3. Long Term Support

For the long-term support SITP have a special customer service department that will directly handle all the issues reported and it make sure the direct communication with the clients.

Statement of customer service department:

SITP provides the high-quality customer service by

- Focusing on customer satisfaction
- Strictly following the time frame to provide response to all the reported issues
- Getting feedback from the client so that the company can further improve their customer support service
- Giving respect and courtesy to the customer
- Customer support team will always be highly motivated to improve the service.

Customer service department operations:

The SITP customer service department will receive all the issues reported either by calls or through emails and will directly response in order to provide support for the requested issue. The customer support team is able to provide the assistance in related to project technical issues of general FAQs. Furthermore, to make the process of delivering service more efficient all the reported requests or enquires will be categories into different levels depending upon its severity. If the issue falls in very severity level, then the support team will try to communicate through properly organized meetings with the clients or otherwise video conference tools will be used.

12.7. Service Levels and Agreements

12.7.1. Overview

Service level agreement plays a very vital role in measuring the performance of the project as it ensures that a certain level of service will be maintained in regarding to the use of technological devices and application, which are the part of project working solution.

The creation of service level agreement SLA will involve the external parties from which the products are been purchased or outsourced and Colworths Aus. Our company SITP will act as a communication medium between both as when some issues are reported related to products or devices that are purchased from some external companies, SITP support team will transfer that reported issue to the concerned parties. SLA is a very important agreement and in the result of its violation, external party may have to face consequences such as financial penalties and product replacement within the decided time. The minimum validation period of the agreement will be 3 years after the project completion and after that duration Colworths and SITP Inc can mutually decide to discontinue or continue the agreement.

The customer service department of SITP Inc will provide the support services after the one year from the project completion and all the issues will be reported and registered to the customer support team and will be addressed on the basis of its level of severity. Furthermore, for this project the major service level concerns will be in regards to the application availability and infrastructure reliability.

12.7.2. Application Availability

There are many applications that are the part of this solution like, Colworths mobile and web application, Knight Spear's project monitoring tool, robots for order processing and smart cart

application, therefore the agreements will vary between the applications. The table below captures the level of service that will be the part of agreement for the related applications.

Application/ Services	**Service Level**
Colworths mobile application	99 % availability 24/7
Colworths Web application	99 % availability 24/7
Fetch robots	97 % availability as it's a new technology
Ocado's picking robot	97 % availability as it's a new technology
Knight Spear's monitoring tool	99 % availability
Smartcart application	Issues should be resolved within 4 hours.

Is the service level agreement is made for any of the application then appropriate compensation will be provided to the clients, depending upon the severity of registered issue.

12.7.3. Infrastructure Reliability

The reliability of the infrastructure for this project is very much focused as the solution services that are the part of this project not only fulfils the current requirements of the customers but can also cater the future needs, therefor the network and hardware infrastructure must be reliable enough to make sure that the solution provides the desired output.
There will be audits on regular basis done by the system experts so that the quality standards which are required can be matched. For this project ISO quality standards would be considered during the implementation and execution phases, as these standards will make sure that the infrastructure is reliable enough to provide a consistent performance, SITP project team will make sure that there are proper monitoring and control checks so that every aspect of the project is well implemented.
Furthermore, the project will also have disaster recovery strategies. As backup plans are very much necessary for having a reliable infrastructure which involves, servers, application software's, networking and new technology which ensures that even if there is some issue the project can provide the required result and can run effeciently for a long period.

13. Costs

13.1. Overview

In the following section we have done a vast and expansive research about all the requirements including technical, non- technical, liabilities, Human Resources, smart carts and robots etc. All the estimated cost for the proposal is given based on our study of the whole project. It is assumed that most of the cost elements for infrastructure as well as technology will not be varied to a high extent and would remain constant. Any changes in cost if dynamic will be taken care of whether it is in the technology upgrading or the recurrence cost.

13.2. Solution Implementation Costs

A) Initial costs

In the initial part of the cost we have taken expert advice about the kind of software, hardware and technologies that will be utilized in the project. We will list out the stakeholders that will be responsible for the management and operation of the software and hardware of the solution referred to as the Human Resources. For all the integrated ideas and with all the research done for the various departments we have tabulated our pricing according to the department as given below:-

Various Stakeholders	**Quantity**	**Cost per unit**	**Amount**
Hardware section	3	35000	105000
Software section	3	27000	81000
Information systems section	4	25000	100000
Technology section	5	53000	265000
Travel costs	2	32000	64000
Consultation costs	3	4500	13500
Total costs			628500

We have taken expertise advice for the software components of costs and taken out our cost outcomes for the various elements as required within our scope which will make the solution much more efficacious and productive. Following is the table that shows the division of cost of the software used within our system:-

Software products	**Quantity**	**Cost per unit**	**Amount**
Software applications user licensing	15	18000	270000
Database and SQL related licensing	13	22000	286000
Added licensing for Add ons	10	5500	55000
Updates in Software	25	30000	750000

Operating systems (Windows, Apple etc)	23	4700	108100
Other security requirements	17	6000	102000
Total costs			1561100

B) Hardware and infrastructure costs

The hardware costs will heavily rely on the various kinds of robots used in the warehouse as well as the smart carts or UPC scanners used in the whole supermarket system. The infrastructure will also be dependent on the E-R diagram, software architecture and the topology of the networks as well. There will be lots of network components as well which will be included in the hardware section as well to make the system much more efficient. We should include all the latest hardware devices which will be used by the company. So the hardware and the infrastructure cost can be calculated in a single table as shown below:-

Hardware, networking and infrastructure components	**Quantity**	**Cost per unit**	**Amount**
CCTV devices	700	600	420000
Vending machine	30	900	27000
Smart carts	120	1500	180000
Fetch robots	30	15000	450000
Suction robots	30	8000	240000
UPC scanners	50	1200	60000
EFTPOS	40	800	32000
Servers	45	3500	157500
CPUs	20	1500	30000
Commercial refrigerators	25	6000	150000
Back up devices	15	1800	27000

Routers	20	9000	180000
WIFI for internet	1	1500	1500
Server switches database	30	7500	225000
Switch devices	350	600	210000
Conveyor belt	5	2500	12500
Memory devices	22	6000	132000
Cabling and wiring of the system	400	400	160000
Total costs			2694500

C) Stakeholder costs

No matter how virtual our system is becoming, we will always need a manpower to execute the project operations. The project team will consists of all the required project team members according to the project implementation phases. The implementation of robots in the warehouse to the installation of scanners or eftpos everything will require a proper management of a project team which should work in a well orderly manner. Every project personnel should be clear about their roles and responsibilities as required by the various task breakdowns. We have include both the project team as well as the support team which will be there to maintain the virtual store even after the whole implementation process has taken place. We have made assumptions that all the team members are well aware of their responsibilities and are capable and qualified enough to reach the best possible outcome.
Following will be the project team members who will work in the building of the virtual supermarket:-

Stakeholders	**Quantity**	**Price per unit (Annually)**	**Cost**
Project manager	1	130000	130000
General manager	1	120000	120000
Assistant manager	1	90000	90000
Project coordinator	1	85000	85000
Chief financial officer	1	75000	75000
System engineer	1	70000	70000

Quality assurance	2	65000	130000
System analyst	1	75000	75000
Chief technology officer	2	70000	140000
Consultants	3	60000	180000
Temporary staff members	4	50000	200000
Business analysis consultant	2	75000	150000
Associate developer	3	80000	240000
Database administrator	2	70000	140000
Information system support manager	1	65000	65000
Network analyst	1	75000	75000
Customer manager	1	70000	70000
Total costs			1935000

The employees of the virtual supermarkets will also be trained to become familiar with both the kinds of robots as well as the scanners so they can help the customers and guide them on how to use the new technology. All the technical and non-technical internal staff will be trained as well to adapt with the new technology in the supermarket. Following table shows the cost division for the training purposes below:-

D) Training costs

For the implementation of the project in a smooth manner there will be proper training sessions taking place throughout the year. These training sessions are very important for the internal employees to get familiar with the new technology and robots present in the virtual supermarkets. The following table gives us a good estimate of the cost for training as given below:-

Stakeholder training	**Quantity**	**Cost per unit**	**Cost**
Training the internal staff users	25	1500	37500
Training items or materials	5	2500	12500

Technical training for the project implementation members	15	1200	18000
Travelling costs for training	25	400	10000
Total costs			78000

E) Recurring costs

The recurrence costs is the cost which is mostly the personnel costs. The project is considered to be completed in 540 days so we need a 6 months recurring costs for the stakeholders as shown in the following table below:-

Stakeholders	**Quantity**	**Price per unit**	**Cost**
Project manager	0.5	130000	65000
Assistant manager	0.5	90000	45000
General manager	0.5	120000	60000
Project coordinator	0.5	85000	42500
Chief financial officer	0.5	75000	37500
System engineer	0.5	70000	35000
Quality assurance	1	65000	65000
System analyst	0.5	75000	37500
Chief technology officer	1	70000	70000
Consultants	1.5	60000	90000
Temporary staff members	2	50000	100000
Business analysis consultant	1	75000	75000
Associate developer	1.5	80000	120000
Database administrator	1	70000	70000

Information system support manager	0.5	65000	32500
Network analyst	0.5	75000	37500
Customer manager	0.5	70000	35000
Total costs			967500

The other recurring costs will be for the next training session that would take place for the whole personnel of the project team. The training costs for the next 6 months of the project implementation is given in the following table as below:-

Stakeholder training	**Quantity**	**Cost per unit**	**Cost**
Training the internal staff users	12	1500	18000
Training items or materials	3	2500	7500
Technical training for the project implementation members	8	1200	9600
Travelling costs for training	12	400	4800
Total costs			39900

F) Pilot testing cost

In our following project we will also carry out pilot testing at one of our decided destinations close to the Wynyard station. This will be a smaller version of the supermarket which could also be said a rehearsal to track the functioning of how this virtual market will go about and correct the flaws that could be seen in the pilot testing. We would need a similar staff for the small version of our virtual supermarket but the number of workers in the supermarket would be hardly 30% of the ones needed in the real supermarket. These workers would be called as volunteers who would be trained to work in the virtual environment of robots and guide the customers on how to adapt with the new virtual system. The following would show the expenses that would occur for the virtual supermarket pilot testing that would take place at Wynyard. The table showing the pilot testing cost is given below:-

Stakeholders or products	Quantity	Cost per unit	Cost
Volunteers	10	2500	25000
Hardware costs	1	35000	35000
Software costs	1	27000	27000
Information system costs	1	25000	25000
Technology costs	1	53000	53000
Consultation costs	1	4500	4500
Travel costs	15	400	6000
Total costs			175500

G) Maintenance costs

There will be a few ongoing costs which are added for the proper maintenance and updating of the system whenever required. Sometimes we may have to change a robot or there may be a flaw in a scanner, eftpos etc. To keep our hardware as well as the software updated and maintained on its high efficiency we need the maintenance costs as well. The overall infrastructure and database also needs regular check and upgrades as per the requirements of a system. Some of the following hardware malfunctioning is assumed for robots etc. as it may depend upon their application later. The following table shows the maintenance costs for our project as below:-

Maintenance products	Quantity	Cost per unit	Costs
Hardware updates	5	20000	100000
Licensing software	1	15000	15000
Database management and updates	1	25000	25000
Accidental mis happenings	2	20000	40000
Total costs			180000

It is assumed in the above table that hardware costs and accidental mis happenings are taken on an average and the number may increase or decrease as per required.

13.3. Total Costs

After including all the parameters of costs within our system we can give our final project costs that would be including all the phases of our development. The total project cost for the project is AUD 6.8 million. This is including all kinds of labor, management, contingency plan costs. This costs also includes the pilot testing costs and recurring costs which is taken for the project duration i.e. 540 days.

TOTAL COSTS - AUD 6.8 Million.

14. Benefits

1. **Enhancing the customer experience**

The customer experience will reach a whole new level as they don't have to push any heavy carts and there will be easy check out for card payment options. Purchasing at a supermarket will become much easier than the manual system that is present currently.

2. **Increase in the sales and revenue**

When there will be a revolution in the supermarkets with smart carts coming in the picture and robots handling the whole system people will start getting inclined towards this new way of buying. This limelight of new technology will bring a sharp rise in the increment of customer base and would help in increasing the sales and revenue of the new supermarkets.

3. **Technological advancements**

There will be a surge in the use of latest technologies as Microsoft Kinect is used to follow the shoppers. Smart carts, fetch robots and suction robots will be used in the supermarket which shows the advancement of technology. UPC scanners and tablets etc. will help in reading the items of shopping list. The application of the latest technologies will be advantageous for the organizations to gain more insights for the improved user experience and also beneficial for the firms business strategies.

4. **Market analysis**

According to the Nelson's survey report Today, 13% of global respondents say they're already using a virtual store and nearly six-in-10 (58%) are willing use them when they become available. This shows the interest of customers which is inclined towards our project. Such a survey encourages us to assume that people will use virtual stores and hence bringing the trend of smart carts and self-checkouts will improve the business processes in a very positive manner.

5. **Reduction in workforce**

The supermarkets will start using smart carts as well as the manual payment system. The back end of the warehouse will have robots who will manage and maintain the stocks. Additionally the filling of the front end of the supermarket will work with the robots and a low number of human workforce. As a whole the use of robots in the supermarkets and warehouse will bring a sharp decline in the human workforce which will help in depreciation of the recurrence cost to a good extent. This will be a benefit for the organization as it can invest once in robots which don't have a recurrence cost as much as for the human workforce.

6. **Easy shopping experience for physically disabled**

The launch of smart carts in the supermarkets would be a great benefit for the physically disabled as well. They would not have to drag any trolleys with them instead the smart carts would be easy to handle for them as well. Therefore they would not only be a new technology for the normal people but also a very helpful discovery for the disabled people as well.

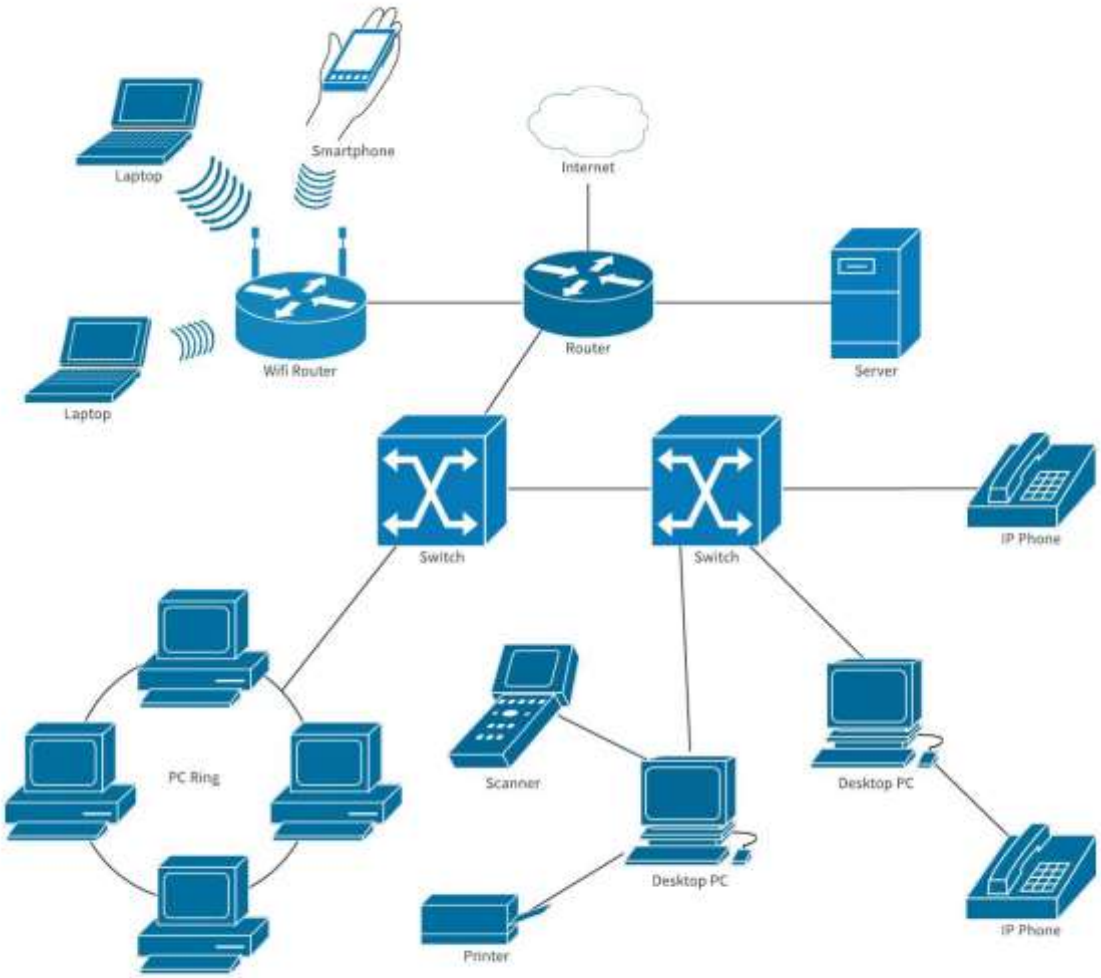
15. Recommendations and Conclusions

This document is designed to include all the details pertaining to the virtual supermarket system for the Colworths Australia. The project team expertise must be contacted for more comprehensive information about this project. To gain an overall image of the project as a whole, there are lots of assumptions undertaken. All the expertise and stakeholders must go through the entire document and make logical and valid decisions before signing off the final project for the Colworths virtual supermarket.

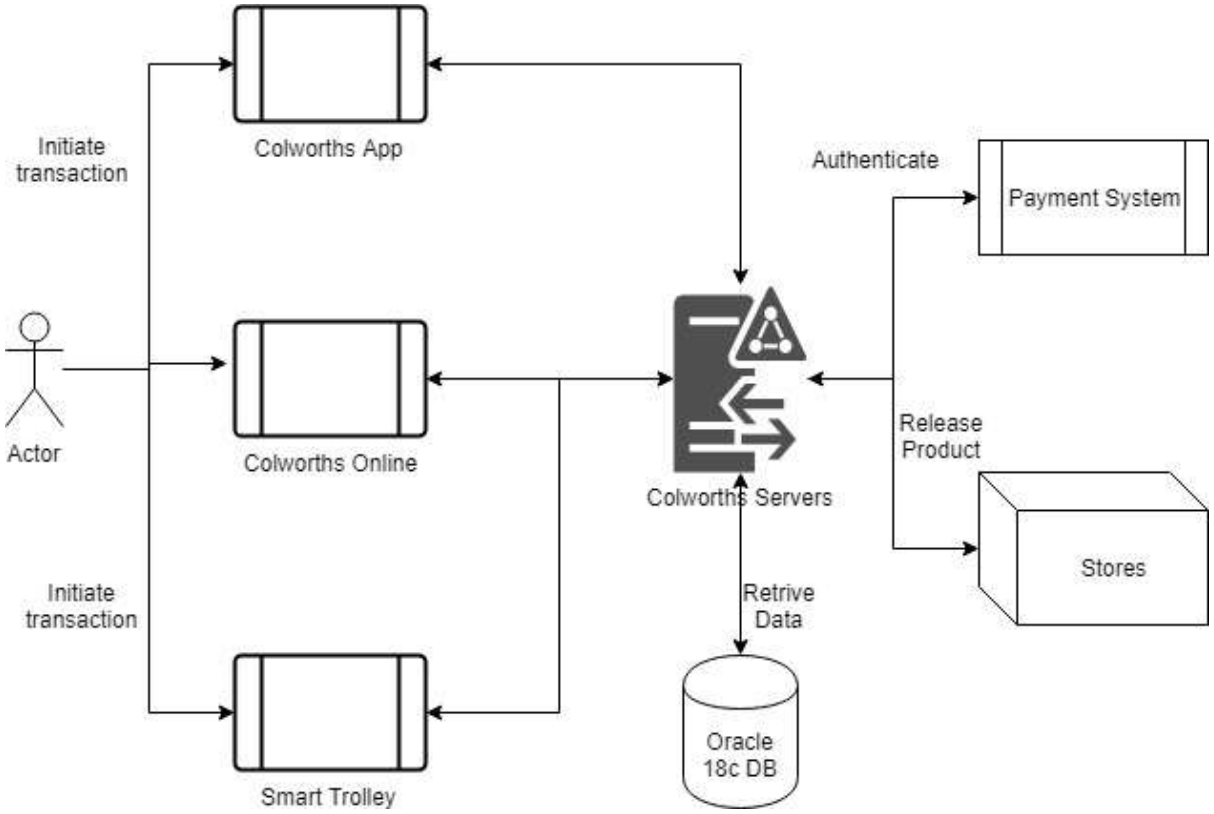
16. Bibliography / References

Leveaux, R. 2018, *UTS Faculty of Engineering & Information Technology - SITP Case Study 2018 Spring : A High Level Design for Colworths (Aust) Project*, UTS Faculty of Engineering & Information Technology, Sydney, viewed 1/10/2018 2018, <https://online.uts.edu.au/bbcswebdav/pid-2895662-dt-content-rid-34217580_1/courses/32040-2018-SPRING-CITY/2018%20Spr%20Colworths.pdf>.

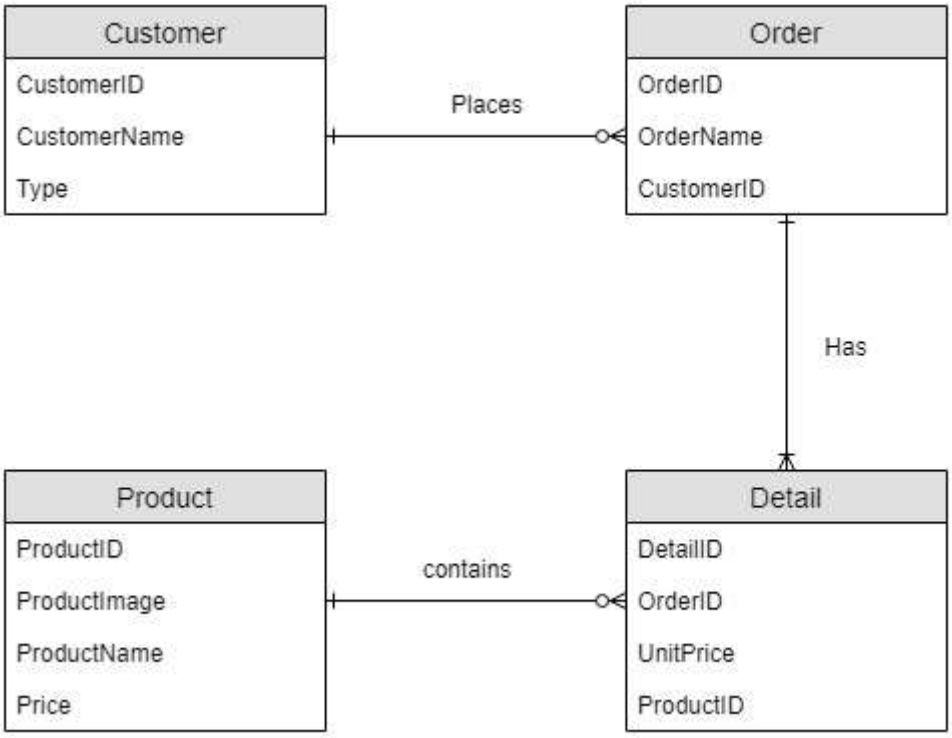
Appendix A – Detailed Network Topology Diagram



Appendix B – Data Flow Diagram



Appendix C – Entity Relationship Diagram



Appendix D - Detailed Hardware specifications

Cisco IP phone 7931G

Phone Overview:

The Cisco Unified IP Phone 7931G is a full-feature telephone that provide voice communication over the same data network that your personal computer uses, which allows you to place and receive phone calls, put calls on hold, transfer calls, and make conference calls. It is designed to meet the communication needs with moderate telephone traffic and specific call requirements. It provides you with dedicated hold, redial, and transfer keys to facilitate call handling and enhanced productivity features that extend your call-handling capabilities: Access to network data, XML applications, and web-based services. Online customisation of phone features and services from your Cisco Unified Communications Manager User Options web pages. A comprehensive online help system that displays information on the phone screen.

Features

The Cisco Unified IP Phone 7931G is designed to grow with your organization. A dynamic, soft-key activated feature set allows the phone to keep pace with your requirements through regular software upgrades. You can easily move phones, add new phones, and change existing phone arrangements; users can simply pick up their phones and move to a new location anywhere on the network. The Cisco Unified IP Phone 7931G also provides accessibility features for those with special needs. Tables 1 through 7 present the features, specifications, and compliance information for the Cisco Unified IP Phone 7931G, Table 8 provides ordering information, and Table 9 lists available optional accessories.
Table 1. Features and Descriptions

Feature
Description
Lighted line keys
Twenty-four lighted line keys to which individual lines can be assigned-Each line key provides a busy-line indication if the line is shared with another IP phone. Lighted line keys are also used to access services and call history directories and to activate the headset port.
Dedicated hold, redial, and transfer keys

Dedicated keys for hold, redial, and transfer-The hold key is colored red to make it clearly visible in a fast-moving call environment; the redial and transfer keys facilitate rapid call handling.
Lighted message waiting indicator
Lights turn on when there is new voicemail and when the phone rings; the message waiting indicator is visible on both the phone chassis and handset, and it stays lit until the user processes new voicemail.
Graphical display
A graphical monochrome display with resolution of 192 x 64 pixels and a white backlight provides scrollable three-line intuitive access to calling features and text-based XML applications. The Cisco Unified IP Phone 7931G also supports audio-based XML applications.
Four soft keys and a four-way rocker key
These keys dynamically present calling options to the user. The four-way rocker key allows easy movement through the displayed information.
Network features
Cisco Discovery Protocol and LLDP-MED (Link Layer protocol) 1; IEEE 802.1 p/q tagging and switching
Ethernet switch
The phone offers 10/100BASE-T Ethernet connection through two RJ-45 ports: one for the LAN connection and the other for connecting a downstream Ethernet device such as a PC.
Speakerphone
A full-duplex speakerphone enables the user to handle calls hands-free.
Volume control
A volume-control toggle provides easy decibel-level adjustments of the handset, headset, speakerphone, and ringing volume.
Headset port
A dedicated headset port eliminates the need for a separate amplifier when using a headset; it allows the handset to remain in its cradle, making headset use simpler.
Single-position foot stand
The phone offers optimum display viewing and comfortable use of buttons and keys. The foot stand can be removed for wall mounting with mounting holes located on the base of the phone.
Multiple ring tones
The phone offers more than 24 user-selectable ring tones.
American Disabilities Act (ADA) features
A hearing-aid-compatible (HAC) handset meets ADA requirements, including ADA HAC requirements for a magnetic coupling to approved hearing aids; the phone dialing pad also complies with ADA requirements.
Signalling protocol support
Compatible with Cisco Unified CallManager Express Version 4.0(2) and later, using the Skinny Client Control Protocol (SCCP), or Cisco Unified Call Manager 6.0 and later.
Also compatible with the Session Initiation Protocol (SIP), starting from Cisco Unified Call Manager 7.0 or later.
Codec support
The phone supports G.711a, G.711u, G.729a, G.729b, and G.729ab audio-compression codecs.
Configuration options
Network parameters can be provisioned through the Dynamic Host Configuration Protocol (DHCP).

Voice quality
Comfort-noise generation and voice-activity-detection (VAD) programming is offered on a system basis.
1LLDP is compatible only with firmware 8.3(3) or later
Table 2. Security Features

Item
Description
Certificates
Phones shipped with factory-installed X.509v3 certificates; there is also an option to install and remove certificates at the customer's site
Device authentication and signalling encryption
Transport Layer Security (TLS) with Advanced Encryption Standard (AES)-128 encryption available with Cisco Unified CallManager Express Version 4.0(2) or later. Cryptography is not enabled by default and may only be enabled through a cryptographically enabled CUCM.
Media encryption
Secure Real-Time Transport Protocol (SRTP) with AES-128 encryption available with Cisco Unified Communications Manager Express and Cisco Unified Communications Manager in a later release. Cryptography is not enabled by default and may only be enabled through a cryptographically enabled CUCM.

Table 3. Software and Physical Specifications

Item
Description
Firmware upgrades
Firmware upgrade supported using a Trivial File Transfer Protocol (TFTP) server
Dimensions (H x W x D)
8 x 9 x 7 in. (20.3 x 22.9 x 17.8 cm)
Weight
3.0 lb (1.36 kg)
Phone casing composition
Polycarbonate acrylonitrile butadiene styerene (ABS) plastic in textured dark gray with silver bezel

Item
Description
IEEE 802.3af PoE
Can receive power from IEEE 802.3af-compliant data switches (Class III)
Local power
Powered locally with a power adapter (Cisco part number CP-PWR-CUBE-3=)

IntelliPro CCTV cameras

Specifications	Intellipro ID12V2812MI
Shutter time	1-1/100000 sec
Digital Noise reduction	3D DNR
Minimum illumination	0.008 lux @ AGCon, 0 with lux IR
Day and night	ICR
Image sensor	1/1.7” Progressive scan CMOS
Wide dynamic range	120 dB WDR
Video compression	H.264 to H.264+
Frame rate	12 FPS @12MP
Image settings	Contrast, Brightness, colour, saturation, web browser.
Bit rate	32kbps-16mbps
Security	Video masks, user identification, water mark, heart beat, dual stream.
Interoperability	PSIA, CGI, ONVIF
Alarm trigger	IP address conflict, network disconnect, tampering alarms, motion detection, storage exception.
Micro SD storage	Up to 128 GB without including card.
BLC	Yes zone configurable
Lens	2.8-12 mm@ F1.4 motorised VF lens, 96-32” Angle of view

Lenovo Think Centre M900

Operating System	Windows 10 Pro
Graphics	NVIDIA® GeForce® GT720 1GB DDR3
Memory	8GB DDR4 2133 MHz
Storage	1TB HDD
Power Supply	**Tower:** 92% 400W Adapter **SFF:** 85% 210W Adapter
Dimensions (W x D x H)	**Tower:** 6.89" x 16.26" x 15.98" / 175 x 413 x 406 (mm) **SFF:** 3.46" x 14.05" x 13.31" / 88 x 357 x 338 (mm)
Weight	**Tower:** 27.5 lbs (12.5 kg) **SFF:** 19.8 lbs (9 kg)
Physical Security	• Kensington® Lock • Removable HDD (Tower Only)
I/O (Input/Output) Ports	**Front** • 2 x USB 3.0 • 2 x USB 2.0 (Optional) • Card Reader (Optional) • 2 x Audio **Rear** • 6 x USB 3.0 • DisplayPort™ 1.2 + DisplayPort™ 1.2 • VGA • 1 x Serial • 1 x LAN • 3 x Audio • PS/2 (Optional) • Parallel (Optional)

Windows 10 Preloads	• Lenovo™ Solution Center • Desktop Power Manager • Fingerprint Software • Lenovo™ SHAREit • Lenovo™ REACHit • Lenovo™ Companion • CyberLink PowerDVD Create (DVD) • McAfee® LiveSafe™ (trial) • Microsoft Office (trial)
Windows 7 Preloads	• Lenovo™ Solution Center • Desktop Power Manager • PC Cloud Manager • Fingerprint Software • ThinkVantage® Product Recovery • Lenovo™ SHAREit • Lenovo™ REACHit • CyberLink PowerDVD Create (DVD) • McAfee® LiveSafe™ (trial) • Microsoft Office (trial)

Dell EMC V rack FLEX 100server

Table 1. BASE SYSTEM CONFIGURATION FOR VXRACK WITH FLEX NODES

COMPONENTS	CONFIGURATION
Compute	Compute based on x86 standard architecture
Storage	DAS storage attached to the x86 servers
Networking	Cisco Nexus switches
Server Virtualization	VMware vSphere 6.0 or higher VMware ESXi, VMware vSphere Server Enterprise Plus, VMware vCenter Server
Storage Virtualization	EMC ScaleIO
Management Infrastructure	VCE Vision™ VxRack™ Manager for unified access and management VCE Vision™ Intelligent Operations for telemetry data
Environmental	Intelligent Physical Infrastructure consisting of Cabinet 2.0—fully welded and dynamically load-rated Smart Power Deliver Units (PDU) Hid Reader and Thermal Sensors

The enclosure for each VxRack with FLEX Nodes falls into one of the following three types within one 28-inch 42U cabinets. There is a base configuration that is a minimum set of resources.

Table 2. ENCLOSURE TYPE FOR EACH VXRACK WITH FLEX NODES

ENCLOSURE TYPE	BASE CONFIGURATION
Performance Compute	2RU total 1-4 server slots Each server with 6 disk drives
Capacity Compute	2RU total 1 server Each server with 24 disk drives
Capacity Storage	2RU total 1 server Each server with 24 disks drives and minimum CPU/memory configuration

VxRack with FLEX Nodes has many configuration options. Enclosures are flexible and can be configured with dense compute, dense storage, storage only, or a combination of the three.

Table 3. CONFIGURATION USING PERFORMANCE COMPUTE ENCLOSURES

CONFIGURATION NAME	PERFORMANCE HIGH	PERFORMANCE MEDIUM	HYBRID HIGH	HYBRID MEDIUM
Chassis- # of Node	2RU-4N	2RU-4N	2RU-4N	2RU-4N
Power Supply	Dual 1600W platinum PSU AC	Dual 1600W platinum PSU AC	Dual 1600W platinum PSU AC	Dual 1600W platinum PSU AC
Processors per Node	Dual Intel E5-2680 V3, 12c, 2.5 GHz	Dual Intel E5-2680 V3, 12c, 2.5 GHz	Dual Intel E5-2680 V3, 12c, 2.5 GHz	Dual Intel E5-2650 V3, 10c, 2.3 GHz
Chipset	Intel 610	Intel 610	Intel 610	Intel 610
DDR4 Memory per Node	512 GB (16x32 GB)	256 GB (16x16 GB)	256 GB (8x32 GB) 512 GB (16x32 GB)	256 GB (8x32 GB) 512 GB (16x32 GB)
Embedded NIC per Node	Dual 1-Gbps Ethernet ports + 1 10/100 management port	Dual 1-Gbps Ethernet ports + 1 10/100 management port	Dual 1-Gbps Ethernet ports + 1 10/100 management port	Dual 1-Gbps Ethernet ports + 1 10/100 management port
RAID Controller per Node	1x LSI 3008	1x LSI 3008	1x LSI 3108 with Supercap and CacheCade SW	1x LSI 3108 with Supercap and CacheCade SW
Solid State Drives per Node	4.8 TB (6x 2.5-inch 800 GB eMLC)	4.8 TB (6x 2.5-inch 800 GB eMLC)	1x 2.5-inch 400 GB eMLC	1x 2.5-inch 400 GB eMLC
Hard Disk Drives per Node	NA	NA	6 TB (5x 2.5-inch 1.2 TB 10,000 RPM HDD)	6 TB (5x 2.5-inch 1.2 TB 10,000 RPM HDD)
SATADOM per Node	32 GB SLC	32 GB SLC	32 GB SLC	32 GB SLC
10 GbE Port per Node	4x 10 Gbps ports SFP+	4x 10 Gbps ports SFP+	4x 10 Gbps ports SFP+	4x 10 Gbps ports SFP+

Cisco integrated service router

In the following section we will give a detailed specification in a tabular form about what integrated service routers are used and what are their features. Following are the tables which show all the technical features and service capacities of the various Cisco 3900 series service routers used in the system:-

Services and Slot Density	Cisco 3945E	Cisco 3925E	Cisco 3945	Cisco 3925
Embedded hardware-based cryptography acceleration (IPSec + Secure Sockets Layer [SSL])	Yes	Yes	Yes	Yes
Cisco Unified Communications Manager Express Sessions**	450	400	350	250
Cisco Unified SRST sessions	1500	1350	1200	730
Total onboard WAN or LAN 10/100/1000 ports	4	4	3	3
RJ-45-based ports	4	4	3	3
SFP-based ports	2	2	2	2
Service-module slots	4	2	4	2
Doublewide service-module slots	1	1	1	1
EHWIC slots	3	3	4	4
Doublewide EHWIC slots	1	1	2	2
ISM slots	0	0	1	1
Online insertion and removal (OIR)	Services modules	Services modules	Services modules	Services modules
Onboard DSP (PVDM) slots	3	3	4	4
Memory DDR2 ECC DRAM: Default	1 GB	1 GB	1 GB	1 GB
Memory DDR2 ECC DRAM: Maximum	2 GB	2 GB	2 GB***	2 GB***
Compact Flash (external): Default	Slot 0: 256 MB Slot 1: None	Slot 0: 256 MB Slot 1: None	Slot 0: 256 MB Slot 1: None	Slot 0: 256 MB Slot 1: None
Compact Flash (external): Maximum	Slot 0: 4 GB Slot 1: 4 GB	Slot 0: 4 GB Slot 1: 4 GB	Slot 0: 4 GB Slot 1: 4 GB	Slot 0: 4 GB Slot 1: 4 GB
External USB 2.0 slots (Type A)	2	2	2	2
USB console port (Type B) (up to 115.2 kbps)	1	1	1	1
Serial console port (up to 115.2 kbps)	1	1	1	1
Serial auxiliary port (up to 115.2 kbps)	1	1	1	1
Power-supply options	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC
Redundant power supply	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC	Internal: AC, PoE, and DC
Power Specifications				
AC input voltage	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging
AC input frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
AC input current range, AC power supply (maximum)	7.1 to 3.0A	7.1 to 3.0A	7.1 to 3.0A	7.1 to 3.0A
AC input surge current	<50A	<50A	<50A	<50A

Services and Slot Density	Cisco 3945E	Cisco 3925E	Cisco 3945	Cisco 3925
DC Operating Input Voltage	24Vdc - 60Vdc	24Vdc - 60Vdc	24Vdc - 60Vdc	24Vdc - 60Vdc
Max Input Current range, DC power supply (A)	33.2 - 12.4	33.2 - 12.4	33.2 - 12.4	33.2 - 12.4
DC Input Surge Current	<50A	<50A	<50A	<50A
Typical power (no modules) (watts)	158	150	105	100
Maximum power with AC power supply (watts)	540	420	540	420
Maximum power with PoE power supply (platform only) (watts)	540	420	540	420
Maximum endpoint PoE power available from PoE power supply (watts)	520	520	520	520
Max power with DC input (W)	574	446	574	446
Maximum endpoint PoE power capacity with PoE boost (watts)	1040	1040	1040	1040
Dimensions (H x W x D)	5.25 x 17.25 x 18.75 in. (133.35 x 438.15 x 476.25 mm)	5.25 x 17.25 x 18.75 in. (133.35 x 438.15 x 476.25 mm)	5.25 x 17.25 x 18.75 in. (133.35 x 438.15 x 476.25 mm)	5.25 x 17.25 x 18.75 in. (133.35 x 438.15 x 476.25 mm)
Rack height	3 rack units (3RU)	3RU	3 RU	3RU
Rack-mount 19in. (48.3 cm) EIA	Included	Included	Included	Included
Rack-mount 23in. (58.4 cm) EIA	Optional	Optional	Optional	Optional
Wall-mount	No	No	No	No
Weight with AC power supply (no modules)	39 lb (17.7 kg)	39 lb (17.7 kg)	39 lb (17.7 kg)	39 lb (17.7 kg)
Weight with PoE power supply (no modules)	40 lb (18.1 kg)	40 lb (18.1 kg)	40 lb (18.1 kg)	40 lb (18.1 kg)
Typical weight (with modules)	60 lb (27.2 kg)	60 lb (27.2 kg)	60 lb (27.2 kg)	60 lb (27.2 kg)
Airflow	Back and sides to front	Back and sides to front	Back and sides to front	Back and sides to front
Optional airflow kit (includes filter)	None	None	Front to back and sides	Front to back and sides
Environmental specifications				
Operating conditions				
Temperature: 5906 ft (1800m) maximum altitude	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)
Temperature: 9843 ft (3000m) maximum altitude	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)
Temperature: 13123 ft (4000m) maximum altitude'	32 to 86°F (0 to 30°C)	32 to 86°F (0 to 30°C)	32 to 86°F (0 to 30°C)	32 to 86°F (0 to 30°C)
Temperature: Short-term per NEBS/5906 ft (1800m) maximum altitude	23 to 122°F (-5 to 50°C)	23 to 122°F (-5 to 50°C)	23 to 122°F (-5 to 50°C)	23 to 122°F (-5 to 50°C)
Altitude	4,000m (13,000 ft)	4,000m (13,000 ft)	4,000m (13,000 ft)	4,000m (13,000 ft)
Relative humidity	5 to 85%	5 to 85%	5 to 85%	5 to 85%
Short-term (per NEBS) humidity	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air
Acoustic: Sound pressure (typical/maximum)	57.6/77.6	57.6/77.6	57.6/77.6	57.6/77.6
Acoustic: Sound power (typical/maximum)	67.8/84.7	67.8/84.7	67.8/84.7	67.8/84.7
Nonoperating conditions			2	
Temperature	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)
Relative humidity	5 to 95%	5 to 95%	5 to 95%	5 to 95%
Altitude	15,584 ft (4750m)	15,584 ft (4570m)	15,584 ft (4750m)	15,584 ft (4570m)

Appendix E – Software (Detailed Specifications)

Sublime Text

POWERFUL API AND PACKAGE ECOSYSTEM

Sublime Text has a powerful, Python API that allows plugins to augment built-in functionality.

Package Control can be installed via the command palette, providing simple access to thousands of packages built by the community.

CUSTOMIZE ANYTHING

Key bindings, menus, snippets, macros, completions and more - just about everything in Sublime Text is customizable with simple JSON files. This system gives you flexibility as settings can be specified on a per-file type and per-project basis.

SPLIT EDITING

Get the most out of your wide screen monitor with split editing support. Edit files side by side, or edit two locations in the one file. You can edit with as many rows and columns as you wish. Take advantage of multiple monitors by editing with multiple windows, and using multiple splits in each window.

Take a look at the `View ▸ Layout` menu for split editing options. To open multiple views into the one file, use the `File ▸ New View into File` menu item.

INSTANT PROJECT SWITCH

Projects in Sublime Text capture the full contents of the workspace, including modified and unsaved files. You can switch between projects in a manner similar to *Goto Anything*, and the switch is instant, with no save prompts - all your modifications will be restored next time the project is opened.

PERFORMANCE

Sublime Text is built from custom components, providing for unmatched responsiveness. From a powerful, custom cross-platform UI toolkit, to an unmatched syntax highlighting engine, Sublime Text sets the bar for performance.

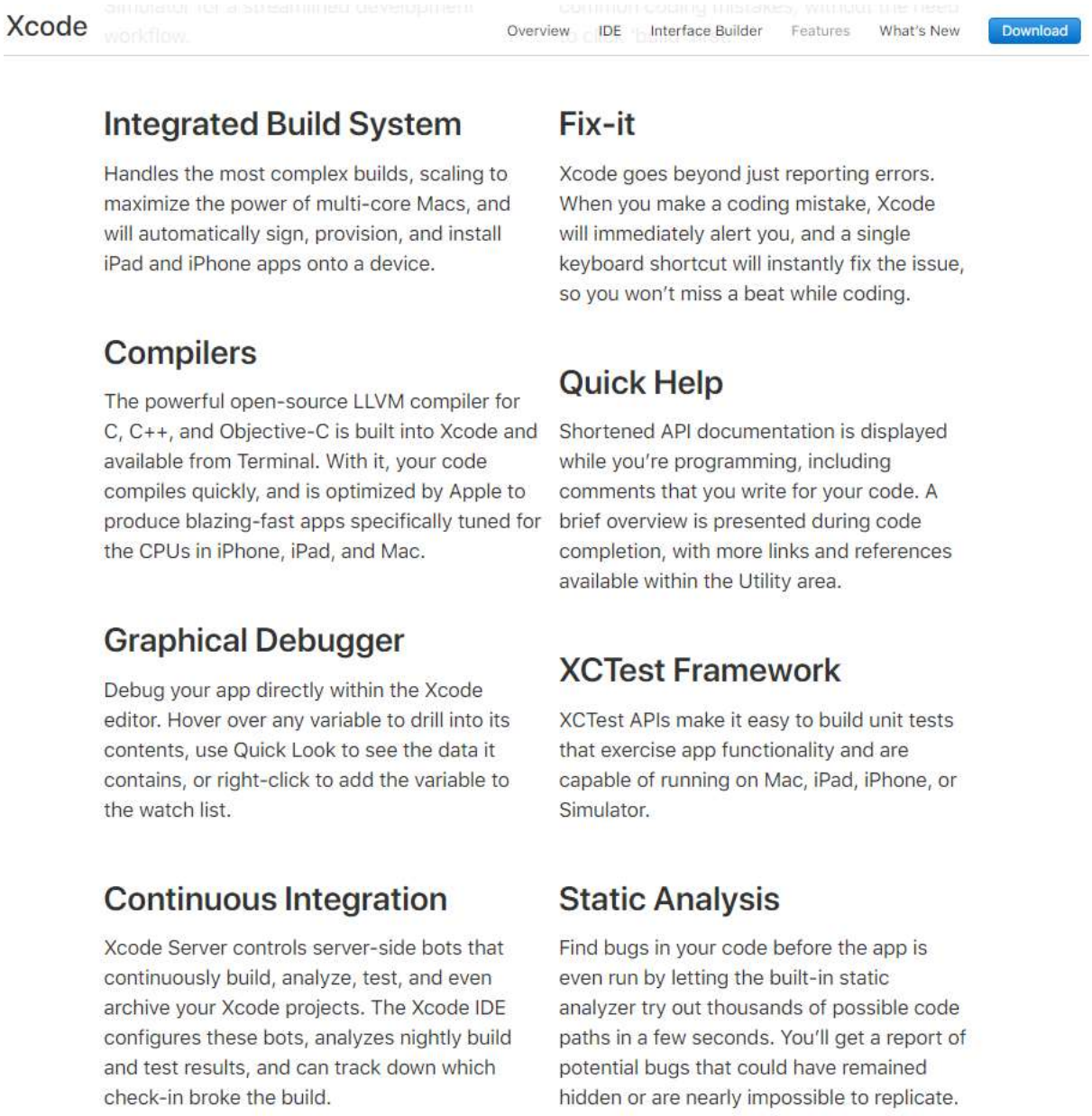
CROSS PLATFORM

Sublime Text is available for Mac, Windows and Linux. One license is all you need to use Sublime Text on every computer you own, no matter what operating system it uses.

Sublime Text uses a custom UI toolkit, optimized for speed and beauty, while taking advantage of native functionality on each platform.

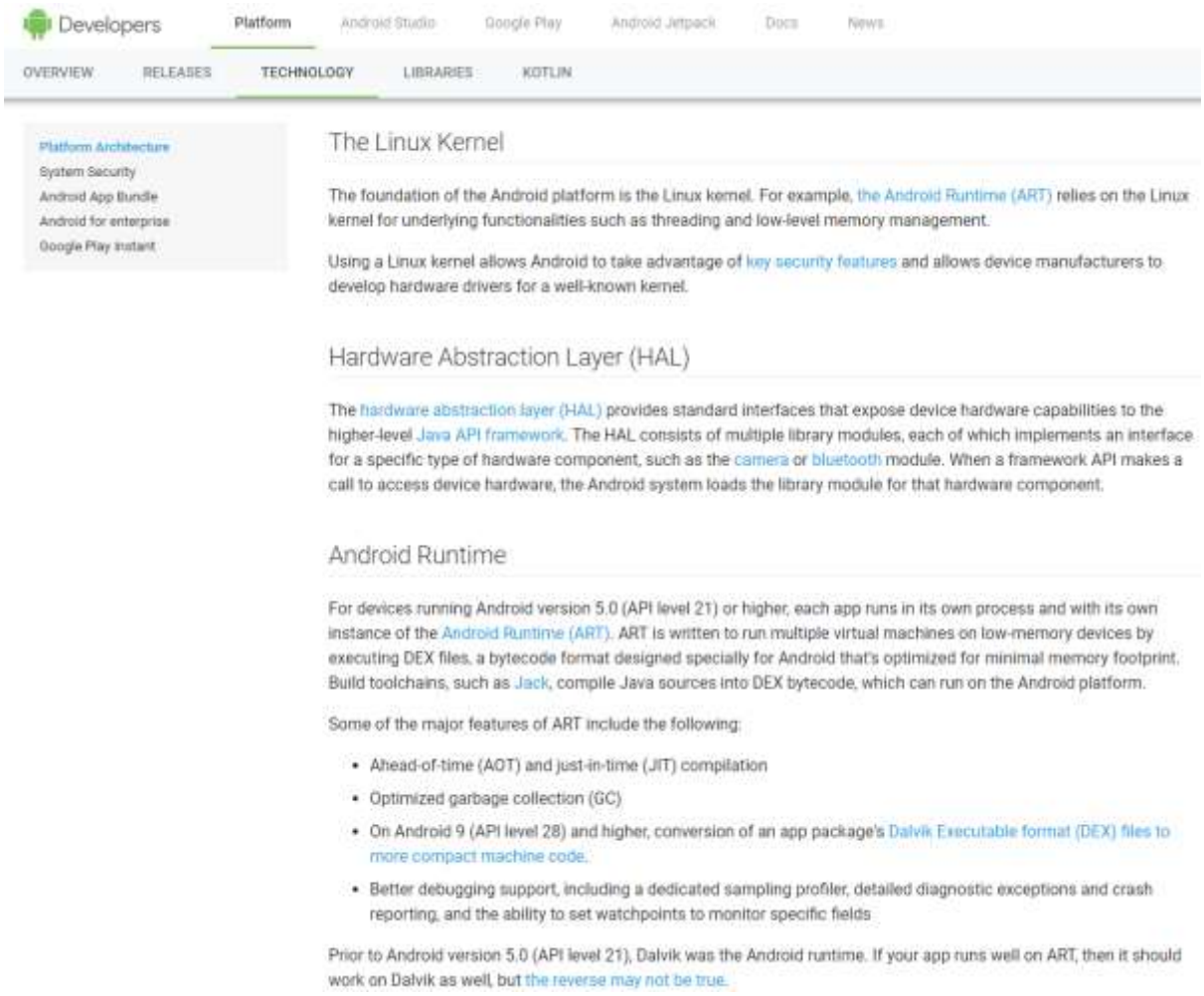
www.sublimetext.com

Xcode



https://developer.apple.com/xcode/features/

Android Studio



https://developer.android.com/guide/platform/

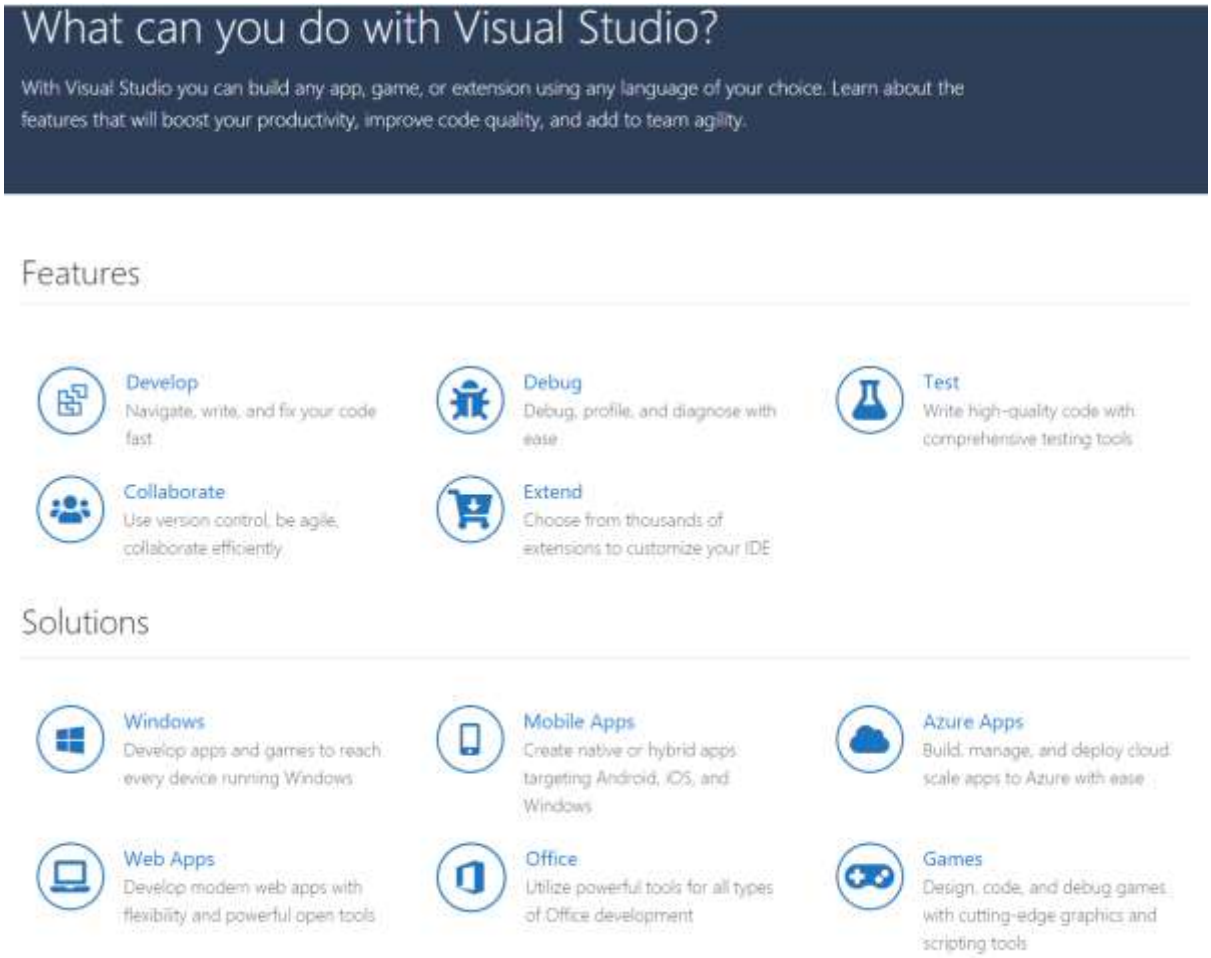
Notepad++

https://notepad-plus-plus.org/

Eclipse

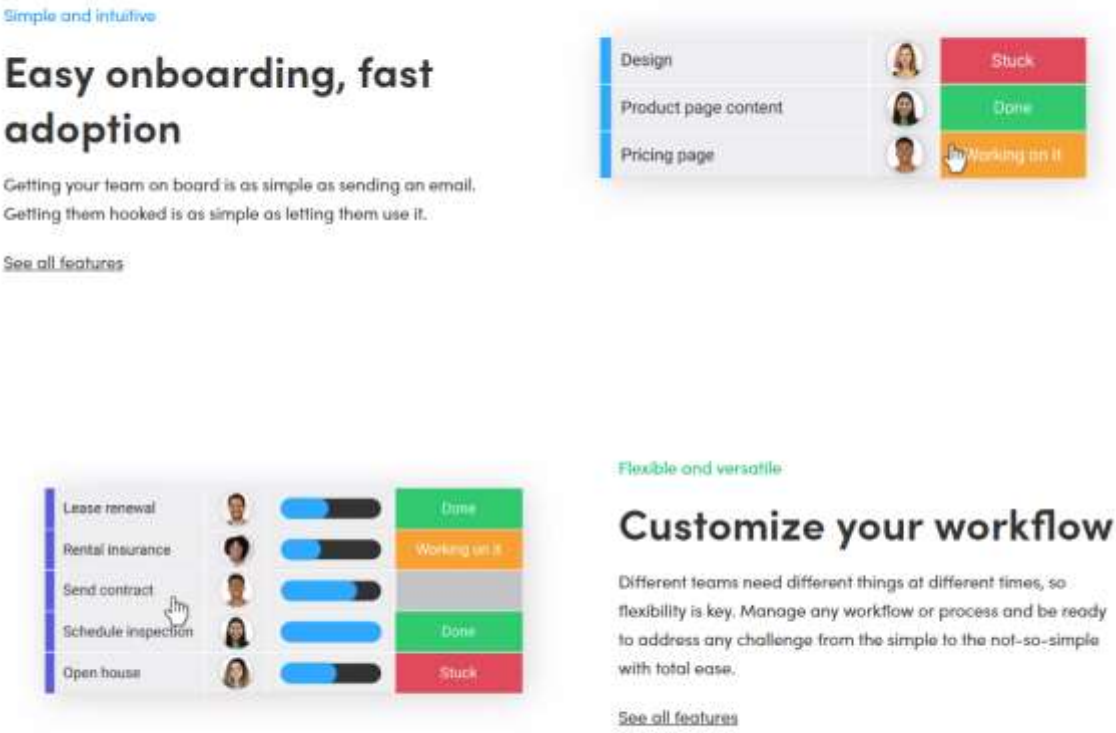
https://www.eclipse.org/ide/

Visual Studio



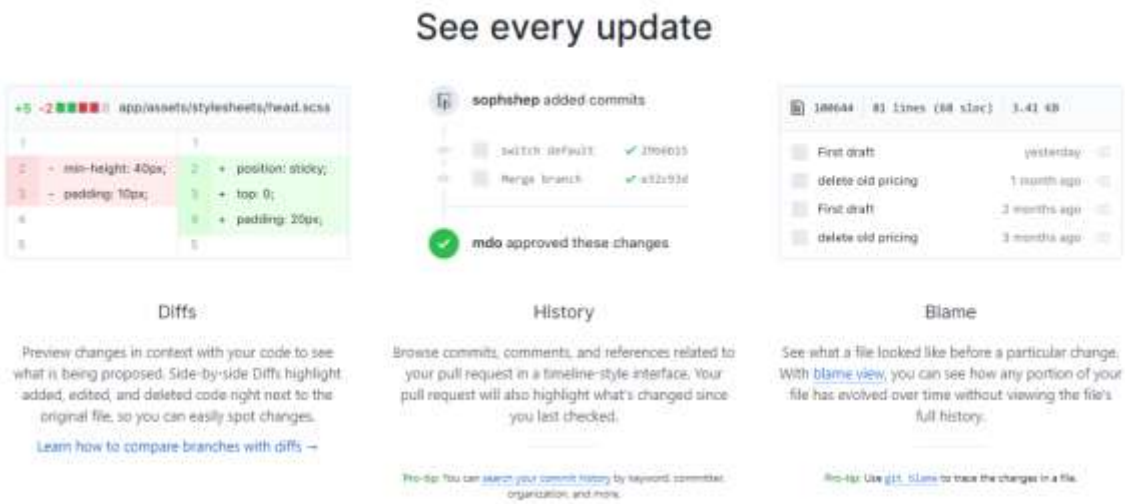
https://visualstudio.microsoft.com/vs/features/

Monday.com



https://monday.com/

GitHub



https://github.com/features/code-review/

Appendix F - Detailed Cost Breakdown

Project expenditure tables are given in the following order as per the ordering of the project had taken place. First the general costs are given in the project and then the implementation of the project is done by giving the following table costs as shown below:-

Various Stakeholders	**Quantity**	**Cost per unit**	**Amount**
Hardware section	3	35000	105000
Software section	3	27000	81000
Information systems section	4	25000	100000
Technology section	5	53000	265000
Travel costs	2	32000	64000
Consultation costs	3	4500	13500
Total costs			628500

Now we will proceed with the costs of the implementation process that has taken place in the whole project with different phases as shown below:-

Software products	**Quantity**	**Cost per unit**	**Amount**
Software applications user licensing	15	18000	270000
Database and SQL related licensing	13	22000	286000
Added licensing for Add ons	10	5500	55000
Updates in Software	25	30000	750000
Operating systems (Windows, Apple etc)	23	4700	108100
Other security requirements	17	6000	102000
Total costs			1561100

Hardware, networking and infrastructure components	**Quantity**	**Cost per unit**	**Amount**
CCTV devices	700	600	420000
Vending machine	30	900	27000
Smart carts	120	1500	180000
Fetch robots	30	15000	450000
Suction robots	30	8000	240000
UPC scanners	50	1200	60000
EFTPOS	40	800	32000
Servers	45	3500	157500
CPUs	20	1500	30000
Commercial refrigerators	25	6000	150000
Back up devices	15	1800	27000
Routers	20	9000	180000
WIFI for internet	1	1500	1500
Server switches database	30	7500	225000
Switch devices	350	600	210000
Conveyor belt	5	2500	12500
Memory devices	22	6000	132000
Cabling and wiring of the system	400	400	160000
Total costs			2694500

Stakeholders	**Quantity**	**Price per unit (Annually)**	**Cost**
Project manager	1	130000	130000
General manager	1	120000	120000
Assistant manager	1	90000	90000
Project coordinator	1	85000	85000
Chief financial officer	1	75000	75000
System engineer	1	70000	70000
Quality assurance	2	65000	130000
System analyst	1	75000	75000
Chief technology officer	2	70000	140000
Consultants	3	60000	180000
Temporary staff members	4	50000	200000
Business analysis consultant	2	75000	150000
Associate developer	3	80000	240000
Database administrator	2	70000	140000
Information system support manager	1	65000	65000
Network analyst	1	75000	75000
Customer manager	1	70000	70000
Total costs			1935000

Stakeholder training	**Quantity**	**Cost per unit**	**Cost**
Training the internal staff users	25	1500	37500
Training items or materials	5	2500	12500
Technical training for the project implementation members	15	1200	18000
Travelling costs for training	25	400	10000
Total costs			78000

Stakeholders	**Quantity**	**Price per unit**	**Cost**
Project manager	0.5	130000	65000
Assistant manager	0.5	90000	45000
General manager	0.5	120000	60000
Project coordinator	0.5	85000	42500
Chief financial officer	0.5	75000	37500
System engineer	0.5	70000	35000
Quality assurance	1	65000	65000
System analyst	0.5	75000	37500
Chief technology officer	1	70000	70000
Consultants	1.5	60000	90000
Temporary staff members	2	50000	100000
Business analysis consultant	1	75000	75000
Associate developer	1.5	80000	120000
Database administrator	1	70000	70000
Information system support manager	0.5	65000	32500
Network analyst	0.5	75000	37500
Customer manager	0.5	70000	35000
Total costs			967500

Stakeholder training	**Quantity**	**Cost per unit**	**Cost**
Training the internal staff users	12	1500	18000

Training items or materials	3	2500	7500
Technical training for the project implementation members	8	1200	9600
Travelling costs for training	12	400	4800
Total costs			39900

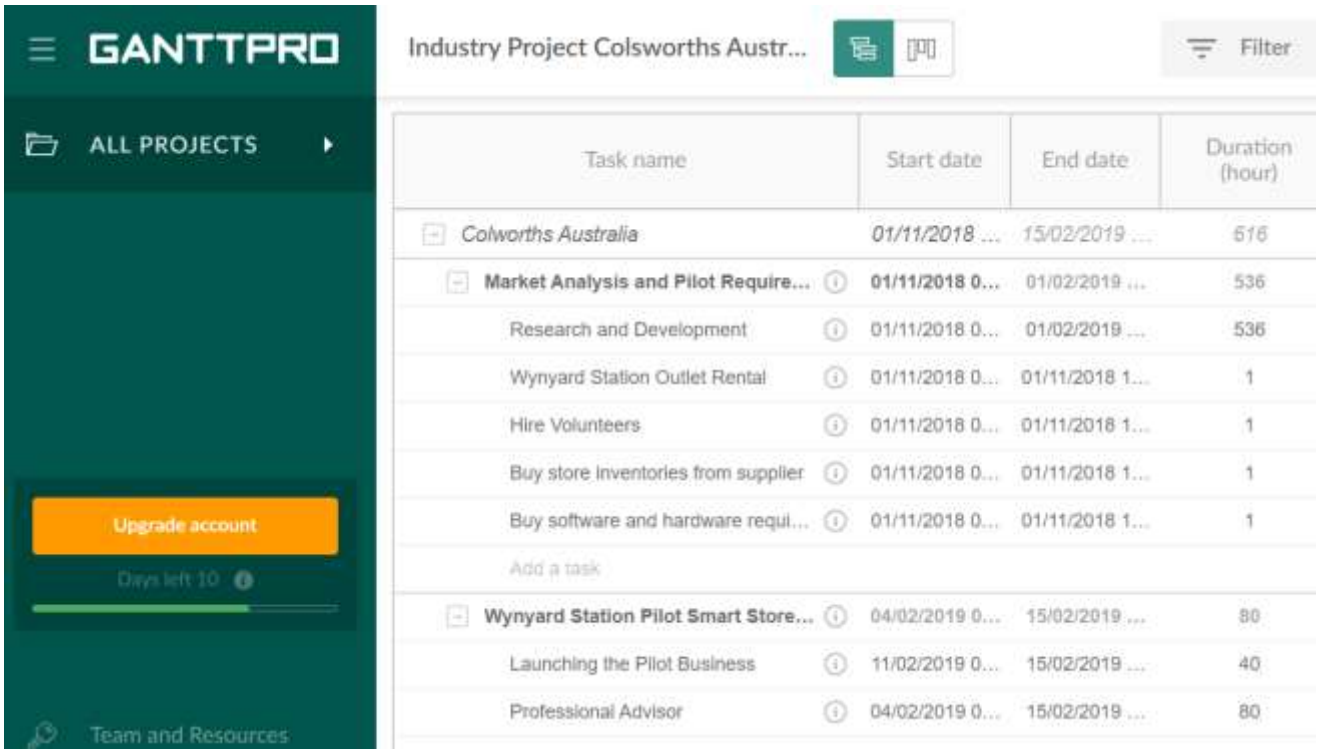
This given table below is for the project phase when pilot testing would take place.

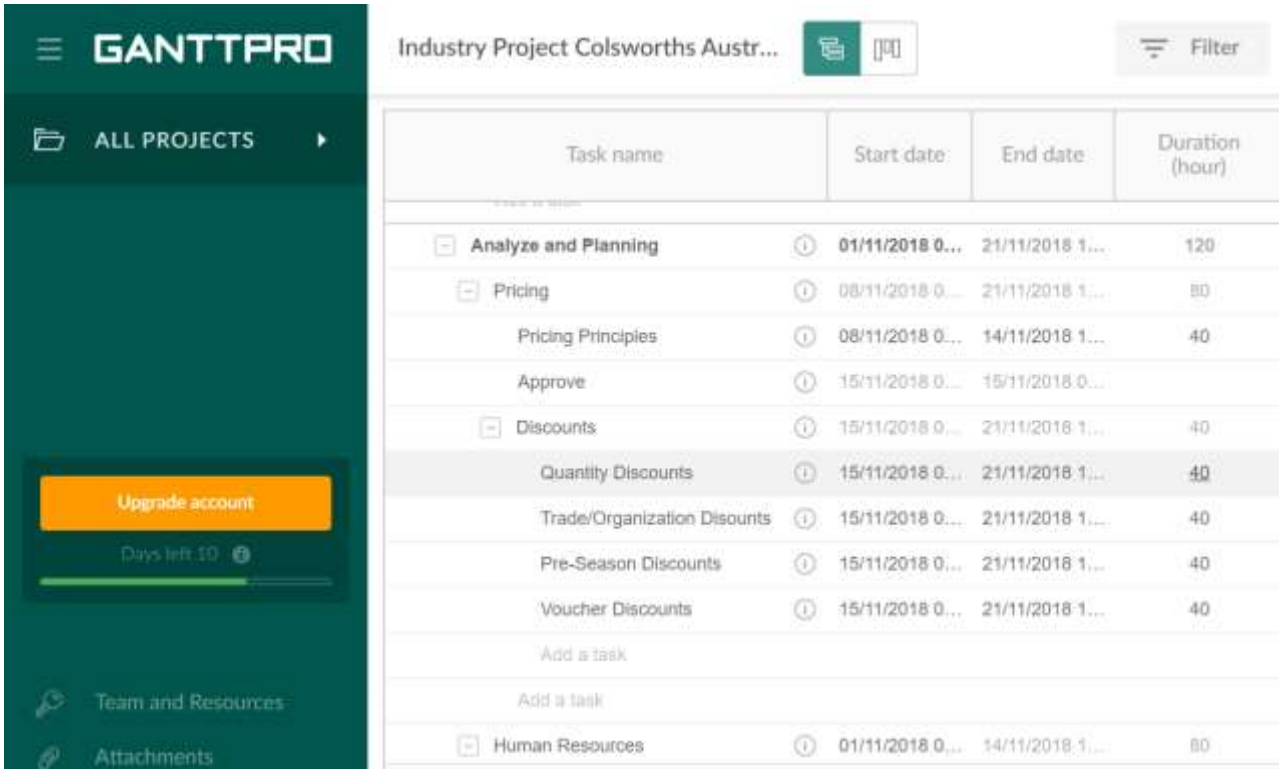
Stakeholders or products	**Quantity**	**Cost per unit**	**Cost**
Volunteers	10	2500	25000
Hardware costs	1	35000	35000
Software costs	1	27000	27000
Information system costs	1	25000	25000
Technology costs	1	53000	53000
Consultation costs	1	4500	4500
Travel costs	15	400	6000
Total costs			175500

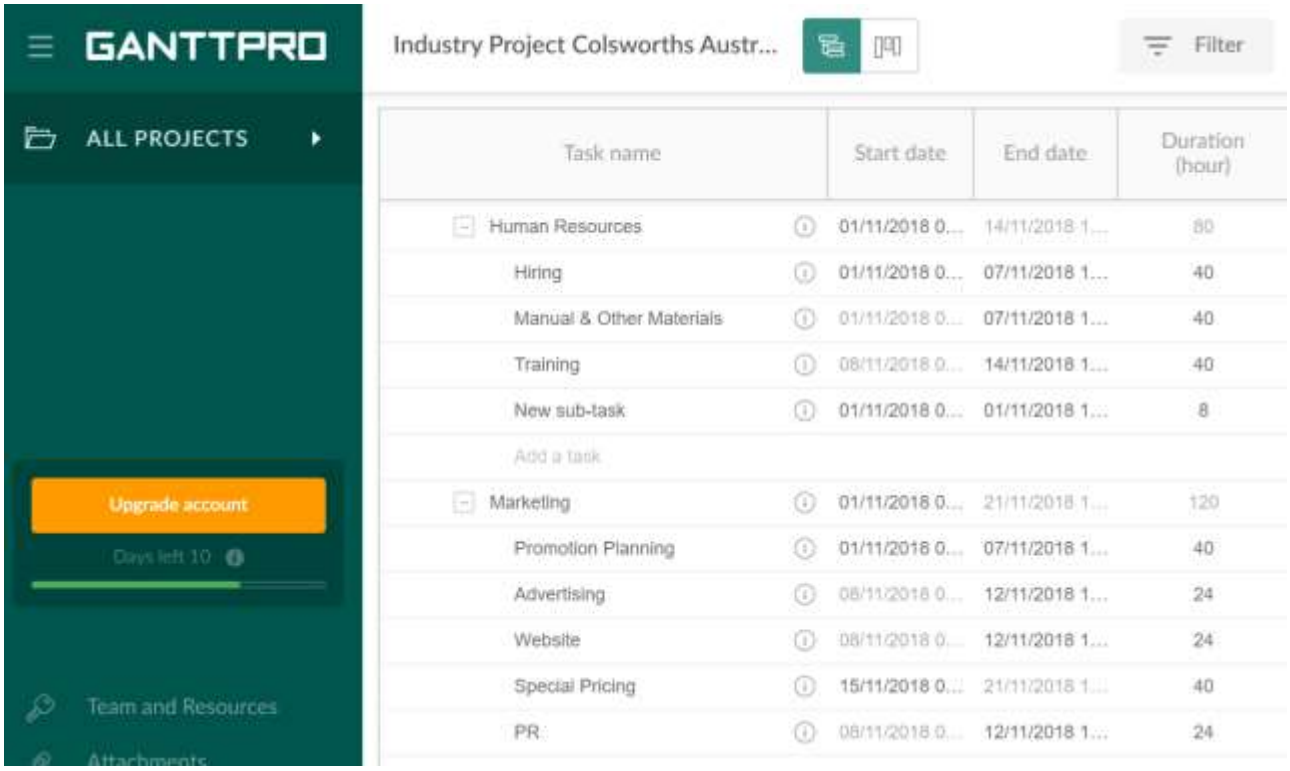
Maintenance products	**Quantity**	**Cost per unit**	**Costs**
Hardware updates	5	20000	100000
Licensing software	1	15000	15000
Database management and updates	1	25000	25000
Accidental mis happenings	2	20000	40000
Total costs			180000

Total calculated cost – AUD 6.8 Million.

Appendix G – Implementation Gantt chart



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Industry Project Colsworths Austr...
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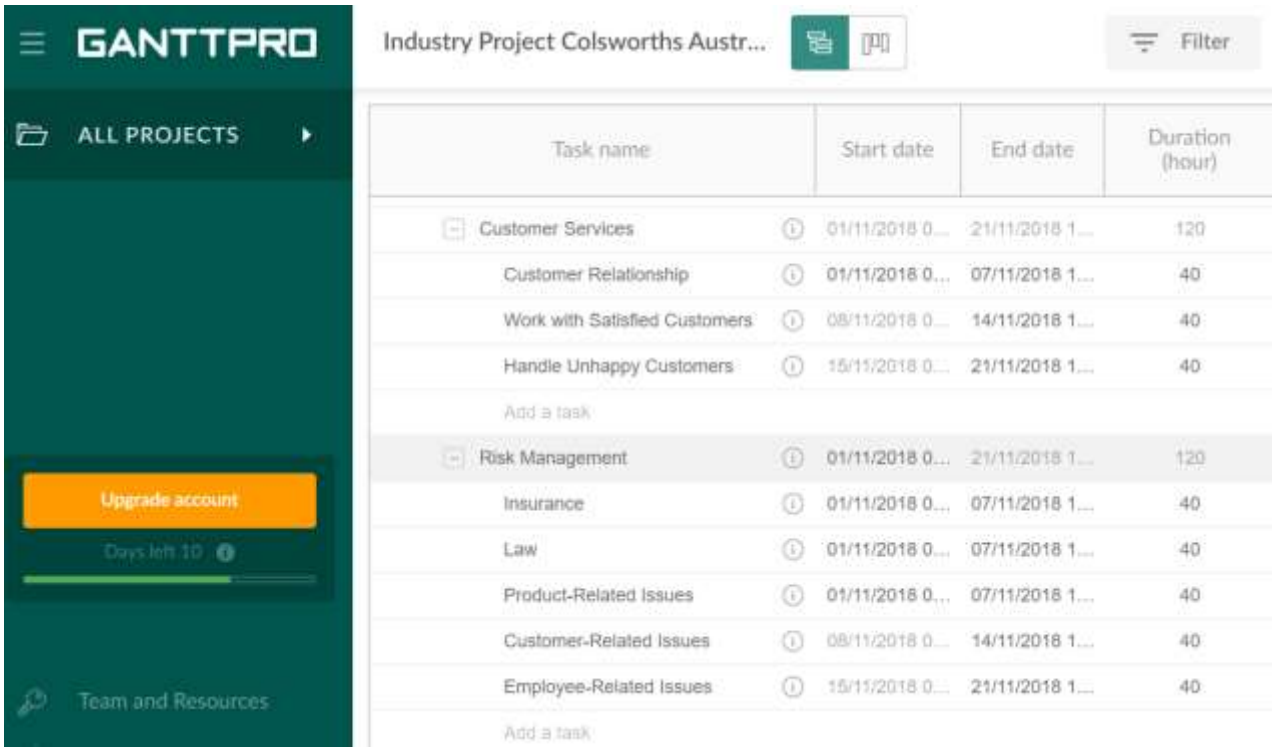
ALL PROJECTS
Upgrade account
Days left 10
Team and Resources
Attachments
Task name
Start date
End date
Duration (hour)
Human Resources 01/11/2018 0... 14/11/2018 1... 80
Hiring 01/11/2018 0... 07/11/2018 1... 40
Manual & Other Materials 01/11/2018 0... 07/11/2018 1... 40
Training 08/11/2018 0... 14/11/2018 1... 40
New sub-task 01/11/2018 0... 01/11/2018 1... 8
Add a task
Marketing 01/11/2018 0... 21/11/2018 1... 120
Promotion Planning 01/11/2018 0... 07/11/2018 1... 40
Advertising 08/11/2018 0... 12/11/2018 1... 24
Website 08/11/2018 0... 12/11/2018 1... 24
Special Pricing 15/11/2018 0... 21/11/2018 1... 40
PR 08/11/2018 0... 12/11/2018 1... 24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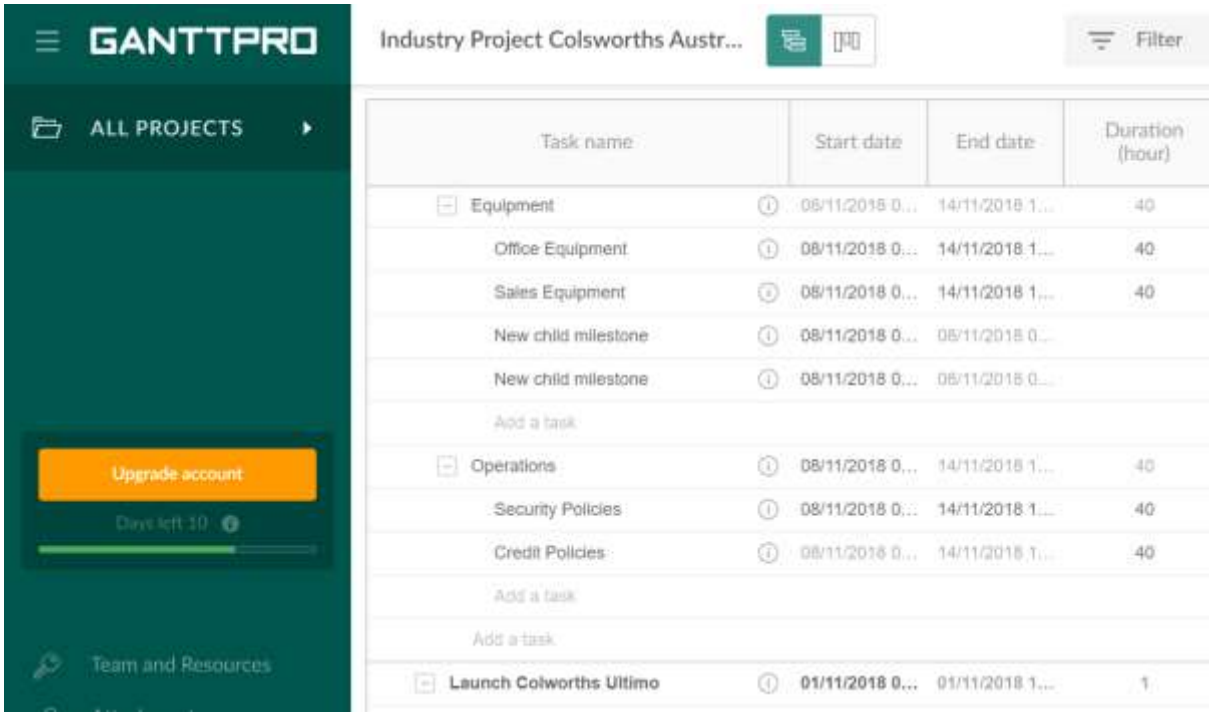
Filter
ALL PROJECTS
Upgrade account
Days left 10
Team and Resources
Task name
Start date
End date
Duration (hour)
Customer Services 01/11/2018 0... 21/11/2018 1... 120
Customer Relationship 01/11/2018 0... 07/11/2018 1... 40
Work with Satisfied Customers 08/11/2018 0... 14/11/2018 1... 40
Handle Unhappy Customers 15/11/2018 0... 21/11/2018 1... 40
Add a task
Risk Management 01/11/2018 0... 21/11/2018 1... 120
Insurance 01/11/2018 0... 07/11/2018 1... 40
Law 01/11/2018 0... 07/11/2018 1... 40
Product-Related Issues 01/11/2018 0... 07/11/2018 1... 40
Customer-Related Issues 08/11/2018 0... 14/11/2018 1... 40
Employee-Related Issues 15/11/2018 0... 21/11/2018 1... 40
Add a task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Task name
Start date
End date
Duration (hour)
Equipment
Office Equipment
Sales Equipment
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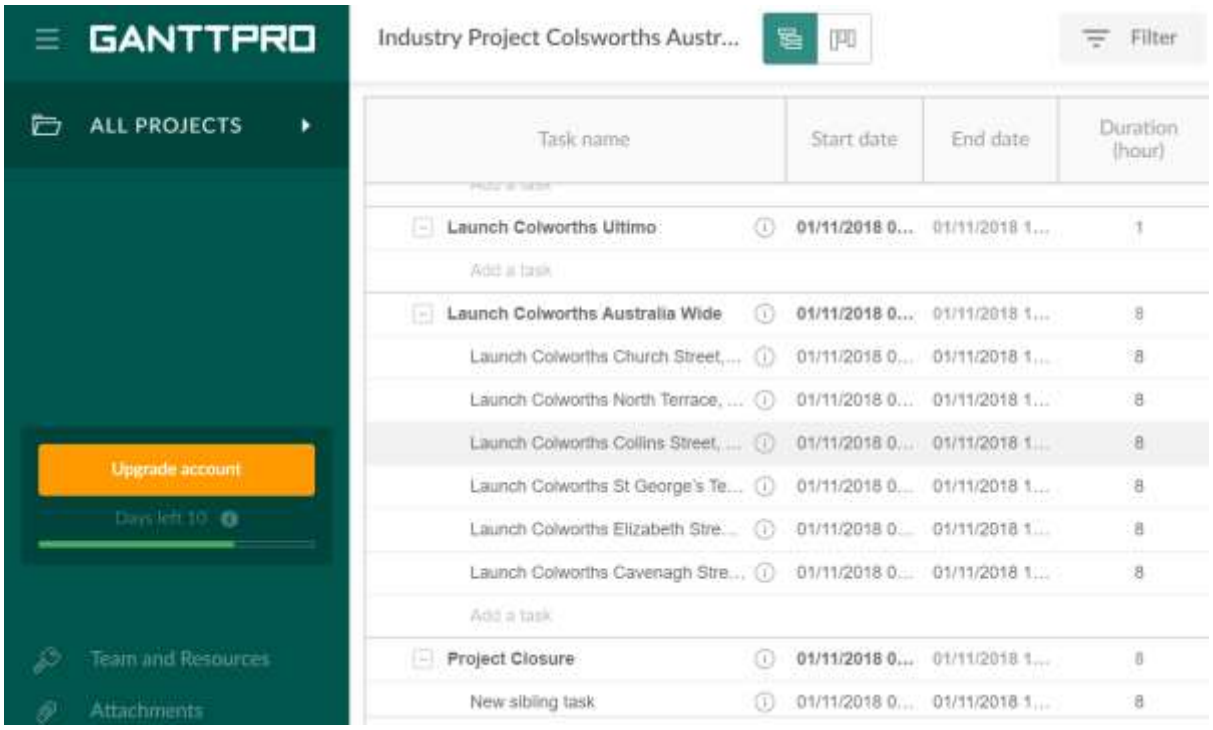
New child milestone
Add a task
Operations
Security Policies
Credit Policies
Add a task
Add a task
Launch Colworths Ultimo
Upgrade account
Team and Resources


GANTTPRO
Industry Project Colsworths Austr...
Filter
ALL PROJECTS
Task name
Start date
End date
Duration (hour)
Launch Colworths Ultimo
Add a task
Launch Colworths Australia Wide
Launch Colworths Church Street,...
Launch Colworths North Terrace, ...
Launch Colworths Collins Street, ...
Launch Colworths St George's Te...
Launch Colworths Elizabeth Stre...
Launch Colworths Cavenagh Stre...
Add a task
Project Closure
New sibling task
Upgrade account
Team and Resources
Attachments

17. Appendix H – Glossary

AWS – Amazon Web Services
CBD – Central Business District
DBMS – Database Management System
IDE – Integrated Development Environment
IS – Information System
IT – Information Technology
OLS – Operational Level Agreement
RFID – Radio Frequency Identification
SLA – Service Level Agreements
SMS – Short Message Service