The Tolstoy Technologies Company brings the best solution for the better care in healthcare settings. The product offers the infection control in hospitals by monitoring the employee hand wash pattern and enforces the hygiene practice.

EE3031E Innovation & Enterprise 1 Project#3 Report

Intra-Splash®

Hand Hygiene System

Healthcare solution for Hospitals & Medical Institutes

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1. Product Mission Statement

- *Product Description*

Hand Hygiene System with Bluetooth Tag and Reader Integration. The Employee will be equipped with Bluetooth Tag, logging the action whenever they practice hand wash. The information of employee, time and pattern of hand washing practice will be logged via Wi-Fi/Ethernet to the system. The system can generate the reports of user hand wash patterns which can be used by Infection Control Enforcement team to engage more activities.

- *Key Business Goals*

Development Budget: SGD$ 550,000 for initial startup

Development Timeframe: 6 months for prototype, 6 months for production, 1 year for marketing activity and 2 years to achieve 0.8 million revenue goal globally.

Market Share: 40% of hospitals in Singapore & Thailand (Initial 2 years)

Unit Price: SGD $350

System Price: SGD $65,000

Gross Margin: 140%-160%

Cost per System: SGD $200000

Intellectual Properties: Awaiting patents registration

- *Primary Market*

  Hospitals & Health Care institutes in Singapore, Thailand and US
  Market Size: 10000 hospitals (45% of total size) in 5 years

- *Secondary Market*

  It is targeted for Specialist centers & clinics which has day surgery or minor operation facility in Singapore, Thailand and US.

- *Assumption & Constraints*

  Maintenance of IT system and enforcement requirement by Hospital Infection Control Committee
  Products seems to be pricy for low grade facility
  Wi-Fi connection is necessary for data logging.

- *Stakeholders*

  Suppliers
  Manufacturers
  Shareholders
  Service Teams
  Distributors and resellers
  Regulatory Committee for Medical Settings
  Hospitals & Clinics
  Healthcare Personnel & Patients

2. Customer Needs Recognition

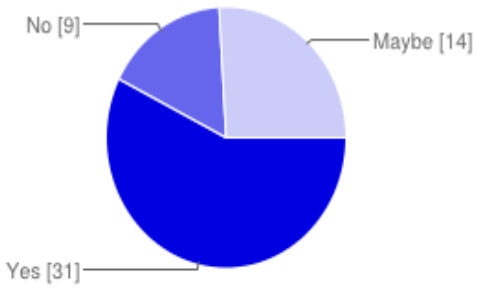
Hand hygiene is now regarded as one of the most important element of infection control activities. In the wake of the growing burden of health care associated infections (HCAIs), the increasing severity of illness and complexity of treatment, superimposed by multi-drug resistant (MDR) pathogen infections, health care practitioners (HCPs) are reversing back to the basics of infection preventions by simple measures like hand hygiene. This is because enough scientific evidence supports the observation that if properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities.

Thus, in the environment of Hospitals, Operating Theaters and medical institutes, the keeping track of employee's awareness and following infection control procedure is essential.

It always been a challenge that failure to enforce and coercive the hand hygiene practice is the major issue of health care associates. If one product could solve the infection control – hand washing practice with the simple steps is the answer needed by all healthcare centers.

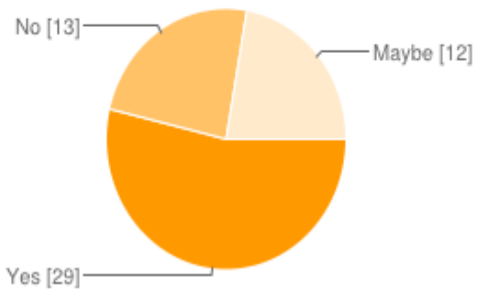
Interview questions for hospitals and medical institutes ?

Q1) Any Infection control campaign organized in your hospitals?



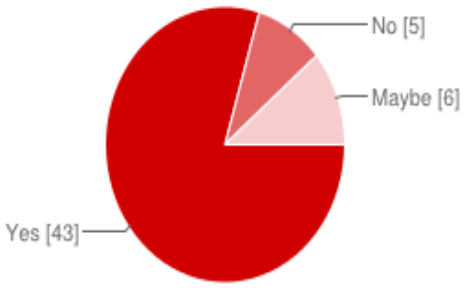
Yes	**31**	57%
No	**9**	17%
Maybe	**14**	26%

Q2) Have you encountered the infection spread around Operation Theatres?



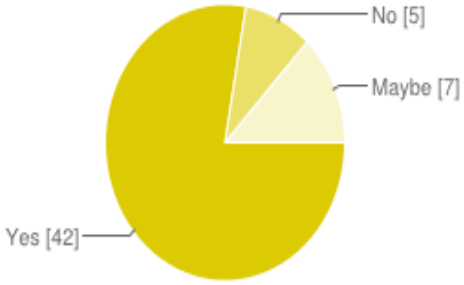
Yes	**29**	54%
No	**13**	24%
Maybe	**12**	22%

Q3) Do you know that infection control is mainly feasible by simple hand washing regularly?



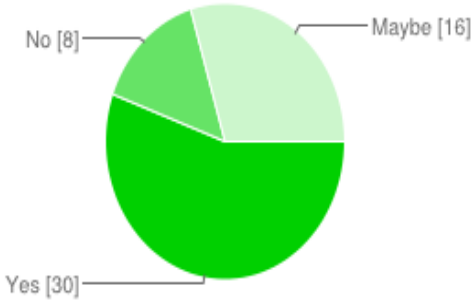
Yes	**43**	80%
No	**5**	9%
Maybe	**6**	11%

Q4) Would you like to try if there's any system that can be used to monitor hand wash pattern?



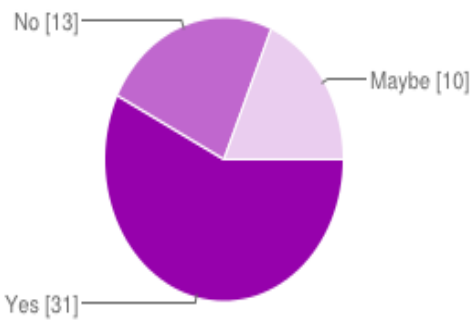
Yes	**42**	78%
No	**5**	9%
Maybe	**7**	13%

Q5) Would you like to generate reports of employee hand wash pattern for clear analysis? (personal information)



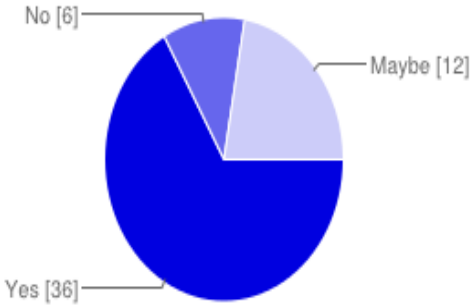
Yes	**30**	56%
No	**8**	15%
Maybe	**16**	30%

Q6) Would you like to receive SMS/Email Reminder if hand wash practice is poor?



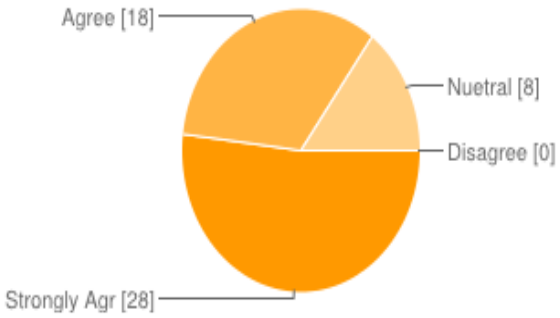
Yes	**31**	57%
No	**13**	24%
Maybe	**10**	19%

Q7) Would you like to customize the sink designs and employee ID badge designs if options are available?



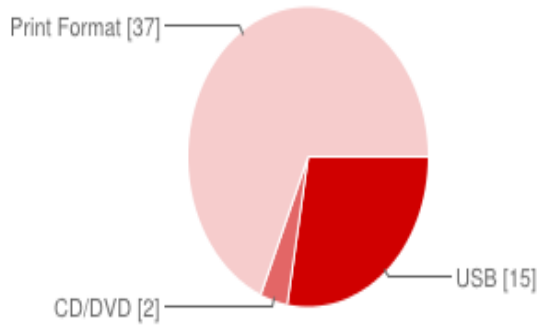
Yes	**36**	67%
No	**6**	11%
Maybe	**12**	22%

Q8) Would you think this Hand Hygiene System will be helpful in Infection Control?



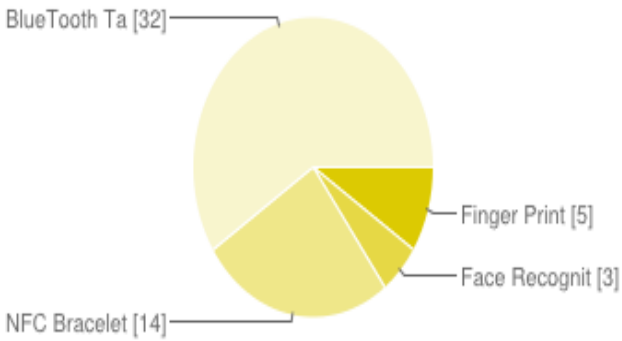
Strongly Agree	**28**	52%
Agree	**18**	33%
Nuetral	**8**	15%
Disagree	**0**	0%

Q9) Which way do you prefer to retrieve hand wash practice reports?



USB	15	28%
CD/DVD	2	4%
Print Format (Digital)	37	69%

Q10) How do you like to record hand washing of employees?



Finger Print	5	9%
Face Recognition	3	6%
NFC Bracelet	14	26%
BlueTooth Tag	32	59%

Questionnaire summary:

https://docs.google.com/forms/d/1qxbpJatrvcjaDIAMmibwiEMl1miNBV9HRYW-ffI11xA/viewanalytics

2.1 Interpret Needs

Question/Prompt	*Customer Statements*	*Interpreted Needs*
Have you encountered the infection spread around Operation Theatres?	Yes: 54% No: 24% Maybe: 22%	Customers encounter infection spread around Operation Theatres.
Any Infection control campaign organized in your hospitals?	Yes: 57% No: 17% Maybe: 26%	Customers know that there is infection control campaign organized in hospitals.
Do you know that infection control is mainly feasible by simple hand washing regularly?	Yes: 80% No: 9% Maybe: 11%	Customers clear that regular hand washing can control infection.
Would you like to try if there's any system that can be used to monitor hand wash pattern?	Yes: 78% No: 9% Maybe: 13%	Customers want to have a system to monitor hand wash pattern.
Would you like to generate reports of employee hand wash pattern for clear analysis? (personal information)	Yes: 56% No: 15% Maybe: 30%	The Intra-Splash® Hand Hygiene System generates reports of employee hand wash pattern for analysis.
Would you like to receive SMS/Email Reminder if hand wash practice is poor?	Yes: 57% No: 24% Maybe: 19%	The Intra-Splash® Hand Hygiene System sends reminder to employee if hand wash practice is poor.
Would you like to customize the sink designs and employee ID badge designs if options are available?	Yes: 67% No: 11% Maybe: 22%	The Intra-Splash® Hand Hygiene System can be customized based on the design from customer.
Would you think this Hand Hygiene System will be helpful in Infection Control?	Strongly Agree: 52% Agree: 33% Neutral: 15% Disagree: 0%	The Intra-Splash® Hand Hygiene System is helpful in infection control.
Which way do you prefer to retrieve hand wash practice reports?	USB: 28% CD/DVD: 4% Print Format: 69% (Digital)	The Intra-Splash® Hand Hygiene System retrieves hand wash practice report by digital printing.
How do you like to record hand washing of employees?	Finger Print: 9% Face Recognition: 6% NFC Bracelet: 26% BT Tag: 59%	The Hand Hygiene System uses Bluetooth tag to record hand washing of employees.

2.2 Prioritizing Needs

Table below show the needs of the system and importance level ranging from 1 to 5.

No.	Product	Needs	Imp. Level
1	Hand Hygiene System	Bluetooth embedded badges to record hand wash pattern.	5
2		Feedback system to remind employee of poor hand wash practice.	5
3		Generate report of hand wash practice for analysis.	5
4		Water saving.	4
5		LCD panel near the sink for notification and feedback.	4
6		LED indicator and vibrator embedded into badges to notify employee for hand washing.	3
7		Wi-Fi to connect and communicate between the Bluetooth reader at the sink and the computer system	3
8		Sink and tap made of stainless steel.	3
9		Custom design option.	1
10		Integration to public.	1

3. Product Specification

3.1 Metric and Units.

Table below show the Metrics of the specification for Hand Hygiene System.

Metric No.	Need Nos.	Metric	Imp.	Units
1	1	Bluetooth version	5	v
2	2, 3, 7	Wi-Fi transfer rate for transmitting and feedback	4	Mbit/s
3	4	Water flow rate	4	l/m
4	8, 9	Size of the sink (Width x Length x Depth)	2	mm
5	6	Frequency of the LED indicator and vibrator	3	Hz
6	5	Resolution for the LCD panel	2	ppi

3.2 Benchmark on Customer needs

Table below show the Customer Needs and Benchmark.

No.	Need	Important
1	All in one badge (Bluetooth, LED indicator, vibrator)	5
2	User friendly	4
3	Accuracy of data	4
4	Wifi transfer rate	3
5	Water saving taps	3
6	Quality of the sink and tap	3

4. Concept Generation and Selection

4.1 Concept A

The product idea is based on Finger Print recognition systems across the hospitals; consists of the components such as Finger Print Reader, washing sink and server system. In order to be more efficient and infection control is widely monitored, it is vital to install the systems in every corner of hospitals, not just in the ward or operating theatres.

Therefore, due to price constraint, the customers may be not able to install as many as they desired. For those customers under budget or small-sized medical institutions, it is important to cater for them exactly the type they need. However, without compromising the quality and standard of efficiency, there are some rooms for adjustment in the system. For example, the server needed for data logging and reports generation can be changed to lower specification as some customer sees there is little point in applying super computer for infection control practice in economic terms. Those are the areas in which the system can do adjustment to cater the needs of users.

Product Specification:

- Medium grade server system
- Medium Quality - Hand Washing Sink
- Standard Finger Print Sensor
- Standard Quality Bluetooth Reader
- No SMS/Email service for infection control campaign
- Generate reports of employees hand washing

4.2 Concept B

The idea is based on optimum performance of the system and ultimate infection control enforcement. In this concept, the users have a number of options for Sink Design and Bluetooth Badge Design in terms of design and color whichever it is appealing to the users. The server system installed will be configured for best performance for data logging and SMS/Email push service as well as reports generation.

The system will be efficient in terms of high quality Bluetooth tag & Reader, and ergonomic hand washing sink with automatic sensors supplied by the system developer. In fact, the sink will be available in a number of designs and individual users can retrieve the record of hand washing pattern on their own from server system via smart phones or computers within hospitals Network. SMS/Email service will also be available as a reminder regularly to enforce infection control campaign.

Product Specification:

- Optimum Grade Server system
- High Quality - Hand Washing Sink (Available with optional designs)
- Bluetooth Employee badge (Available with optional designs & colors) - BT 2.0
- Reminding LEDs on badge
- High Quality Bluetooth Reader
- User can retrieve their hand wash pattern records via apps or web account
- SMS/Email service for infection control campaign
- Generate reports of employees hand washing

4.3 Concept C

The product idea is based on NFC technology where employees will need to wear NFC wrist band containing the personal information. The wrist band is water-proof and in order to record their hand wash, they have to tag NFC reader while washing. The data will be logged and recorded in the server system. The infection control enforcement can be done by retrieving reports from the system as well. However, in this concept the Sink must be integrated together with the NFC reader. Therefore, the availability of optional sink design is not possible as the manufacture have to produce together with the NFC reader.

In this system, users have to manually tag the NFC reader so that their hand wash will be recorded. A wide range of wrist band design is available with affordable price.

Product Specification:

- Optimum Server System
- High Quality Sink
- NFC wrist band
- NFC reader
- User can retrieve their hand wash pattern records via apps or web account
- SMS/Email service for infection control campaign
- Generate reports of employees hand washing

4.4 Concept Testing

Intra-Splash®		Concept: A (Finger Print)		Concept: B (Bluetooth)		Concept: C (NFC)	
Selection Criteria	Weightage	Rating	Score	Rating	Score	Rating	Score
Sensor Technology	20%	3	0.6	5	1	4	0.8
Tag Design(Options)	10%	0	0	5	0.5	5	0.5
Sink Design (Options)	10%	1	0.01	4	0.4	1	0.1
Reminding LEDs	5%	1	0.05	3	0.15	2	0.1
Server Performance	10%	2	0.2	5	0.5	3	0.3
SMS/Email Service	10%	0	0	4	0.4	4	0.4
Price	35%	2	0.7	5	1.75	3	1.05
Total Weightage Score		1.56		4.7		3.25	
Rank		3rd		1st		2nd	
Proceed to Final Product :		No-GO		GO		No-Go	

After careful consideration, in line with technology feasibility and users preferences survey, the concept B scores the highest among three concepts. Therefore, the company decided to continue with the 1st rank Concept B in which Bluetooth technology is applied with various design options. Below paragraph will describe the complete system architecture and functions of the system.

4.5 Concept Selection: Final Product Design

Hence, it came to the conclusion of final product (system) design for Intra-Splash®. Here it will be described in details manner and provide block diagrams or graphic whenever possible to withhold the clear vision of the product design.

The system comprises of 4 main components.

1) Bluetooth Badge worn by Employee
2) Bluetooth Reader Integrated Sink
3) LCD Display
4) Server System

Fig 4.5: System Design of Intra-Splash®.

The main function of the system will be

1) Reminding the Healthcare providers to wash hands
2) Recording the Hand wash Activities of individuals
3) Uploading & Analyzing the data of the Employees
4) Displaying "Message" to the user
5) Generating Reports of Hand Wash Patterns of Employees
6) SMS/Email Service to employees on Infection Control Campaign

The badge

The badge is equipped with Bluetooth technology and the chip will be loaded with the personal information such as name, employee number, department and contacts. On the badge, the notification LEDs to remind the caregivers to practice to hand wash. It is programmed that it is necessary to practice hand wash (Intra-Splash®.) at least once an hour. If the condition is not fulfilled, the LEDs will turn RED and badge will vibrate, reminding that the employee is non-compliant. The LEDs will display GREEN when there is compliance condition i.e. employee practice hand wash at least once an hour. After the hand wash, the reminder program on the badge will reset to initial condition, 1 hour timing.

The Sink

It is automatic sensor hand washing sink with the design of customer's choice. In fact, it is integrated with Bluetooth reader which will actively look for employee Bluetooth badge. When employee comes for hand wash, it will read the personal information when the automatic sensor is activated. Therefore, there are two conditions to be met so that the employee information will be uploaded to the server via Ethernet or Wi-Fi. Firstly, employee badge Bluetooth must be present in the vicinity of the sink. Secondly, the sensor must be activated for water flowing. In this way, wrong recording or manipulation of the system is settled.

The Server

The server is main processing unit of the system where the employee data from the sink will be uploaded and processed for individual recognition and Hand Wash Report Generation. Employee data will be read from the sink from which the data will be check against the employee information in the data base; generation personalized message via the LCD display such as "Dear "Mr. XXX", thank you for participating Infection Control Campaign. You have practiced hand washing "7 "times today. The report can also be generated to monitor effectively in which individual hand wash patterns will be tabulated. SMS/Email can be sent to employees on regular basis; therefore, the campaign message can be reinforced constantly.

The LCD Display

The display is mainly used for displaying personalized message generated from the Server system. It will be located at the sink where employee does hand washing. From the personalized message display, the healthcare professionals will get personal involvement feeling and how their efforts are greatly appreciated. Overall, it will increase the effectiveness of the campaign and impacting every individual.

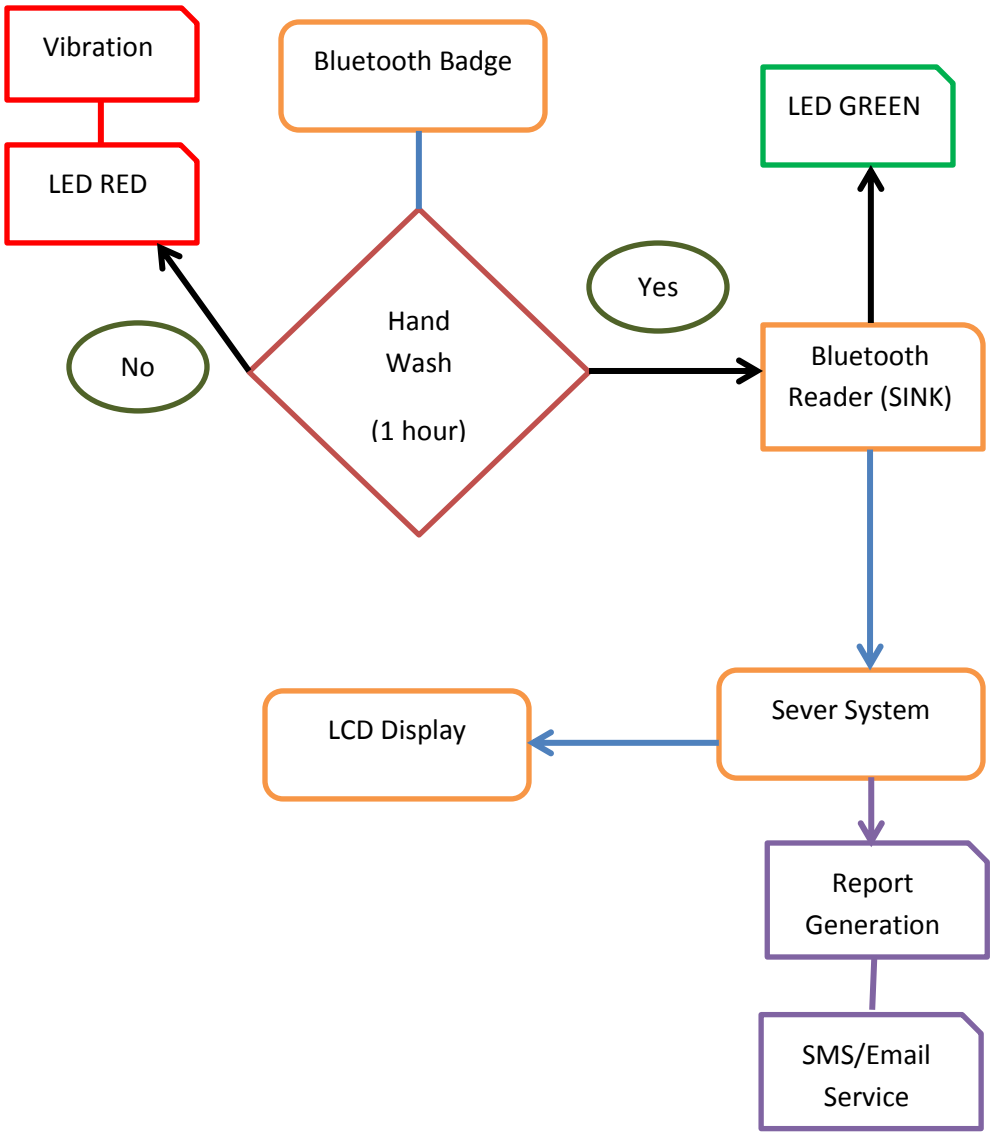


Fig4.2: The function of Intra-Splash®.

4.6 Final Product Specification

Table: Final Product Specification.

No.	Metric	Unit	Value	Remark
1	Wi-Fi transfer rate	Gbps	3	802.11 a/b/g/n/ac
2	Bluetooth	-	-	v4.0
3	Power consumption for Bluetooth device	mW	1 to 5	Bluetooth Smart (Low Energy)Technology
4	Data accuracy	-	-	97%
5	Size of sink	mm	-	W x Lx D= 600x500x300
6	Water flow rate	l/m	<9	Litre per minute
7	Stainless steel grade for sink and tap	-	-	304
8	Resolution for LCD panel	ppi	264	-
9	Screen size of LCD panel	Inch	9.7	Diagonal, LED-backlit widescreen Multi-Touch display with IPS technology

4.7 Final Product Specification Testing

The final design has been made and the design should be in consideration for reliability and functionality testing to assure the concerned stake holder such as regulatory bodies and certification bodies.

Since the system is highly involved with both hardware and software, it is necessary to go through different phases of testing accordingly. For the specification, it will be in line with RF equipment (IT/Hardware) Technical specification Guideline since the system is meant for hospital and medical settings used. This is intended for health workers in a hospital such as biomedical engineers, hospital managers, planning officers, procurement officers, and other health related stakeholders such as ministry of health, regulators, manufacturers, NGOs, and UN agencies.

Therefore, the specification must be accordance to international standards such as IEC, EN, FCC for hardware electronics and IEEE standards for software testing.

The product basically must fulfill the following categories of standards.

1) Information Technology Equipment (EN55022)
2) Medical Device Standards (IEC 60601)
3) FCC (Federal Communication Committee) Part 15.247 FHSS
4) Bluetooth Qualification Testing
5) ASME A112.19.3/CSA B45.4

These standards must be fulfilled as a requirement from FDA, HSA and respective regulatory bodies. It is complicated in nature that devices under the influence of medical environment are tightly controlled by regulatory bodies.

In addition to the above mention standards, the safety mark and functional safety certification must be achieved. The details of quality and reliability will be described in under section 8. Quality & Reliability in project 3.

Medical Device Standards

The product can be categorized under Medical Product as defined in the FDA data base, fallen under communication transmitter. Restricted Hazardous Substances in Medical Devices (RoHS) have to be complied as well under the directive of EU for hospital use.

Information Technology Equipment Standards

As this system falls under Information Technology Devices, the components of the system have to comply with CISPR 22:2008 modified standard or equivalent of EN55022 (2010).

Under CISPR 22, the product belongs to the group B as this equipment are going to place near the home/offices electronics appliances.

Federal Communication Committee Standards

This requirement is enforced by FCC where it is mainly applied in US and many part of the world. There is wireless application present in system, example Bluetooth and Ethernet applicable products; thus, the need for control the emission for RF power from Bluetooth Badge and Integrated Reader in the Sink is monitored.

Bluetooth Qualification Testing

The main technology in the product is *Bluetooth*® in which the communication protocol is vital to the system to commence working. The testing of Bluetooth protocol can be received from Bluetooth SIG and other certified bodies accredited by Bluetooth SIG.

ASME A112.19.3/CSA B45.4

This Standard covers plumbing fixtures made of stainless steel alloys and specifies requirements for materials, construction, performance, testing, and markings.

This Standard covers the following plumbing fixtures:
(a) Bathtubs;
(b) Bidets;
(c) Drinking fountains and water coolers;
(d) Lavatories;
(e) Shower bases;
(f) Urinals; and
(g) Sinks:
(i) Kitchen and bar sinks;
(ii) Laboratory sinks;
(iii) Laundry sinks;
(iv) Service sinks; and
(v) Utility sinks.

Software Testing

As the system comprises the software portion, it is again necessary to develop in line with the software testing to assure the system is in accordance with regulation.

ISO/IEC/IEEE 29119 covers the following topics:

- Test Processes
- Test Documentation
- Test Technique
- Keyword Driven Testing
- Process Assessment Model

5. Product Planning and Architecture

5.1 Product Architecture

Figure 5.1a below shown the design of Intra-Splash, the system is designed with 4 main parts with different components.

The first part of Intra-Splash is Employee badge which equipped with Bluetooth technology loaded with the personal information; LED indicator corporate with timer and nudge. Battery is used to power up the component for a long period of time. The badge is made with plastic and waterproof rubber lining will fasten the openings of the casing, protecting the electronic components inside.

The second part is Bluetooth Reader Integrated Sink. A Bluetooth reader is attached at the side of the sink using power supply. It is made of waterproof rubber in order to protect the electronic component inside.

Thirdly, LCD Display which located in front of the sink. The resolution of the display is 264 ppi and screen size of 9.7 inch.

Last but not least, the server which is the main processing unit of the system. It is the communication channel of the whole system.

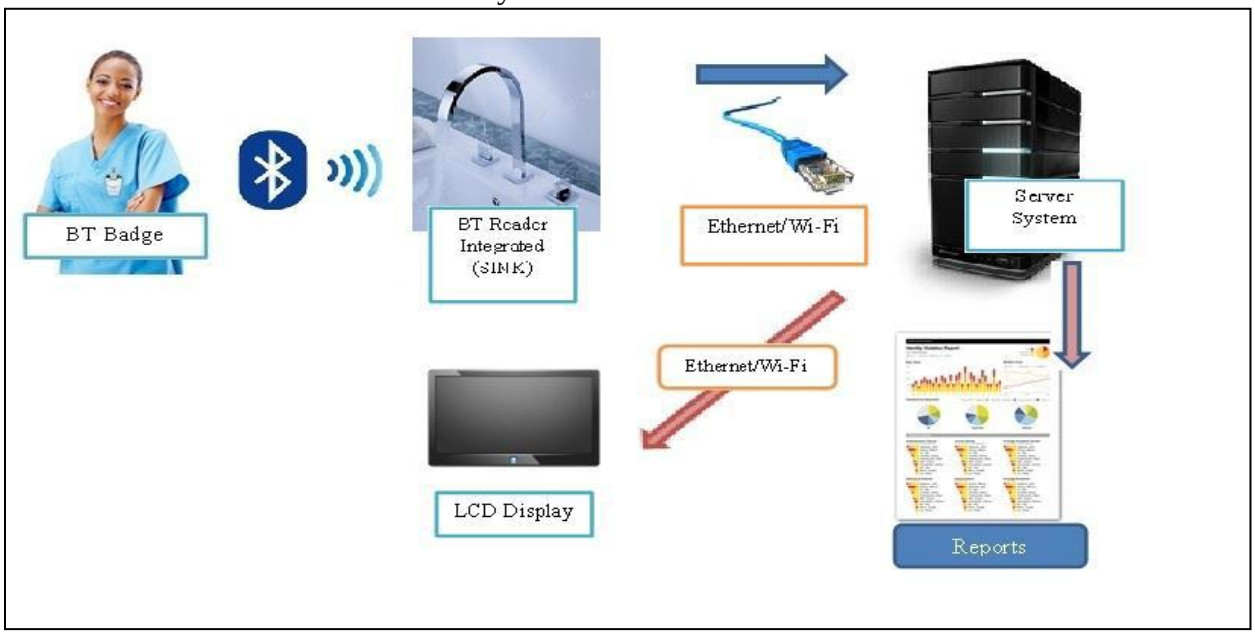


Figure 5.1a: Design of Intra-Splash

From Figure 5.1b below, Intra-Splash is made up of five chunks based on the functionalities of every single chunk. The product architecture follows modular product architectures more closely. There is a number of related elements or functional are grouped accordingly into a chunk. The chunks subsequently become the building blocks of the product, as the below five chunks are integrated into Intra-Splash.

Intra-Splash is chosen to be developed with modular product architecture for some reasons. With modular architecture, chunks are associated with one or more functions distinctly, hence it is much easier with modular architecture to outsource the whole chunk. Sometimes due to some strategies in business, not all the chunks will be able to make in-house which depend on time, cost and direction of the project. On top of that, upgrading a particular separate function in future is uncomplicated with modular architecture approach since the chunk and its function is well-defined.

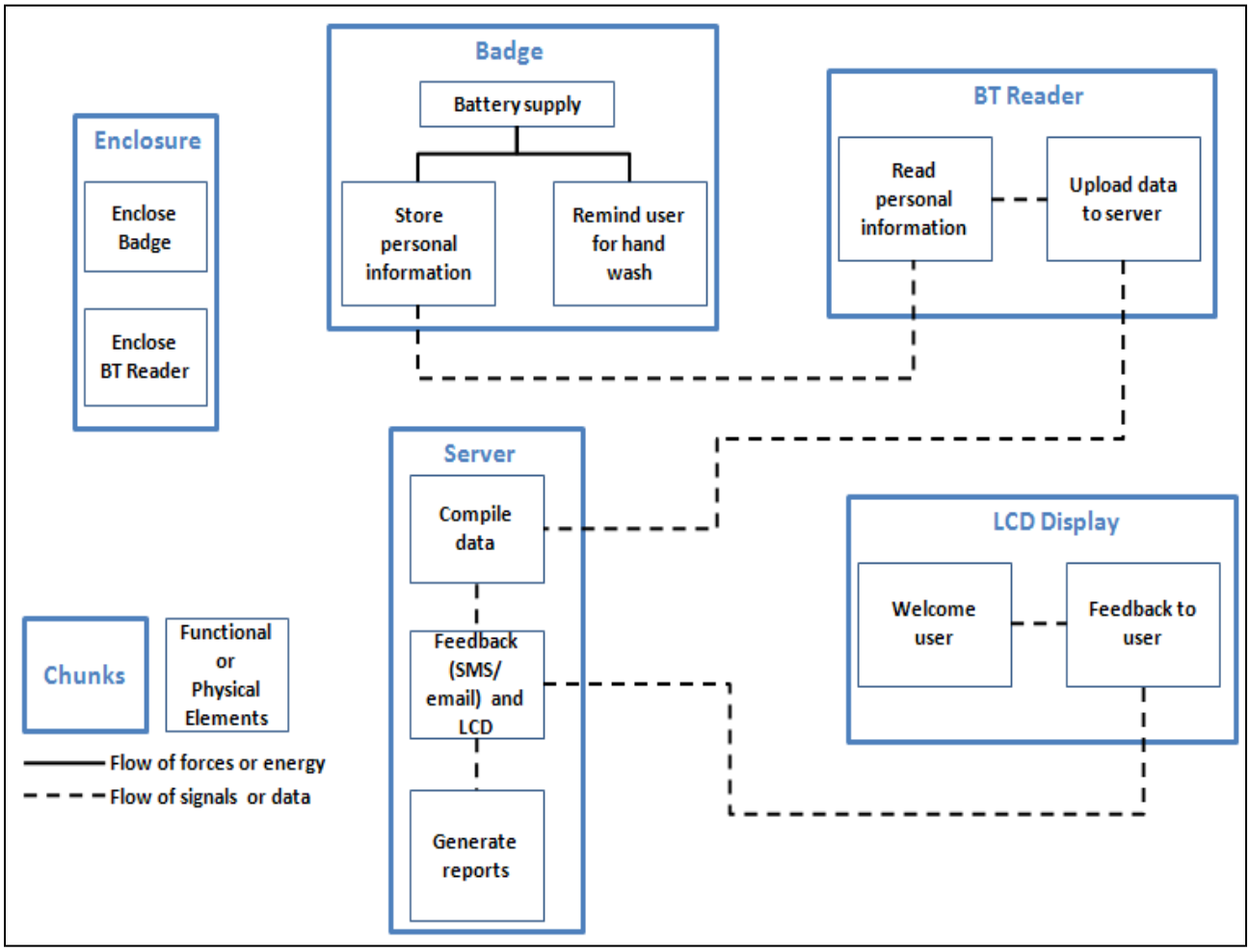


Figure 5.1b: Product Architecture- Intra-Splash Schematic and Elements Clustering

Furthermore, it is very significant to take care of incidental interactions of the product as well as fundamental interactions in order to develop a great ever product. When incidental interactions between different elements of the product are not minimal, efficiency of the product will decrease. Figure 5.1c below identifies the incidental interactions between different elements/functional of the product. Appropriate protectors and shielding will be implemented in order to reduce the incidental interactions between elements.

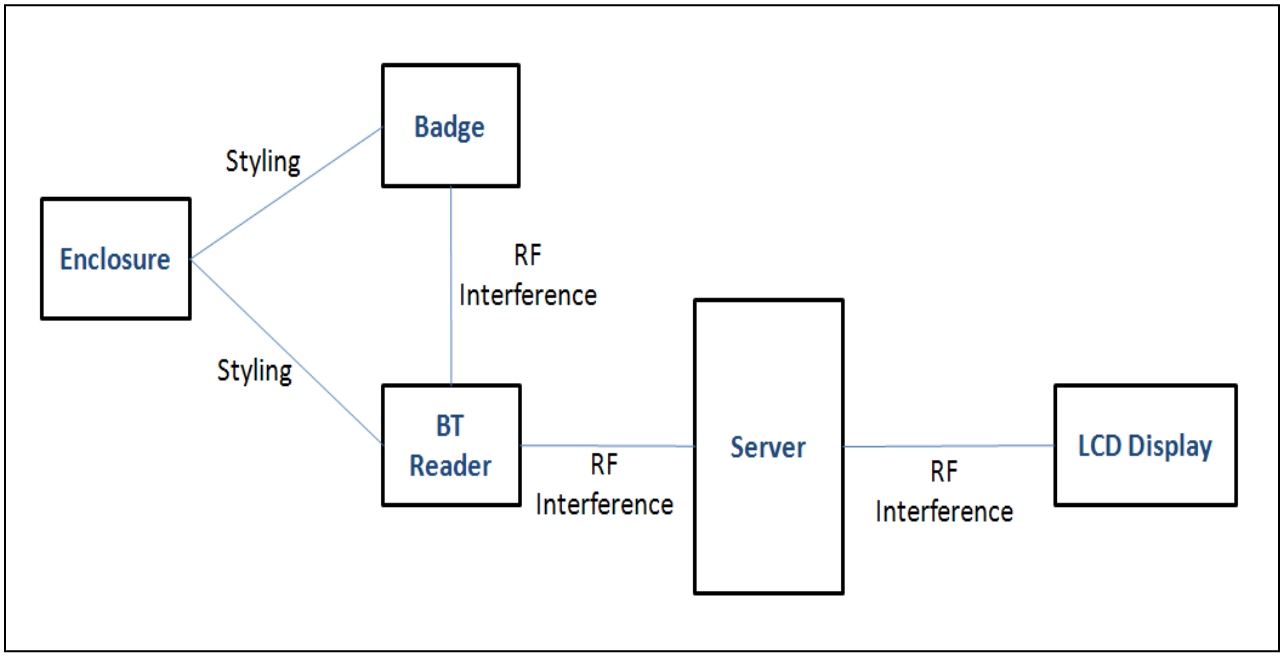


Figure 5.1c: Incidental Interactions

5.2 Product Planning

In order to sustain the product profitable, a systematic product planning is needed to stay in competitive market. A consistent review in product demand, feedbacks from the end user are essential through a systematic planning. It would secure the product in competitive advantage in the market and expanding the size of the market share. The below figure would show an overall idea of product planning according to the time as well as the derivatives and the improvements.

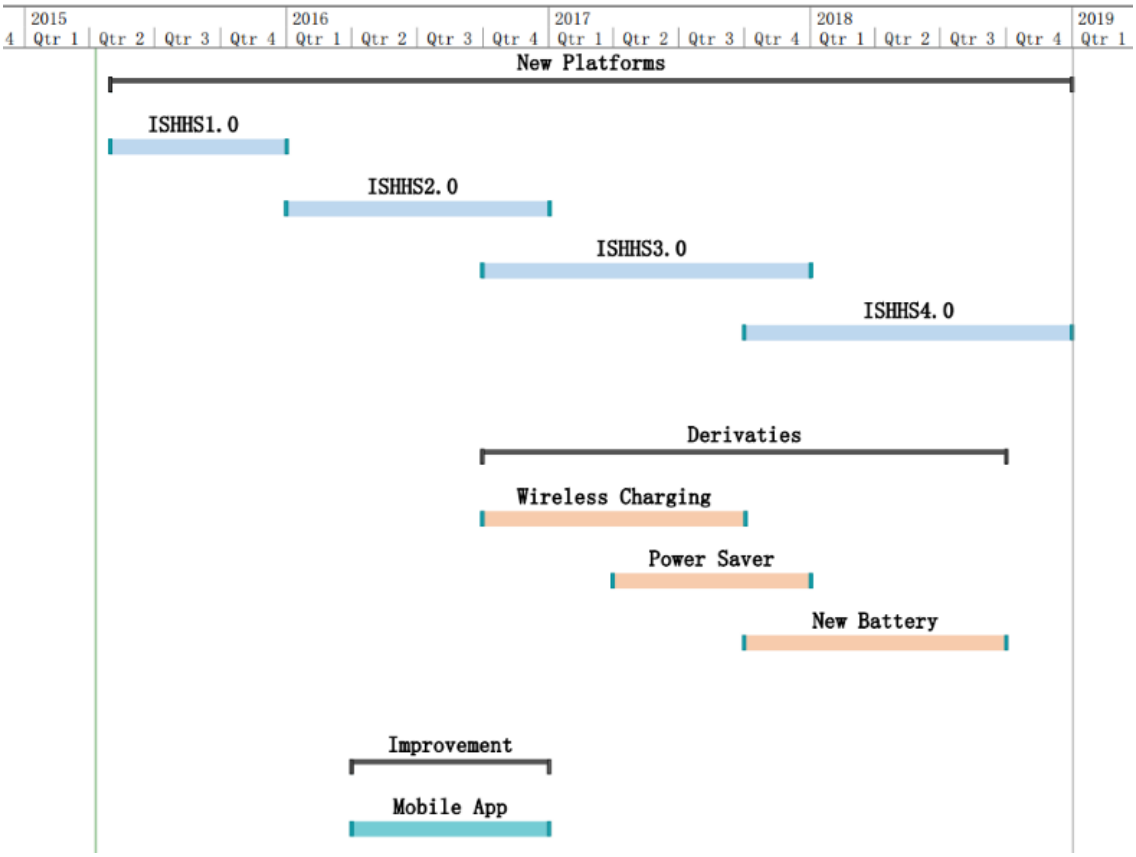


Figure5.2. Product Development Projects

5.2.1 New Platforms

ISHHS1.0 (Intra-Splash Hand Hygiene System Version 1.0) is the on-coming platform, will be set off at the beginning of 2016. It serves as a basic function of the monitoring hand hygiene system through Bluetooth tag and reader integration. The product would be released in 2 versions such as the reader attached at the water tank or the alcohol-based hand lotion dispenser.

ISHHS2.0 (Intra-Splash Hand Hygiene System Version 2.0) would focus on the feedback from the end user of user experience and user interface. It would further improve the design of the current platform and the efficiency of the system. Meanwhile, the hand hygiene system would be re-evaluated consistently through the availability of new technologies. The main purpose of reevaluation is trying to reduce the cost of the elements building the whole systems and stay competitive in the market. At the beginning of 2017, a new version is expected to be released with the above updates.

ISHHS3.0 (Intra-Splash Hand Hygiene System Version 3.0) would be focused on variety of the product to serve the function of monitoring hand hygiene system, such as alcohol-based hand wipes, and etc. In this phase, product availability would be focused not only healthcare provider team, but also the patients themselves. The purpose of increasing the variety of the product and product availability are needed to expand the market share and making profit. At the beginning of 2018, a new version is expected to be released with the above updates.

ISHHS4.0 (Intra-Splash Hand Hygiene System Version 4.0) would be focused on any improvement can be make for perfecting the product in all aspects. ISHHS4.0 will be able to show completeness of hand hygiene system as compared to ISHHS1.0, a proper support and continual maintenance would be withstand through all the test of time. At the beginning of 2019, a new version is expected to be released with the above updates.

5.2.2 Derivatives

There are 3 derivative projects as expected to be launch in coming years. Start from the 4th quarter of 2016, a wireless charging feature would add on to the Bluetooth tag and the reader as well. This wireless charging feature would make the product fancier, end user would prefer to use it as it is cool to be wear.

Another derivative project would focus on the power saving, it would make this product more environmental friendly. It is set to be started from the 2nd quarter of 2017.

Meanwhile, better batteries would be expected to be launched in coming future. The last derivative project would focus on the replacement of better battery, it is expected to start from 4th quarter of 2017. It is able to drive down the costs and boost the capacity. Thus, it would last the performance of the device.

5.2.3 Improvements

In order to enhance user experience and user interface, a mobile app will be expected to work on. It is started from the 2nd quarter of 2016. A mobile app would be able to allow user to access the data 24/7. Through the interaction with the mobile apps and sharing the result with other users, it could promote the hand hygiene compliance.

6. Product Development Economics

"An entrepreneur is someone who initiates a business with personal drive, passion, the will to work hard and an ultimate goal of making money while managing the risks along the way"

Planning for mass manufacturing is one of the most important stages during a new product development.

In this section, the cost of manufacturing is estimated with the consideration of various factors and options. Design for manufacturing methodology is later applied to be able to manufacture a viable product economically while maximizing the profit.

6.1 Estimation of Manufacturing Cost

6.1.1 Target Cost

From the current medical devices market, a few products that have respectable market share and are likely to match the functionalities and quality of Intra-Splash Hand Hygiene System are selected to estimate the target retail pricing. The two selected products, HandGiene and IntelligentM, have different pricing models. Hence, for the price comparison purpose, the prices are calculated accordingly for 300 units or users with product life-time of 6 years.

Existing HHMS™ Products	HandGiene	IntelligentM
Description	*NFC based hand sanitizer dispenser*	*NFC based hand sanitizer dispenser*
Pricing Plan based on 300 users or units with product life of 6 years	Initial Setup Fee : $500,000 Antiseptic Refill : $10 per dispenser per month	Initial Setup Fee : $690,000 Maintenance Contract : $12 per user per month
Average Cost per user per year	$397.80	$527.33

From the table above, the approximate retail price of Intra-Splash system is targeted to be **$300 per user per year including the initial setup fee and basic maintenance contract**. The **profit margin is projected to be around 140%.** Therefore, the **product manufacturing cost is budgeted about $125.**

However, the exact pricing of the systems in this field can only be determined after site visits and evaluation.

6.1.2 Initial Bill of Material (BOM)

The following Bill of Materials is chosen based on the final prototype. It also reflects the material costs which can be further reduced by increasing the minimum purchase quantity.

Bill of Materials and Estimated Costs for Intra-Splash® Bluetooth Badge and Reeciver

Component	Qty	Cost based on MPQ			Extended Cost
		<100	500	1000>	
Common Components					
PCB Board - lead free	1	$13.60	$0.84	$0.43	$0.43
Microcontroller - CortexM3	1	$3.18	$2.86	$2.83	$2.83
Bluetooth 4.0 Module (low power)	1	$13.45	$10.89	$8.32	$8.32
Passive Components (Surface Mount)	15	$0.34	$0.25	$0.20	$2.99
Extra Components for Badge					
Haptic Driver	1	$5.07	$3.74	$2.73	$2.73
Battery CR-1220 - RoHS Compliance	1	$0.70	$0.59	$0.54	$0.54
Plastic Casing (Badge)	1	$0.80	$0.63	$0.48	$0.48
Extra Components for Receiver					
Voltage Regulator 7805	1	$0.46	$0.33	$0.26	$0.26
AC-DC Converter	1	$9.03	$8.43	$7.98	$7.98
Plastic Casing (Receiver)	1	$1.50	$1.39	$1.18	$1.18
				Total Cost for a Badge	**$18.31**
				Total Cost for a Receiver	**$23.98**

*prices are in USD

*total costs are calculated base on 1000 units

6.2 Design for Manufacturing (DFM)

Design for manufacturing method is applied for making decisions on planning the mass manufacturing the products.

In this process, several factors that affect the final product cost, including the costs of software development, infrastructures, equipments, logistics, employees, intellectual properties, product certifications and so on, are evaluated to maximise the ease of manufacturing and profit. Most all of the costs are estimated with the latest information available from the market while a few of them are budgeted.

6.2.1 Manufacturing Cost Estimation

During cost estimation calculaions, the following critical parameters are set according to the business forecasts.

Product life-time : 6 years

Product sales : 3000 units annually

1) Raw Materials

The cost of raw materials is calculated as in initial bill of materials from the final prototype. The estimated cost of Intra-Splash Bluetooth badge and receiver based on 1000 units is as stated below.

Bluetooth Badge Material Cost : $26.76

Bluetooth Receiver Material Cost : $32.43

2) Infrastructure

The cost factory location, machining, equipment, initial setup and utilities are estimated in this section. The allocated budgets are based on the current average market prices.

Infrastructure Cost

Item	Cost	Extended Cost for 6 yrs
Factory Rental Cost (1600 sqft) including utilities per month	$2,500	$180,000
Factory Ramp-Up Cost (Machines, Equipments, Tools)	$50,000	$50,000
	Total	$230,000

3) Production direct labor

The production line will mainly be a final assembly line along with calibration, testing and packaging. Also, the simplicity of the product helps save the necessity of high-skill labour and technicians in the aspect of production. The following table breakdowns the cost of production direct labour.

Direct Labour Cost

Item	Qty	Annual Cost	Extended Cost for 6 yrs
Operator ($9 per hr)	5	$86,400	$518,400
Technician ($13 per hr)	1	$24,960	$149,760
Supervisor ($16 per hr)	1	$30,720	$184,320
	Total		852480

4) Software Development

Software development for the product firmware and web application is outsourced. The cost of it is as follow.

Software Development Cost - Outsource

Item	Qty	Annual Cost	Extended Cost for 6 yrs
Initial Cost for the software	1	$120,000	$120,000
Assistant Web Developer	1	$60,000	$360,000
Total			480000

5) Final estimated cost

The number of bluetooth receiver that needs to be manufacutred is forecasted to be about 20 percent of the total manufacturing units. i.e. 20 bluetooth receivers will be produced for every 80 bluetooth badges.

Forecasted critical parameters:

Product life-time : 6 years

Product sales : 3000 units annually

Raw Materials

Bluetooth Badge (80% of manufacturing)	*18.31 x 0.8*	*14.648*
Bluetooth Receiver (20% of manufacturing)	*23.98 x 0.2*	*4.784*
Average Raw Material per Unit Cost		19.432

Estimated Output for 6 years	**18000**

Total Manufacturing Cost Per Unit

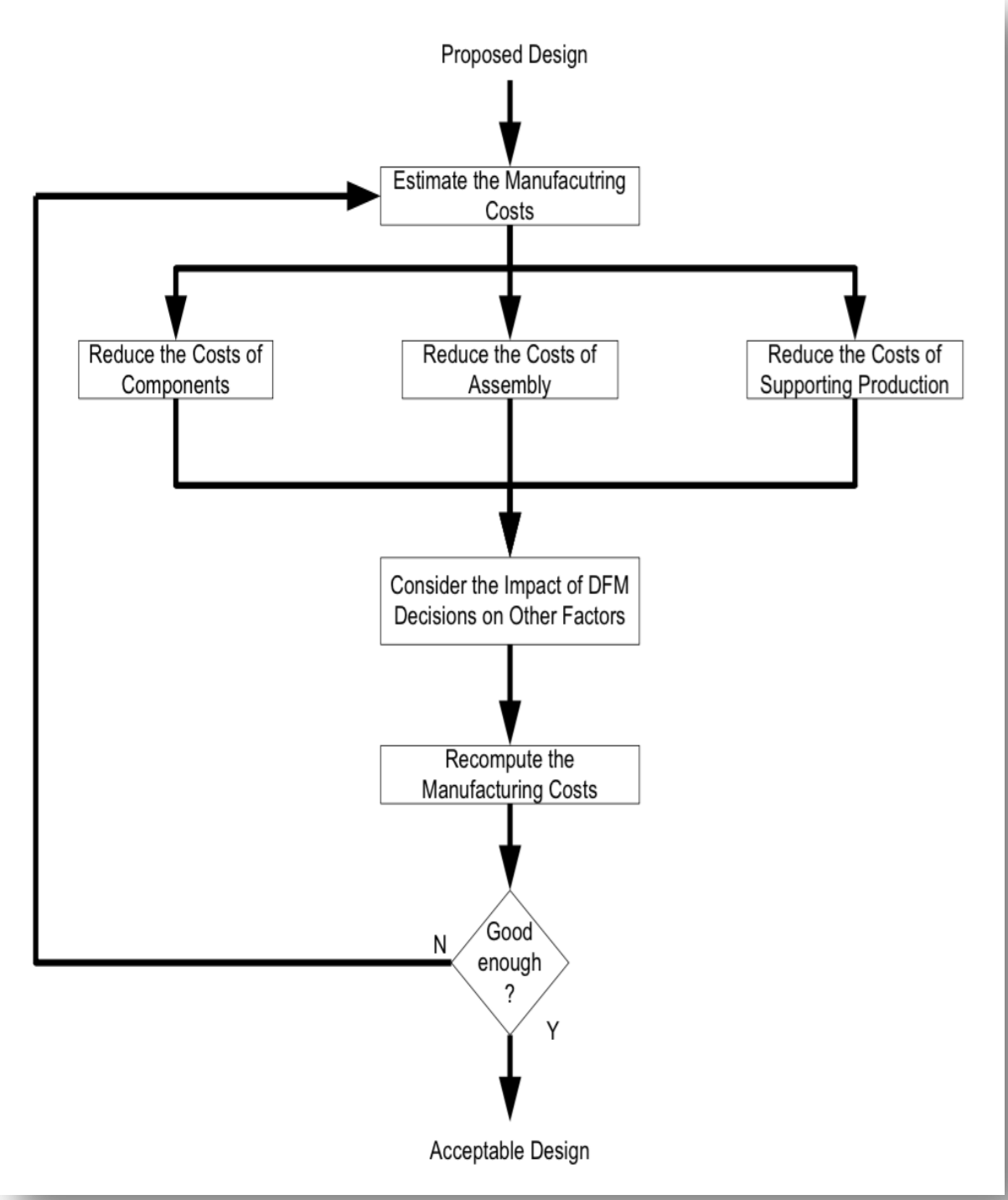
Item	Total Cost for 6 yrs	Per Unit Cost
Average Raw Material Cost		$ 19.43
Infracture Cost	$ 230,000.00	$ 12.78
Direct Labour	$ 852,480.00	$ 47.36
Software Development	$ 480,000.00	$ 26.67
Total Manufacturing Cost Per Unit		$ 106.24

6.2.2 Cost Reduction

Cost Reduction process follows the below DFM stages.

- Reduce the costs of components
- Reduce the costs of assembly
- Reduce the costs of supporting production
- Consider the impact of DFM decisions on other factors

These stages are applied iteratively according to the following DFM process until the minimum viable and maximum profitable product is resulted.


Proposed Design
Estimate the Manufacutring Costs
Reduce the Costs of Components
Reduce the Costs of Assembly
Reduce the Costs of Supporting Production
Consider the Impact of DFM Decisions on Other Factors
Recompute the Manufacturing Costs
Good enough ?
N
Y
Acceptable Design

1) Reducing the Cost of Components

With the help of the prototype, we conclude that we could use less powerful microcontroller which can achieve the existing functionalities with insignificant compromisation in performance. Hence, we decided to replace the cortex-M3 microcontroller with cortex-M0.

Further researches yields that open hardware of cortex-M0 with built-in low power bluetooth module is available. The availability of open hardware can potentially **reduce the risk of electronic hardware related IP issues.**

Revised bill of material

Component	Qty	Cost based on MPQ			Extended Cost
		<100	500	1000>	
Common Components					
PCB Board - lead free	1	$9.90	$0.62	$0.25	$0.25
Micro BLE Module w/Cortex-M0 Basec	1	$16.90	$10.20	$9.30	$9.30
Passive Components (Surface Mount)	15	$0.30	$0.22	$0.10	$1.50
Extra Components for Badge					
Haptic Driver	1	$4.60	$3.50	$1.90	$1.90
Battery CR-1220 - RoHS Compliance	1	$0.65	$0.52	$0.40	$0.40
Plastic Casing (Badge)	1	$0.45	$0.39	$0.30	$0.30
Extra Components for Receiver					
Voltage Regulator 7805	1	$0.46	$0.33	$0.25	$0.25
AC-DC Converter	1	$7.50	$5.60	$4.50	$4.50
Plastic Casing (Receiver)	1	$1.20	$0.99	$0.50	$0.50
				Total Cost for a Badge	**$13.65**
				Total Cost for a Receiver	**$16.30**

*prices are in USD
*total costs are calculated base on 1000 units

2) Reducing the Cost of Assembly

The combination of major components in the product design can reduce the number of pin connections on the PCB which is one of the major costing factors if the PCB assembly is outsourced.

It is obvious that the costs of infrastructure and labors in Singapore are relatively higher compare to other Asia Pacific countries especially when the production unit quantity is not huge.

With these considerations, we decided to outsource the manufacturing the product.

An outsourced manufacturer in Shenzhen, China is chosen as it is located in the industry zone where most of the electronic components come from, to further reduce the cost of the components.

Both infrastructure cost and direct labour cost are replaced by the processing fee which include manufacturing, administration and logistics costs. Moreover, the production output can be scalable easily depending on the demand.

The cost breakdown is as follow.

Component	Qty	Cost based on MPQ			Extended Cost
		<100	500	1000>	
Common Components					
PCB Board - lead free	1	$9.90	$0.62	$0.25	$0.25
Micro BLE Module w/Cortex-M0 Basec	1	$16.90	$10.20	$9.30	$9.30
Passive Components (Surface Mount)	15	$0.30	$0.22	$0.10	$1.50
Extra Components for Badge					
Haptic Driver	1	$4.60	$3.50	$1.90	$1.90
Battery CR-1220 - RoHS Compliance	1	$0.65	$0.52	$0.40	$0.40
Plastic Casing (Badge)	1	$0.45	$0.39	$0.30	$0.30
Extra Components for Receiver					
Voltage Regulator 7805	1	$0.46	$0.33	$0.25	$0.25
AC-DC Converter	1	$7.50	$5.60	$4.50	$4.50
Plastic Casing (Receiver)	1	$1.20	$0.99	$0.50	$0.50
Outsourced Manufacturing					
Processing	1	NA	$0.60	$0.48	$0.48
Administration	1	NA	$0.20	$0.20	$0.20
Logistics	1	NA	$0.40	$0.40	$0.40
				Total Cost for a Badge	**$14.73**
				Total Cost for a Receiver	**$17.38**

*prices are in USD
*total costs are calculated base on 1000 units

3) Reducing the cost of software development

Firmware and web-app development is finally decided to be done in-house with two assistant developers. Below two tables show the advantages of having in-house development team and cost.

Software development - in-house or outsource

Criteria	Wt.	In-house 1	Outsource 2
Cost	3.0	5	3
Time	3.0	2	4
Management	2.0	4	1
Ease of testing	1.0	5	2
Flexibility in Requirements	1.0	4	1
Quality	1.0	4	4
Weighted Scores		42.0	30.0

Criteria	Definition
Cost	Lesser cost gets higher mark
Time	Shorter Time gets higher mark
Management	Ease of management
Ease of Testing	What is more convenience for testing
Flexibility in Requirements	How much flexibility in changing the requirements in each iteration
Quality	The better the quality, the higher the mark

Software Development Cost - In-house

Item	Qty	Annual Cost	Extended Cost for 6 yrs
Assistant Firmware Developer	1	$30,000	$180,000
Assistant Web Developer	1	$27,000	$162,000
Total			342000

4) Reducing the cost of Supporting Production

As the production of the product is outsourced, direct support for the production becomes unnecessary. However, the management of the outsourcing manufacturer will be far more complicated.

5) Final estimated Cost of Manufacturing

Raw Materials		
Bluetooth Badge (80% of manufacturing)	*14.73 x 0.8*	*11.784*
Bluetooth Receiver (20% of manufacturing)	*17.38 x 0.2*	*3.476*
Average Raw Material per Unit Cost		15.26

Estimated Output for 6 years	18000

Total Manufacturing Cost Per Unit

Item	Total Cost for 6 yrs	Per Unit Cost
Average Raw Material Cost		$ 15.26
Software Development	$ 342,000.00	$ 19.00
	Total Manufacturing Cost Per Unit	$ 34.26

6.3 Economic Analysis

Following figures show the final estimated budget needed to kick start the business.

Item	Monthly Cost	Time (month)	Extended Cost
Initial Development	$ 16,600.00	9	$ 149,400.00
Testing and Certification	$ 17,000.00	6	$ 102,000.00
Office and Employee expense	$ 23,400.00	63	$ 1,474,200.00
Market Introduction	$ 20,830.00	6	$ 124,980.00
Ongoing Marketing	$ 7,000.00	24	$ 168,000.00
Unit Sales	**4800 units of deployment/year**		
Unit Price	**Average $300/unit (including initial deployment cost)**		
Unit Production Cost + Servicing	**Average $50/unit (including servicing for 6 years)**		
Forecasted Initial Budget			$ 544,380.00

6.3.1 Sensitivity Analysis

Sensitivity Analysis is carried on for better vision on financial projection of the company using the critical parameters such as sales, manufacturing cost. With this analysis, the core management team will be able to focus and manage on important factors depending on the the possible outcomes.

6.3.2 Financial Model

Critical parameters are put together and boiled down to Net Present Value (NPV) throughout the lifetime of the product.

The observed sensitivities of the critical parameters are as follow:

Parameters	Observed Sensitivity
Initial Development	very low
Testing and Certification	very low
Office & Employee expense	low
Market Introduction	very low
Ongoing Marketing Costs	very low
Unit Sales	quite high
Average Unit Price (including initial setup)	very high
Unit Production Cost + Servicing	high
Discount Rate (per time period)	high

It is found that average **unit price of the product is very highly sensitive**. For instant, increase in the *unit price by 4% is enough to cover the cost of expending the office area and office staff head counts to double.*

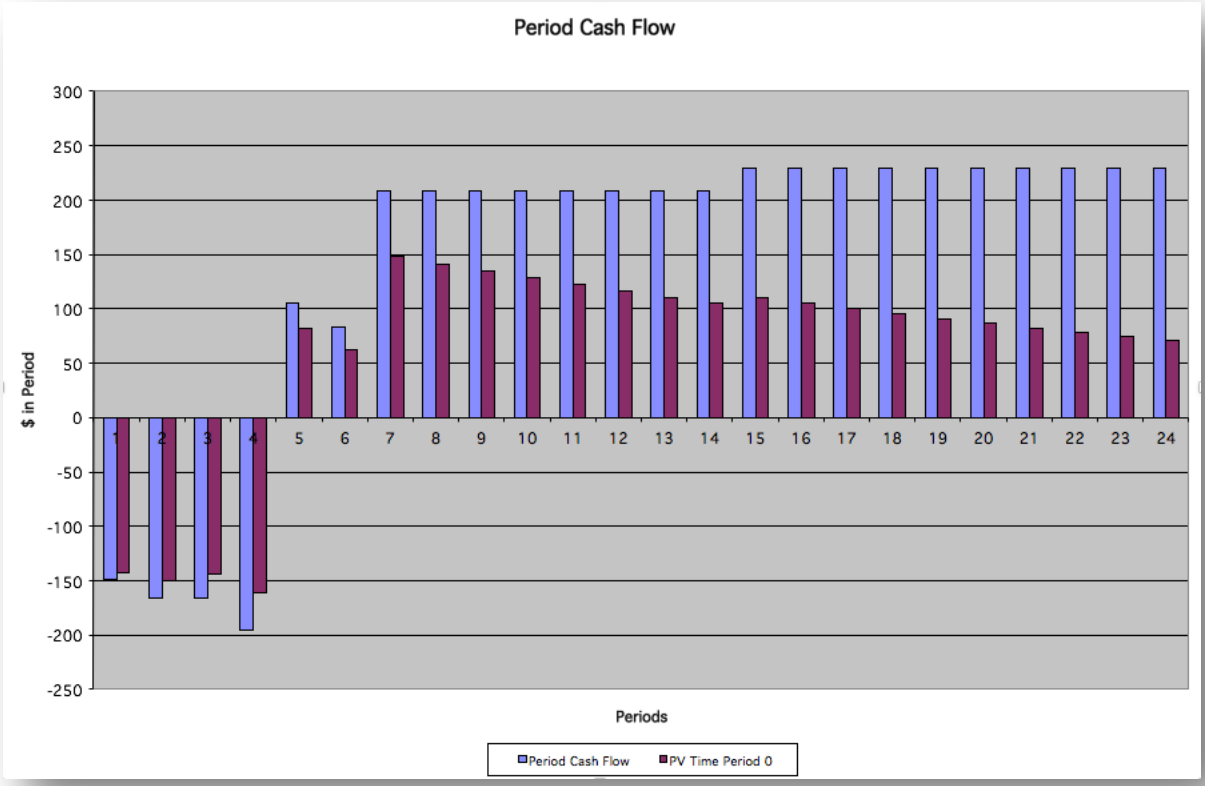
It also indicates that we could comfortably be able to spend more on the initial development cost, certification and marketing when necessary.

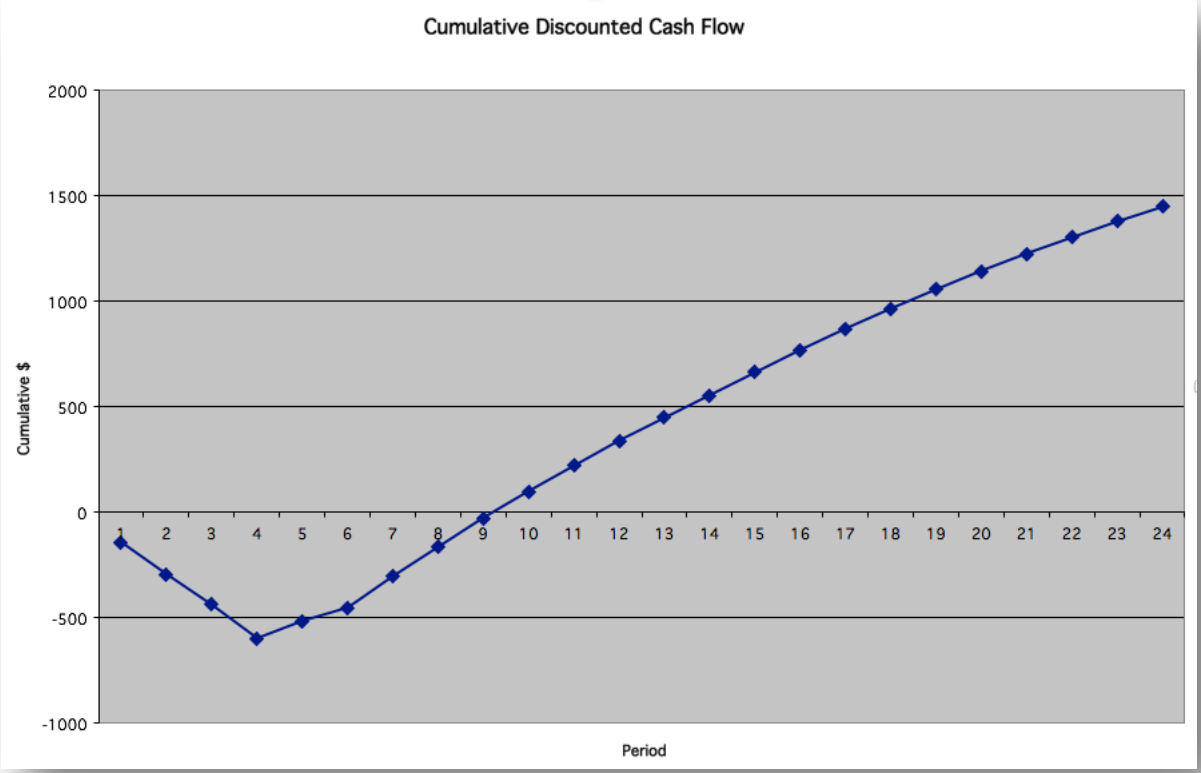
i) Base Case Model

The base case model is set around the calculation results of initial budget needed. The projected cash flow cover 6 years of business operation.

In this base case, the breakeven point is around 9th quarter which is about 2 years.

			PROJECT NPV $	1,451			
			Set Base	Base NPV 1,451	Changes from Base NPV % of NPV 0.0%	$ change 0	
MODEL VALUES							
	first	last	base burn rate	adjusted burn rate	%Δ from base value	$Δ from base value	Observed Sensitivity
Initial Development	1	3	-149	-149	0.0%	0	very low
Testing and Certification	2	3	-17	-17	0.0%	0	very low
Office & Employee expense	4	24	-70	-70	0.0%	0	low
Market Introduction	4	6	-125	-125	0.0%	0	very low
Ongoing Marketing Costs	6	14	-21	-21	0.0%	0	very low
Unit Sales	5	24	1200	1200	0.0%	0	quite high
Average Unit Price (including initial setup)	5	24	0.300	0.300	0.0%	0.00	very high
Unit Production Cost + Servicing	5	24	-0.050	-0.050	0.0%	0.00	high
Discount Rate (per time period)	5.00%						high





ii) Worst Case Model

In this model, we assumed that the development takes more expenses, manufacturing cost and servicing cost increased and sales volume drops while discount rate goes up. For further worst case scenario, other expenses are also increased and sale price is decreased.

In this case, the breakeven point will be shifted to 14th quarter which is about 3 and half years.

PROJECT NPV $ 498

Set Base

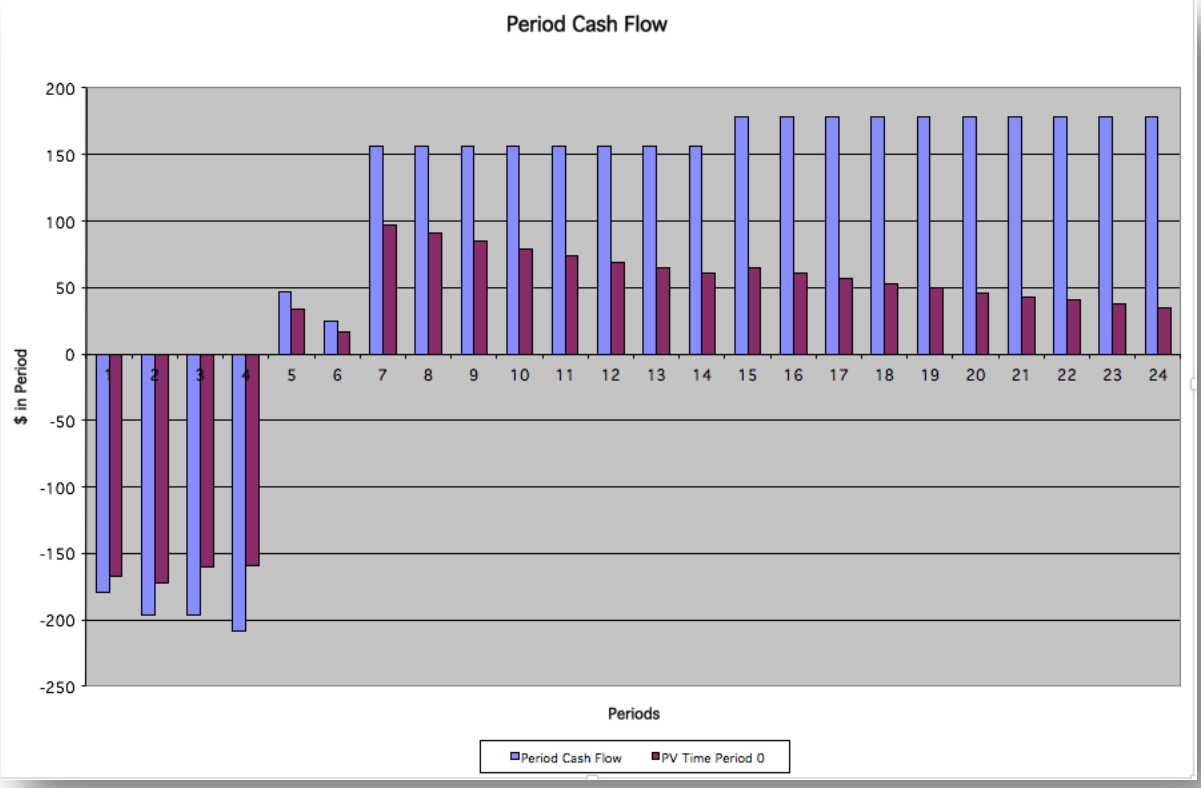
Base NPV 1,451

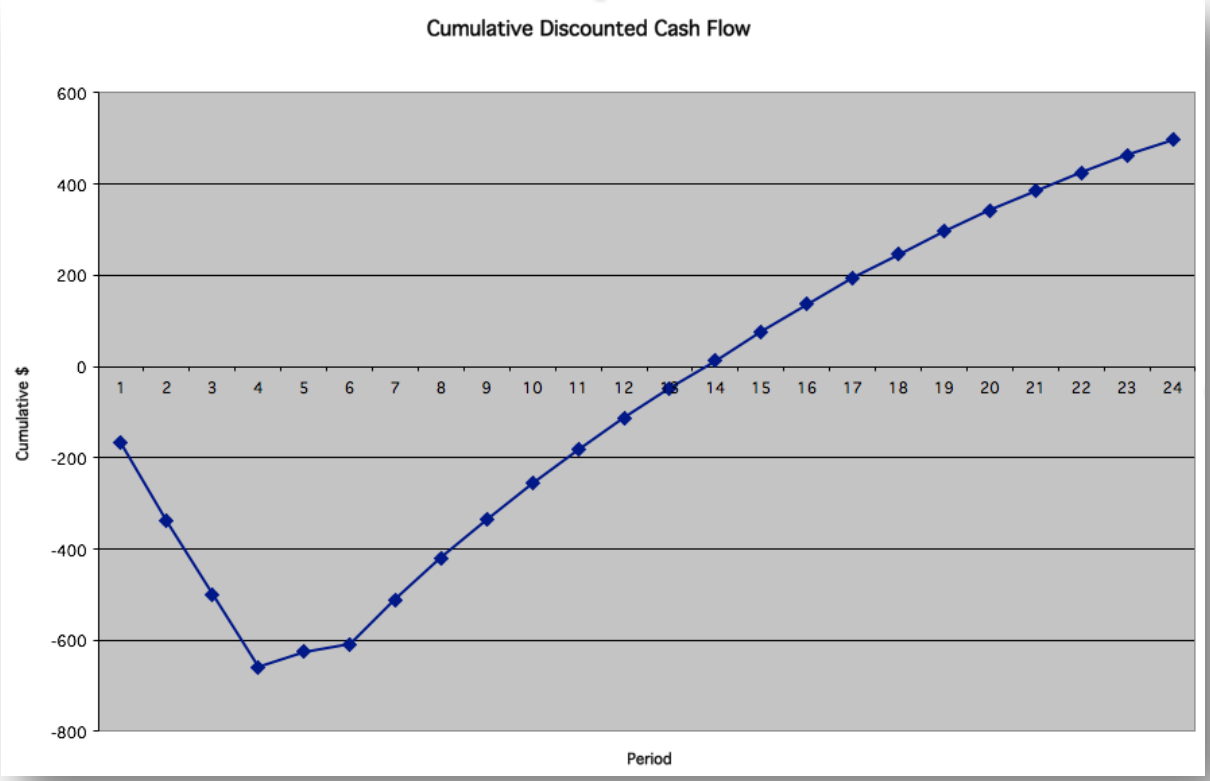
Changes from Base NPV

% of NPV	$ change
-65.7%	-953

MODEL VALUES

	first	last	base burn rate	adjusted burn rate	%Δ from base value	$Δ from base value	Observed Sensitivity
Initial Development	1	3	-149	-179	20.0%	-30	very low
Testing and Certification	2	3	-17	-18	5.0%	-1	very low
Office & Employee expense	4	24	-70	-77	10.0%	-7	low
Market Introduction	4	6	-125	-131	5.0%	-6	very low
Ongoing Marketing Costs	6	14	-21	-22	5.0%	-1	very low
Unit Sales	5	24	1200	1080	-10.0%	-120	quite high
Average Unit Price (including initial setup)	5	24	0.300	0.294	-2.0%	-0.01	very high
Unit Production Cost + Servicing	5	24	-0.050	-0.058	15.0%	-0.01	high
Discount Rate (per time period)	7.00%						high





iii) Best Case Model

In this model, the discount rate is not change much as it is not under our control. But we assume everything goes well and we are paid back as much as we work hard. This model will reflect the target goals of the business.

In this scenerio, we could bring forward the breakeven point to as earliest as 1 and half years which is considered to be hugh achievement.

PROJECT NPV $ 3,303

Set Base

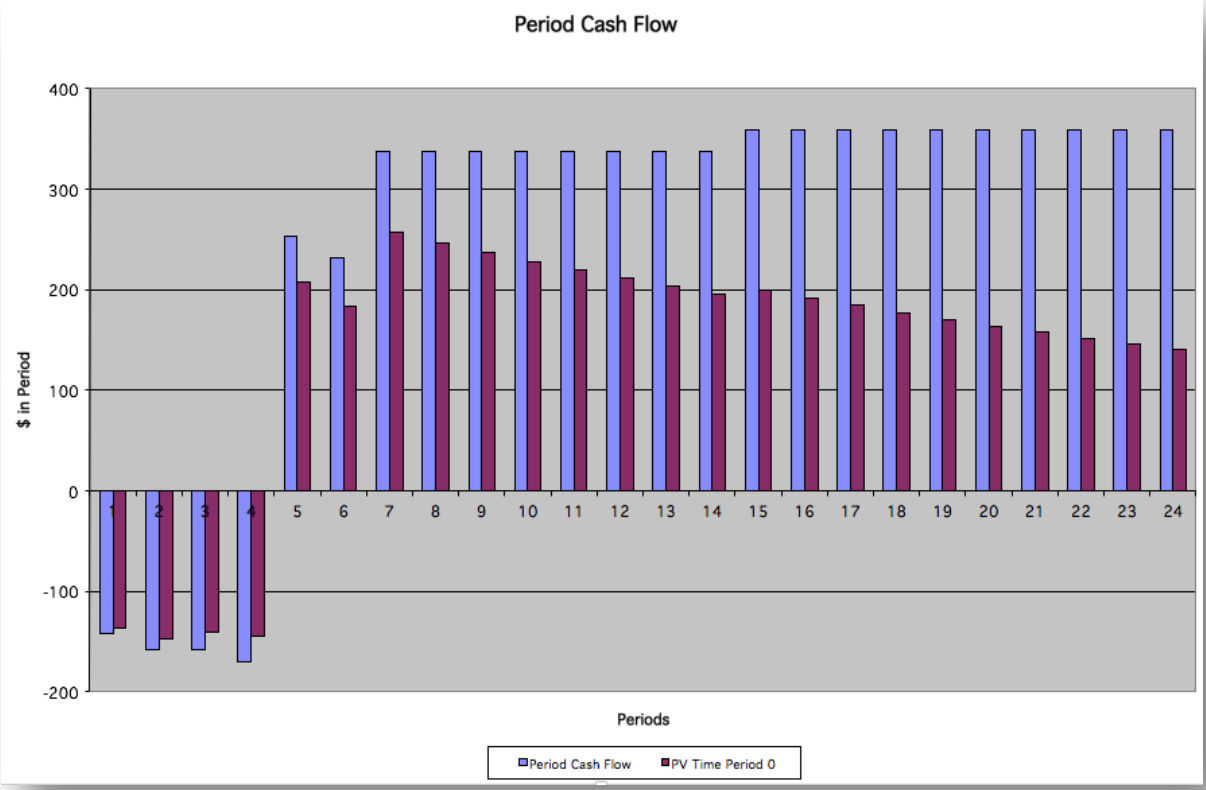
Base NPV 1,451

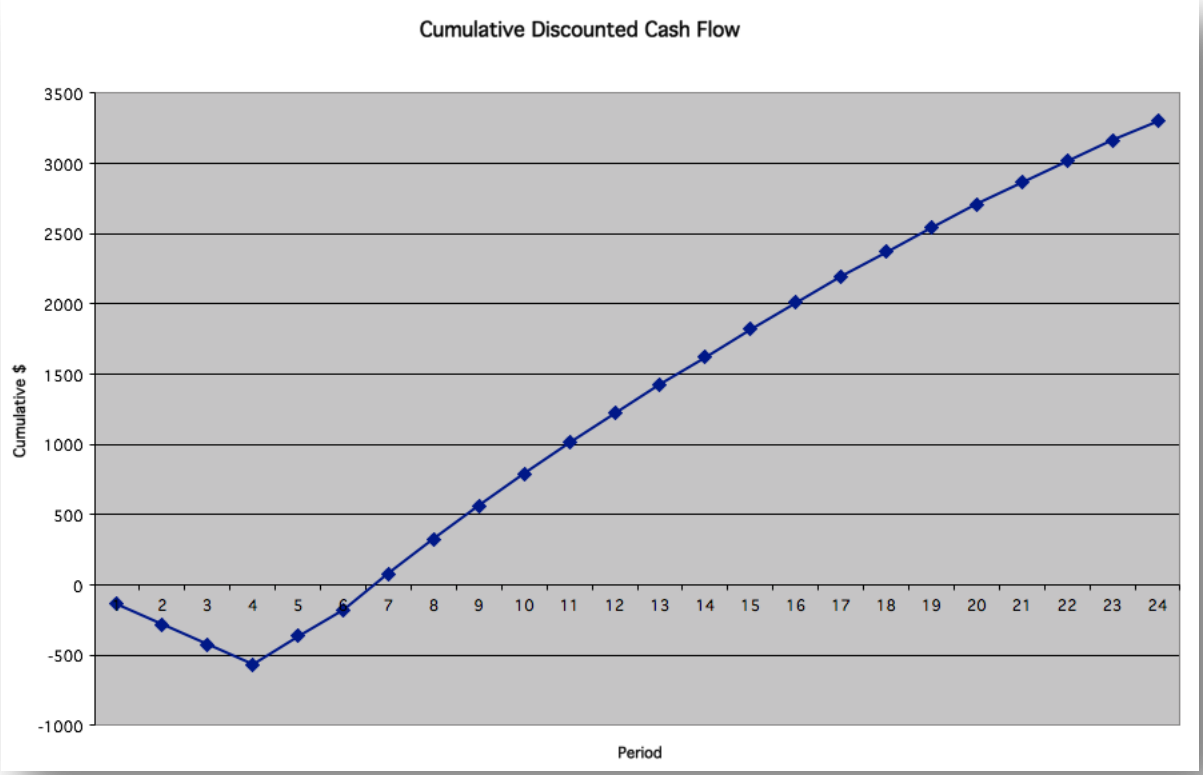
Changes from Base NPV

% of NPV	$ change
127.6%	1852

MODEL VALUES

	first	last	base burn rate	adjusted burn rate	%Δ from base value	$Δ from base value	Observed Sensitivity
Initial Development	1	3	-149	-142	-5.0%	7	very low
Testing and Certification	2	3	-17	-17	0.0%	0	very low
Office & Employee expense	4	24	-70	-63	-10.0%	7	low
Market Introduction	4	6	-125	-106	-15.0%	19	very low
Ongoing Marketing Costs	6	14	-21	-21	0.0%	0	very low
Unit Sales	5	24	1200	1500	25.0%	300	quite high
Average Unit Price (including initial setup)	5	24	0.300	0.324	8.0%	0.02	very high
Unit Production Cost + Servicing	5	24	-0.050	-0.043	-15.0%	0.01	high
Discount Rate (per time period)	4.00%						high




Cumulative Discounted Cash Flow
Cumulative $
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
2
3
4
5
6
7
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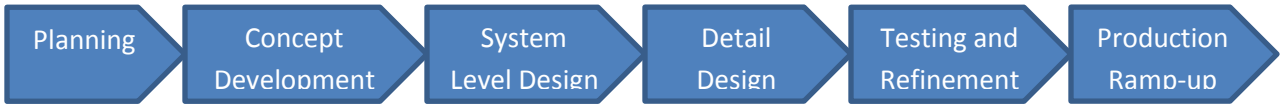
23
24
Period

6.4 Design for Environment (DFE)

Design for the Environment Program (DFE) is a United States Environmental Protection Agency (EPA) program, created in 1992, that works to prevent pollution, and the risk pollution presents to humans and the environment.

Figure. Sample Design for the Environment Logo

As "Tolstoy Technologies" is socially responsible for environment, the product management team is decided to participate in "Design for Environment" program to promote environmentally friendly products. This is the least thing the firm could give back to the society and beloved earth. While maintaining the quality of the product, the firm will go extra miles to control environmental risks arise from the manufacturing and products itself. The DFE will be integrated into the standard product development process.



The Intra-splash design will be programmed under Four Main concepts of DFE. They are as follow:

1. ***Design for Environmental Processing & Manufacturing***
   Under this area, the raw materials to be used in Hand Hygiene system will be strictly followed the environmental compliance such as extraction (mining, drilling, etc.), processing (processing reusable materials, metal melting, etc.). Most importantly, the manufacturing contractor for the system will follow the guideline of Green Manufacturing in which materials and process involved are not dangerous to the environment or the employees working in the manufacturing process. The minimization of waste and hazardous by-products, air pollution, and energy expenditure should be strictly observed.

2. ***Design for Environmental Packing***
   In fact the package is the part of the product; therefore it is needed to ensure that the materials used in packaging are environmentally friendly. In this process, it can be obtained from the reuse of shipping products, elimination of paper and packaging products, control use of materials and space and use of recycled and/or recyclable materials.

3. ***Design for Disposal or reuse***
   It is very important to plan for End of Life of a product. When they are disposed in a land fill, they may emit dangerous chemical into the air, ground and water. Planning ahead can significantly lower the risk of environmental effect. One way to control it is to reuse or refurbish the products developed. Planning of how the products can be disassembled and reused and consider the environmental impacts of the materials used in Products.

4. ***Design for Energy efficiency***
   The design of product must be integrated to reduce overall energy consumption throughout the product's life. For Intra-splash, it will be included in Bluetooth badge energy consumption, Display Unit and Water Flow for the sink as well.

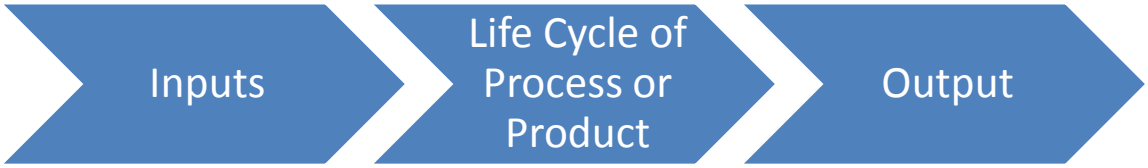
6.4.1 Life Cycle Assessment of Intra-Splash

In order to meet the above objectives of Environmental sustainability, the “Intra-Splash” will be integrated for the product’s materials, design, energy consumption, and recyclability in stages of product development. LCA is a technique to access environmental impacts associated with all stages of product development. In this process, the important facts will be revealed and which can highlight the potential risk for the environment.

LCAs can help avoid a narrow outlook on environmental concerns by:

- Compiling an inventory of relevant energy and material inputs and environmental releases;
- Evaluating the potential impacts associated with identified inputs and releases;
- Interpreting the results to help make a more informed decision.

Before commencing LCA assessment, life cycle stages have to be listed out, considering input and output consideration of the process. It will be discussed in detailed manner here.



Input	*Life Cycle of Process or Product*	*Output*
Trees and Crops	Raw Material Processing	Airborne Emissions
Water	Manufacturing	Recyclable Waste
Gas and Crude Oil	Production	Co-products
Chemicals	Transportation	Waterborne Emissions
Energy	Product Life	Landfilled Waste
Capital Equipment	Maintenance	Dumping and Littering

i) Development Phase

Considering the impact on environment sustainability, the design team is structured to consider the product design and materials to be used according to the testing & research for minimal environmental effect.

Task for Product Designer: To fully understand the impact of materials to be used in product. Preplan the design stage and production stage and submit the risk analysis for environmental impact of the choices of materials and the impact of the application of product.

ii) Materials and Disposal Phase

It is important that tested and environmental approved materials to be used only. The components and
PCB is also another area of focus for materials and disposal phase. For Intra-Splash, the main components will be Bluetooth Badge, Receiver and Display Unit.
Consulting with certification bodies and engaged with suppliers who are environmentally compliant. This task is to be assured by Product Design Team, Product Manufacturing Team and compliance team.

	Requirement	***Environmental Effects***
Bluetooth Badge		
PCB Board	LED Free	Toxic Compounds for Human
Battery CR-1220	ROHS compliant	Hazardous Substances
Plastic Casing	Free- Brominated flame retardants (BFRs) Free Phthalates	Chemical Flame, Toxic
	Requirement	***Environmental Effects***
Bluetooth Receiver		
PCB Board	LED Free	Toxic Compounds for Human
Plastic Casing	Free- Brominated flame retardants (BFRs) Free Phthalates	Chemical Flame, Toxic
	Requirement	***Environmental Effects***
Energy Efficiency		
AC-DC converter	Energy Verified Certificate	Control Energy Wastage
Battery CR-1220	Rechargeable	Control Energy Wastage
	Requirement	***Environmental Effects***
Recycle		
Plastic Casing	Control Required for Disposing, Control the usage of Plastic	Plastic is not biodegradable.
Battery CR-1220	Rechargeable to control the usage of lithium materials	Lithium ion is toxic to environment
PCB	Refurbished board are recommended	PCB is not biodegradable. Toxic compounds present for PCB and electronics components

iii) Manufacturing and Packaging Phase

Manufacturer should be compliant with environmental Laws & Regulations such as air pollution, waste discharge and toxic chemicals used in process. Moreover, packaging should be observed for stringent guideline from local communities and international bodies.

Manufacturing and packaging will be only outsourced to the certified organization compliant with “Clean Air Act”, “Endangered Species”, “Reserving Wetlands”, “Resource Conservation and Recovery Act”.
Suppliers must follow the guideline of environmental standards — including hazardous waste management, wastewater management, process water management, air emissions management, and boundary noise management.

iv) Distribution Phase

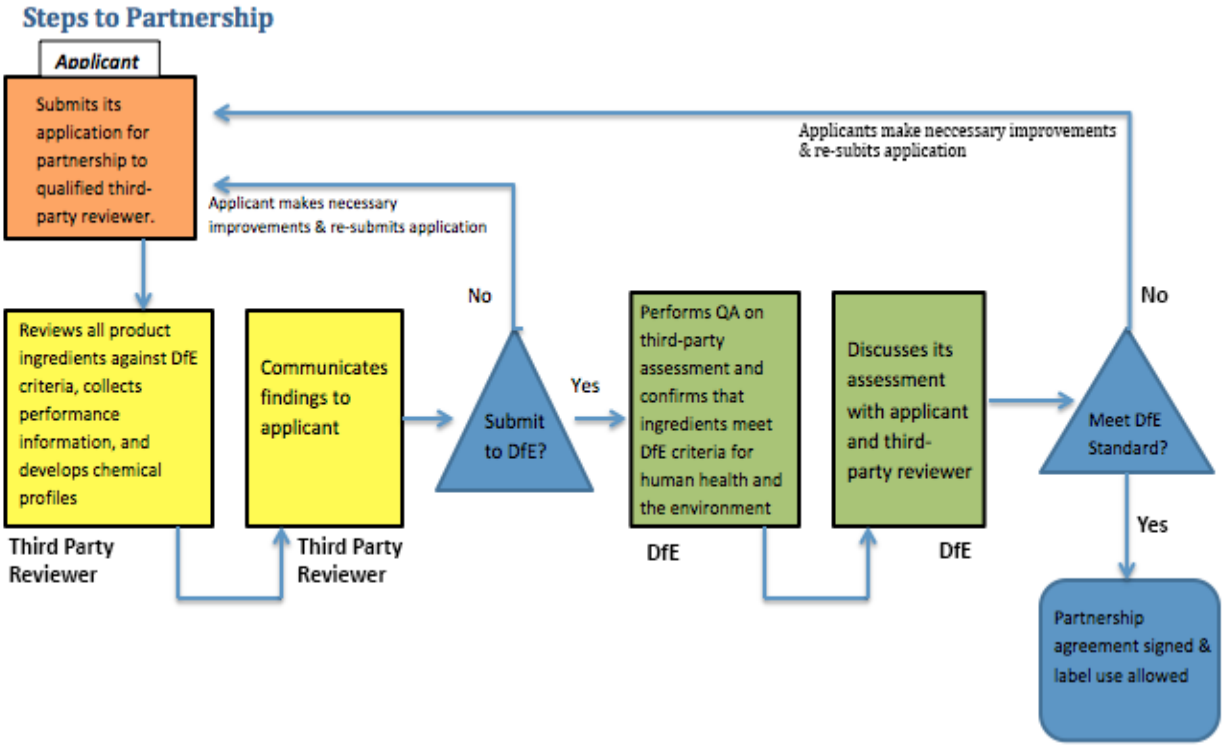
Sustainable distribution refers to any means of transportation / hauling of goods between vendor and purchaser with lowest possible impact on the ecological and social environment, and includes the whole distribution process from storage, order processing and picking, packaging, improved vehicle loadings, delivery to the customer or purchaser and taking back packaging.

It is important to assure "Sustainable Distribution" so that the environmental issues and social impacts are kept to minimal.
In this process, 7 "R"s of Eco friendly packing in distribution has to be observed, namely Renew, Reuse, Recycle, Remove, and Reduce, Revenue and Read.

v) Usage Phase

Mainly concerned with energy efficiency, the Intra-Splash system only uses highly energy efficient components. The low power Bluetooth 4.0 module and long lasting Battery are the main contributors of good usage phase. Moreover, the AC-DC Converter is highly energy efficient and it is certified by third body Certification body for its efficiency.
Furthermore, for software parts, the inactivity period will deactivate the battery usage and display unit as well. In this way, the greener and sustainable environment design is achieved by product development team.

For the best DFE, it is also advisable for the product manufacturers to engage with Environment Protection Agency (EPA). Following is the steps for partnership with EPA for reference.


Steps to Partnership
Applicant
Submits its application for partnership to qualified third-party reviewer.
Applicants make neccessary improvements & re-subits application
Applicant makes necessary improvements & re-submits application
Reviews all product ingredients against DfE criteria, collects performance information, and develops chemical profiles
Third Party Reviewer
Communicates findings to applicant
Third Party Reviewer
No
Submit to DfE?
Yes
Performs QA on third-party assessment and confirms that ingredients meet DfE criteria for human health and the environment
DfE
Discusses its assessment with applicant and third-party reviewer
DfE
No
Meet DfE Standard?
Yes
Partnership agreement signed & label use allowed

7. Project Management & Scheduling

7.1 Project Development Organization (Tolstoy Technologies)

KYAW SOE HEIN

Chief Executive Officer

KAUNG SITHU

Chief Financial Officer

YEW KOK WEE

Chief Operating Officer

LEE JIA JUN

Vice President of Marketing

Kyaw Soe Hein, CEO

The Executive Director serves as chief executive of Tolstoy Technologies and, in partnership with the other board members, is responsible for the success of the Organization. Together, the board and Executive Director assure the Organization's relevance to the community, the accomplishment of the Organization's mission and vision, and the accountability of the Organization to its diverse constituents. The Board delegates responsibility for management and day-to-day operations to the Executive Director, and he has the authority to carry out these responsibilities, in accordance with the direction and policies established by the Board. The

Executive Director provides direction and enabling to the Board as it carries out its governance functions.

Accountabilities

1. *Legal Compliance*
2. *Mission, Policy and Planning*
3. *Management and Administration*
4. *Governance*
5. *Financing*
6. *Community Relations*

Kaung Sithu, CFO

The Chief Financial Officer (CFO) provides both operational and programmatic support to the organization. The CFO supervises the finance unit and is the chief financial spokesperson for the organization. The CFO works directly with the Chief Executive Officer (CEO) and directly assists the Chief Operating Officer (COO) on all strategic and tactical matters as they relate to budget management, cost benefit analysis, forecasting needs and the securing of new funding.

Accountabilities

1. Legal Compliance
2. Financial Controlling
3. Banking Activities
4. Fiscal Activities
5. Management & Budgeting
6. Insurance & Asset Analysis

Yew Kok Wee, COO

The Chief Operating Officer (COO) will have overall strategic and operational responsibility for all Tolstoy Technologies programs and will manage a group of program executive. As the chief program officer, he will provide leadership to the Tolstoy Technologies strategic planning process and will implement new programmatic strategic initiatives. In addition, the COO will: provide coordination for the senior management team; serve as liaison to stakeholders; and work with other member to keep them abreast of programmatic strategies and challenges.
The COO will partner with the CEO and his peers (the chief financial officer (CFO), Vice President of Marketing) and will be responsible for developing, implementing, and managing the operational aspects of the annual budget. Finally, the COO will cultivate existing relationships with public and private funders.

Accountabilities

1. Program Operational Planning
2. External Relationship Development
3. Strategic Plan Implementation
4. Fund Raising
5. Finance, Technology and Human Resource
6. Generating Sales

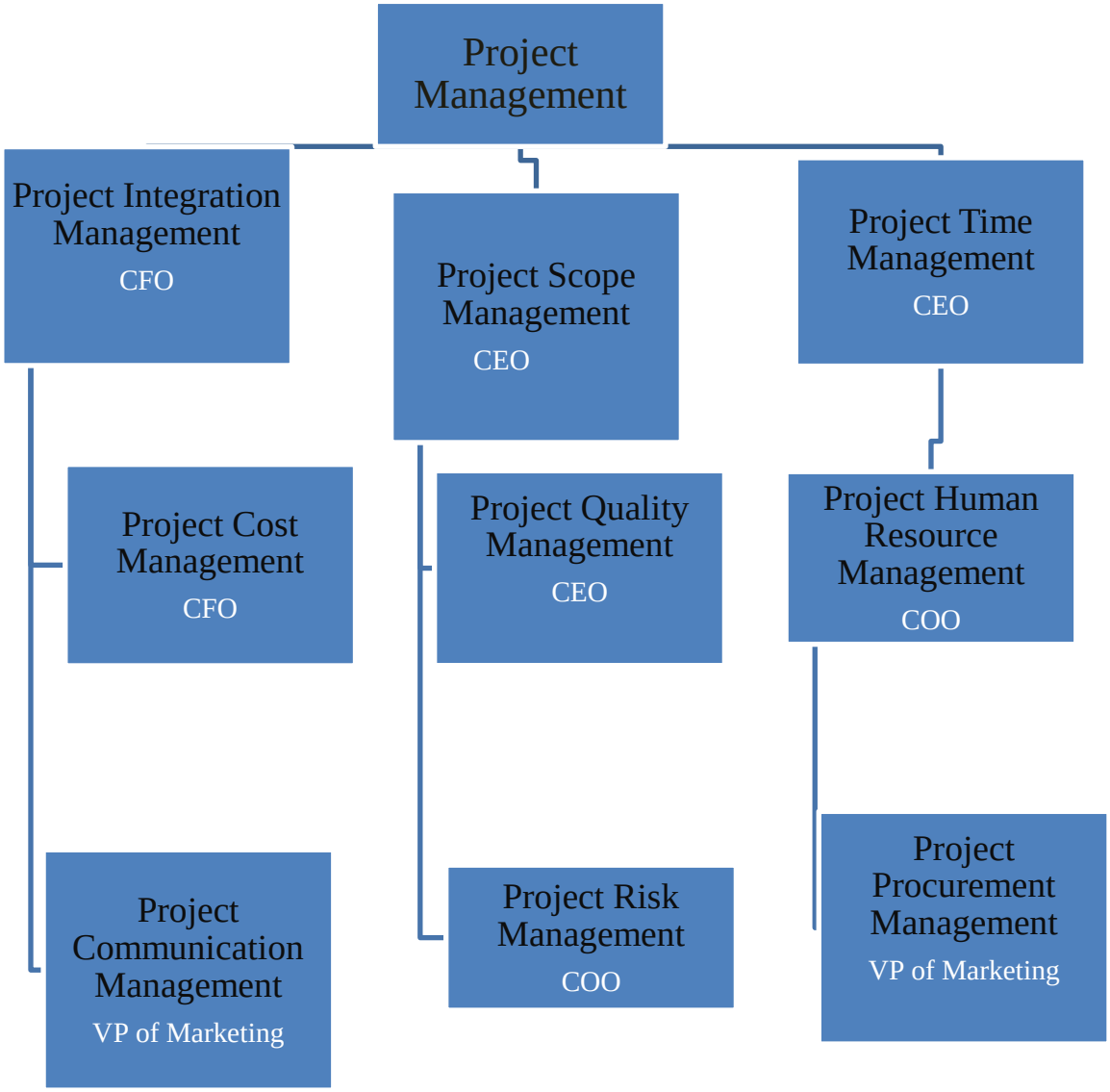
Lee Jia Jun, VP of Marketing

The Vice President of Marketing works directly with the CEO and is a member of the Company's executive team. He will be responsible for providing executive leadership and management of the Company's marketing organization and inbound and out-bound marketing activities worldwide, which include: Corporate marketing, partner/channel marketing, product marketing, and product management. The VP Marketing will drive the Company's efforts to position itself as a visionary leader and potential in its emerging market and to achieve its revenue goals.

Accountabilities

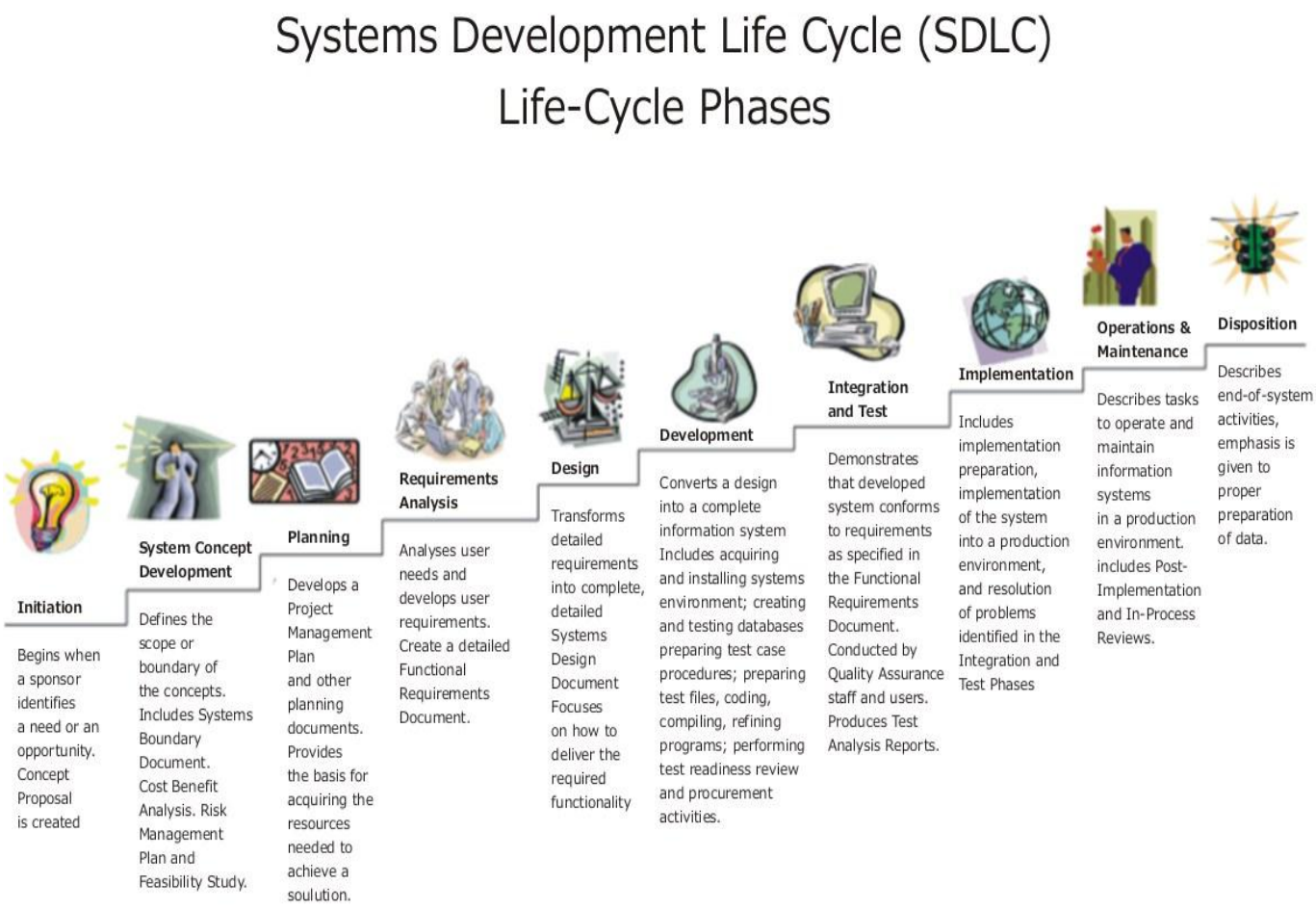
1. Role Model for Business Development
2. Strategic Planning
3. Marketing Communication
4. Direct Marketing Programs
5. Product Launch Management
6. Training, Analysis and Sales Support

Project Task Assignment



7.2 Project Development Stages (SDLC)

As the Intra-Splash® - Hand Hygiene system is complex Software/hardware application, the project development stages will be based on the framework of SDLC (System Development Life Cycle) and as well as, project life cycle process.



Phase 1- System Concept (Idea Generation & Screening)

The new product starts its life as an idea and the system is developed through the needs of health care system. It is a response to a need in the market. The idea undergoes a screening process, including general projections including cost, market reception and profitability.

- Define the project concept and scope
- Evaluate Customer needs and solutions
- Define project boundary, objectives and system

- Determine Cost, Benefit, Risk analysis

Phase 2- Concept Development/Testing

The concept development and testing phase is implemented as to determine the consumer reaction to the idea of the new product. This stage includes data collection, consumer surveys, product specification and acceptable price levels so that the company could obtain the valuable information about new product development.

- Development customer needs Interpretation
- Customer Prioritizing Needs
- Evaluate Product Specification
- Determine Concept Generation & Selection
- Determine Final Product Design and Testing

Phase 3- Analysis

If the new idea survives the concept development and testing phase, a business needs to put together a formal analysis of the new product's viability. In general, this analysis encompasses production costs and expected profit margin, as well as total market size for the product. Businesses must also weigh the product's position within the business brand.

- Perform Market Analysis
- Undergo Product Design Analysis and Cost of Production
- Define Product Life Cycle for whole project (SDLC)
- Sensitivity Analysis and Net Present Values Analysis
- Financial Analysis & Budgeting
- Determine Project Risk Analysis

Phase 4- Product Development

Product development calls for the actual creation of a product, such as manufacturing, a working model or running a short-term test with a new service. Most businesses also consider and develop marketing materials during this phase. The product development phase often follows a rinse-and-repeat model of refining the product and marketing, then testing again with customers or focus groups.

- Managing Production and Outsourcing
- Budgeting and Financing Manufacturing
- Perform Quality testing to launch into Markets
- Developing Prototypes and Forecasting Production Needs

Phase 5- Market Testing

In fact, market testing takes the product and offers it to a limited group or geographic region. Large companies may also use computer simulations to mimic customer responses. For small businesses that typically cater to a small geographic region or a specific market segment. Intra-Splash® - Hand Hygiene system is targeted to Singapore Hospitals, private & public.

- Engage in customer feedbacks for the product and acceptability
- Enhancing product performance based on customer feedback
- Develop further improvements and innovations
- Determine Product or Service Revenues for the market

Phase 6- Commercialization

The commercialization phase consists of making the product available to the customer base at large and launching a marketing effort to support it. Commercialization includes producing enough of the product to cover initial demand or having sufficient staff to provide the new service.

- Planning Demands & Production/Manufacturing
- Invention/Protection (IP, Trademark, Registered, Licensing)
- Marketing the Innovation
- Monitoring the Progress and Taking Corrective Action
- Evaluating Innovation and Upgrading Products

7.3 Project Development Stages (Life Cycle Process)

Phase 1: Concept and Identification of Need/Problem

- Conceptualize the problem and solution
- Develop project's objectives and concept
- Determine 3S framework
- Engage in Survey and gather customer needs/wants
- Prioritize Needs & Concept Generation – Concept Selection

Phase 2: Developing and Planning Product Development

- Developed project management Plan- Schedule & Execution
- Determine the production process (DFM, DFE) & Quality Planning
- Prepare Cost Estimation & Budgeting
- Develop Project Risk Assessment and Risk Management
- Plan for Contracting, Outsourcing & Supplier Management Plan

Phase 3: Executing Product Development & Production

- Direct and Management Product Prototype
- Perform Quality Analysis and Testing
- Information Distribution for production management
- Manage Contractors, Manufactures and Production Line

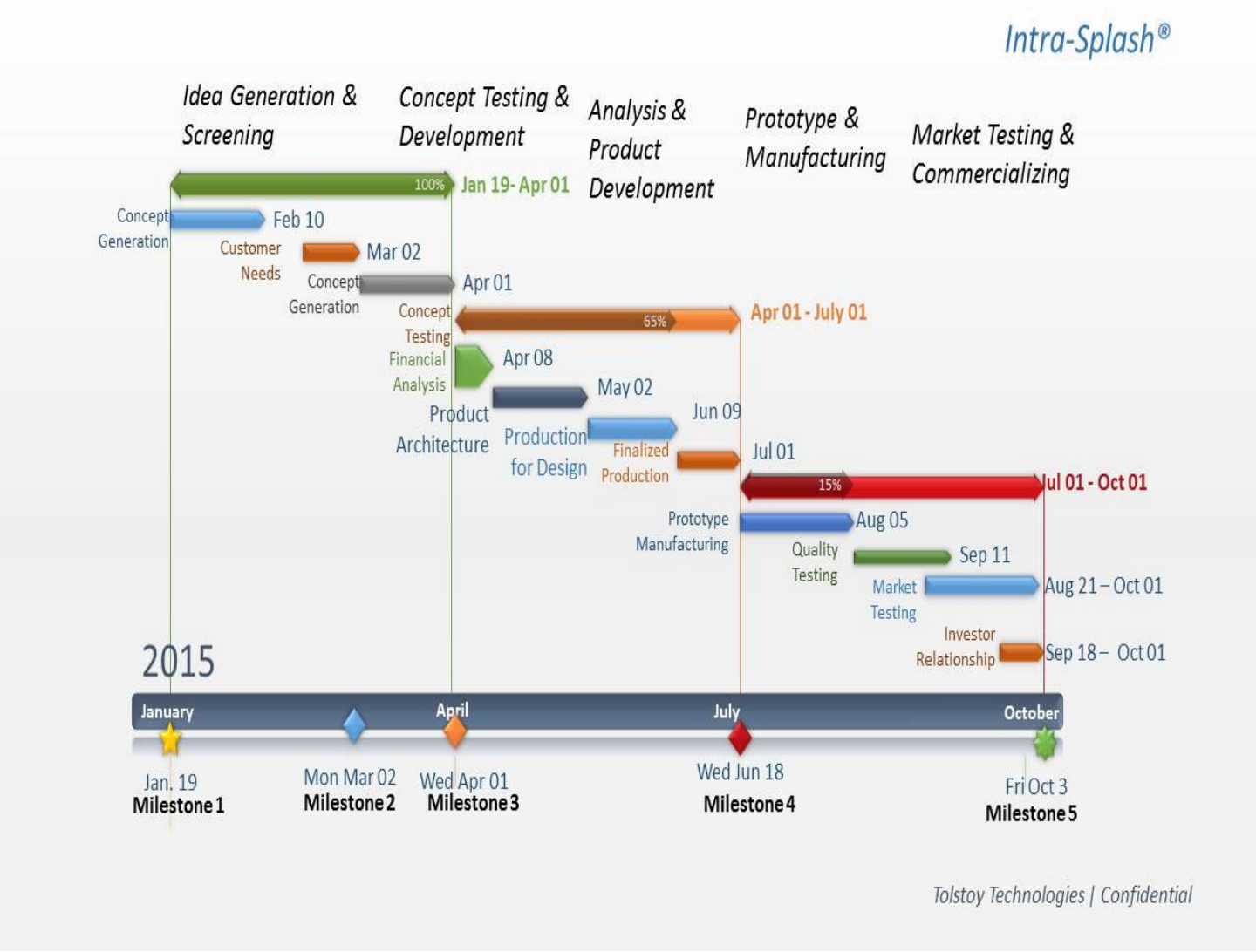
Phase 4: Assessment of product feedback and implementation of growth strategies

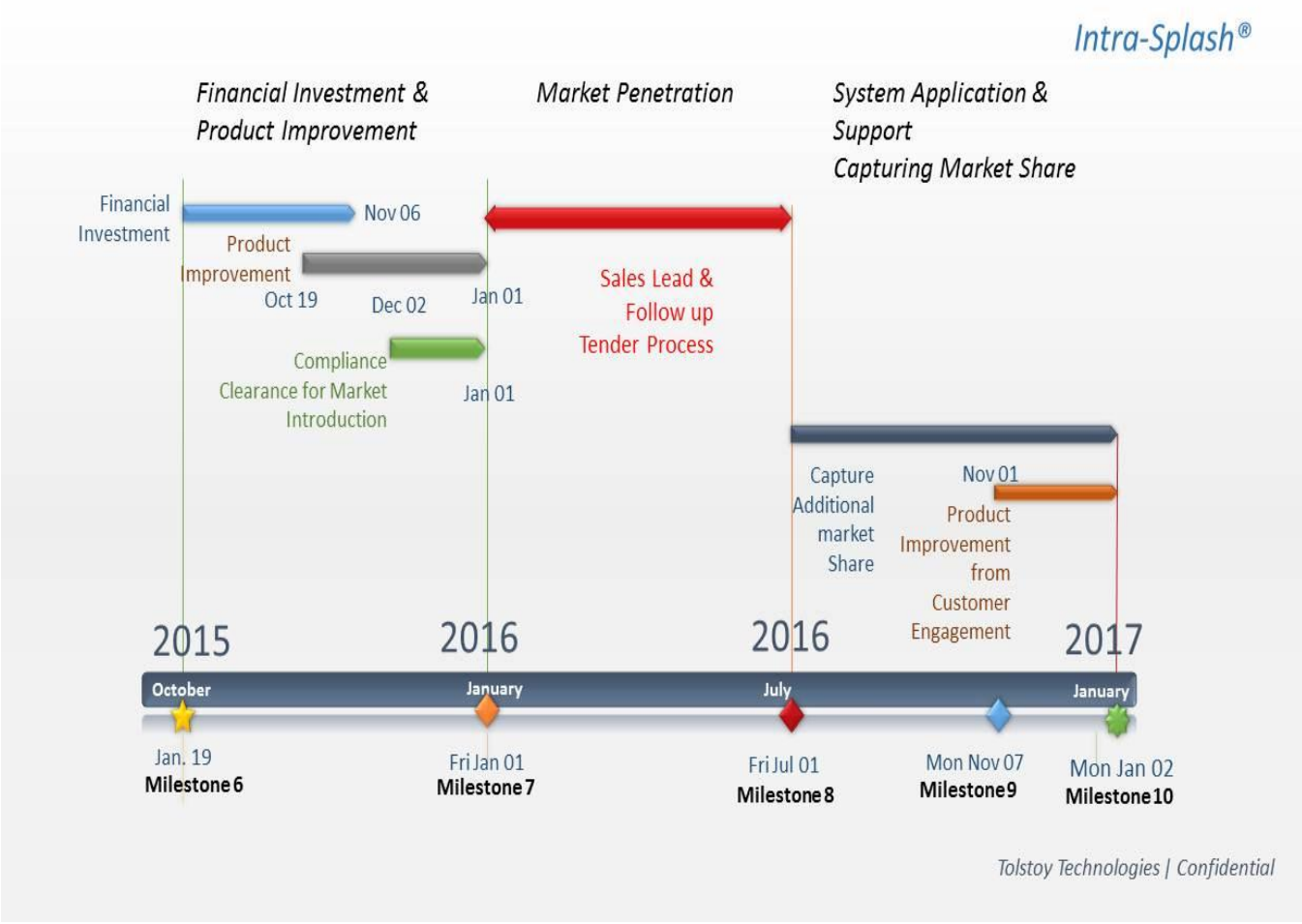
- Monitor the Project & Cost of Production
- Control schedule and monitor the process of production and quality control
- Develop further improvements and innovations from customer feedback
- Administer Contractors & Manufacturers for cost effectiveness

Phase 5: Closing Stage

- Ensure all processes are according to the timeline & quality control implementation
- Report the cost & market feedback for further improvement
- Manage contracts between manufacturers and customers and close them for revenues reporting.

7.3.1 Project Scheduling Timeline



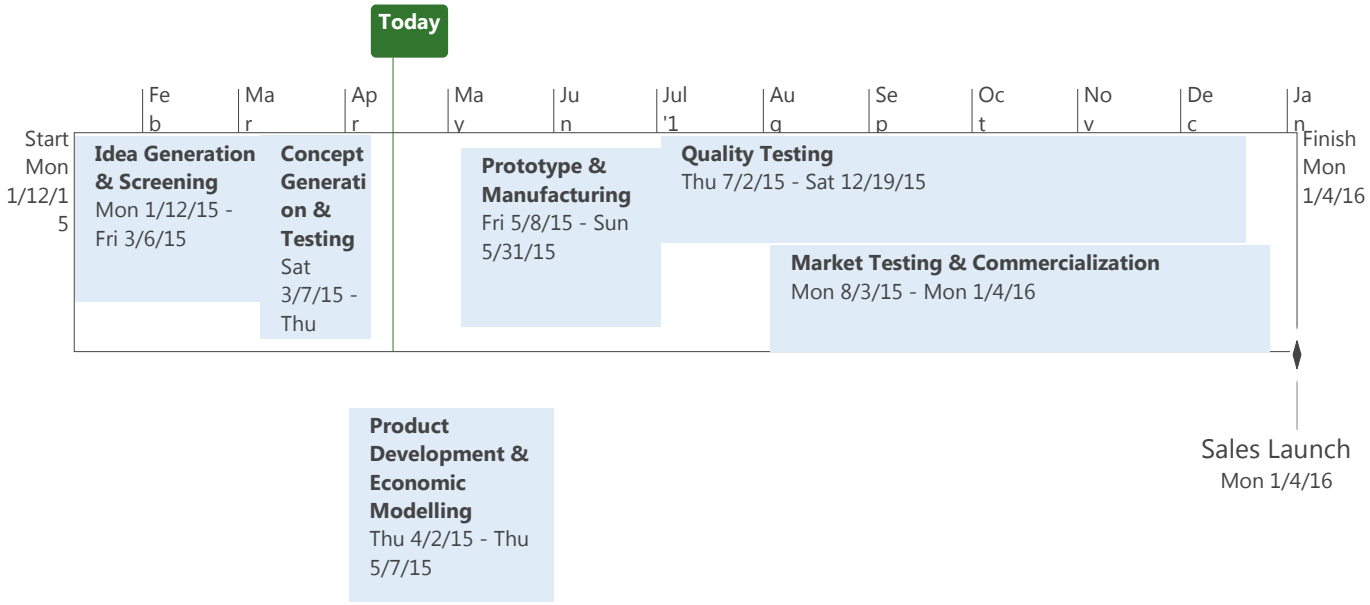

Intra-Splash®
Financial Investment & Product Improvement
Market Penetration
System Application & Support Capturing Market Share
Financial Investment
Nov 06
Product Improvement
Oct 19
Dec 02
Jan 01
Sales Lead & Follow up Tender Process
Compliance Clearance for Market Introduction
Jan 01
Capture Additional market Share
Nov 01
Product Improvement from Customer Engagement
2015
2016
2016
2017
October
January
July
January
Jan. 19
Milestone 6
Fri Jan 01
Milestone 7
Fri Jul 01
Milestone 8
Mon Nov 07
Milestone 9
Mon Jan 02
Milestone 10
Tolstoy Technologies | Confidential

7.3.2 Project Scheduling Gantt chart

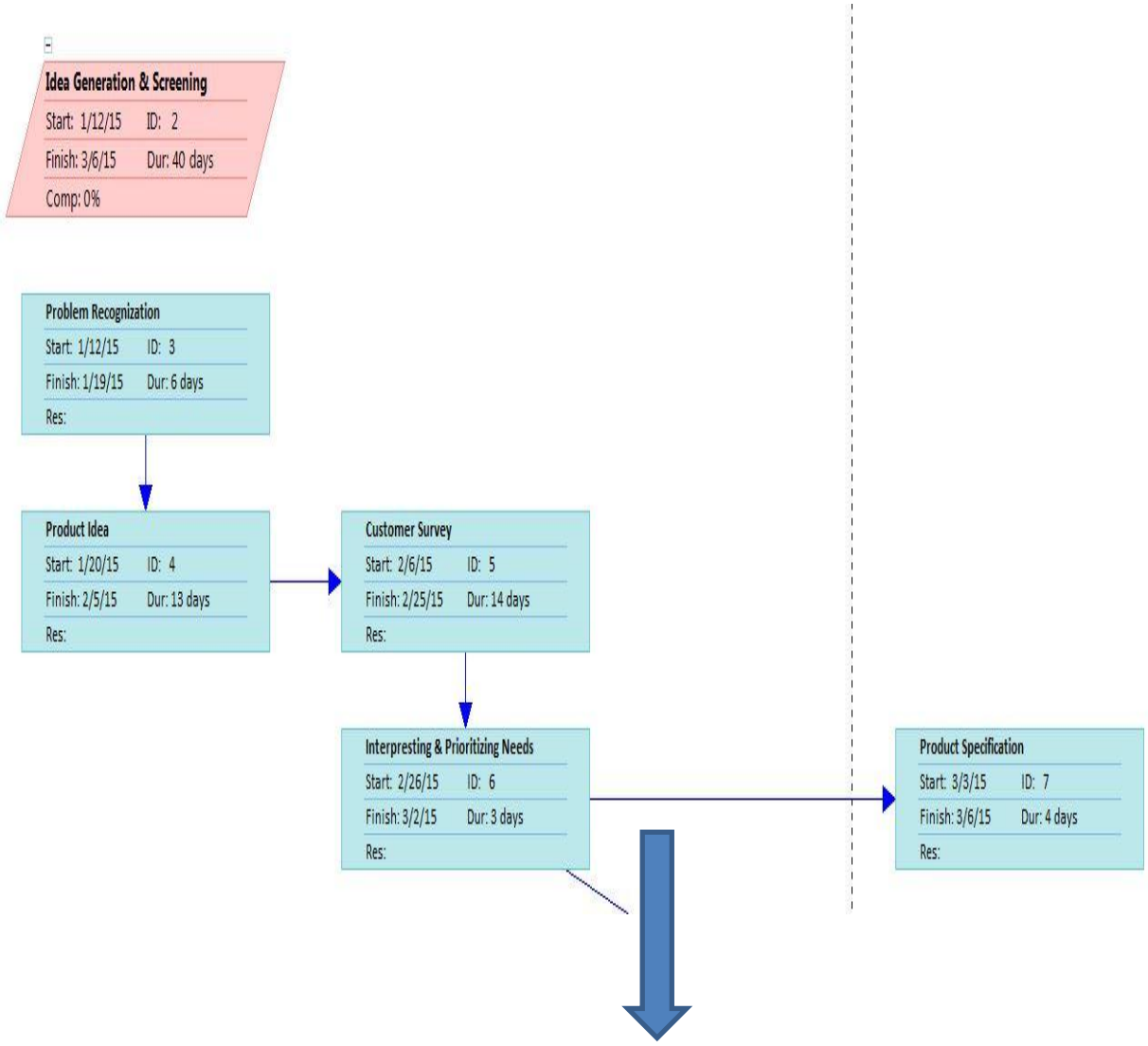
For project management, the detail task & time line is prepared in Microsoft Project to provide visual monitoring and better understanding of task among the team members.

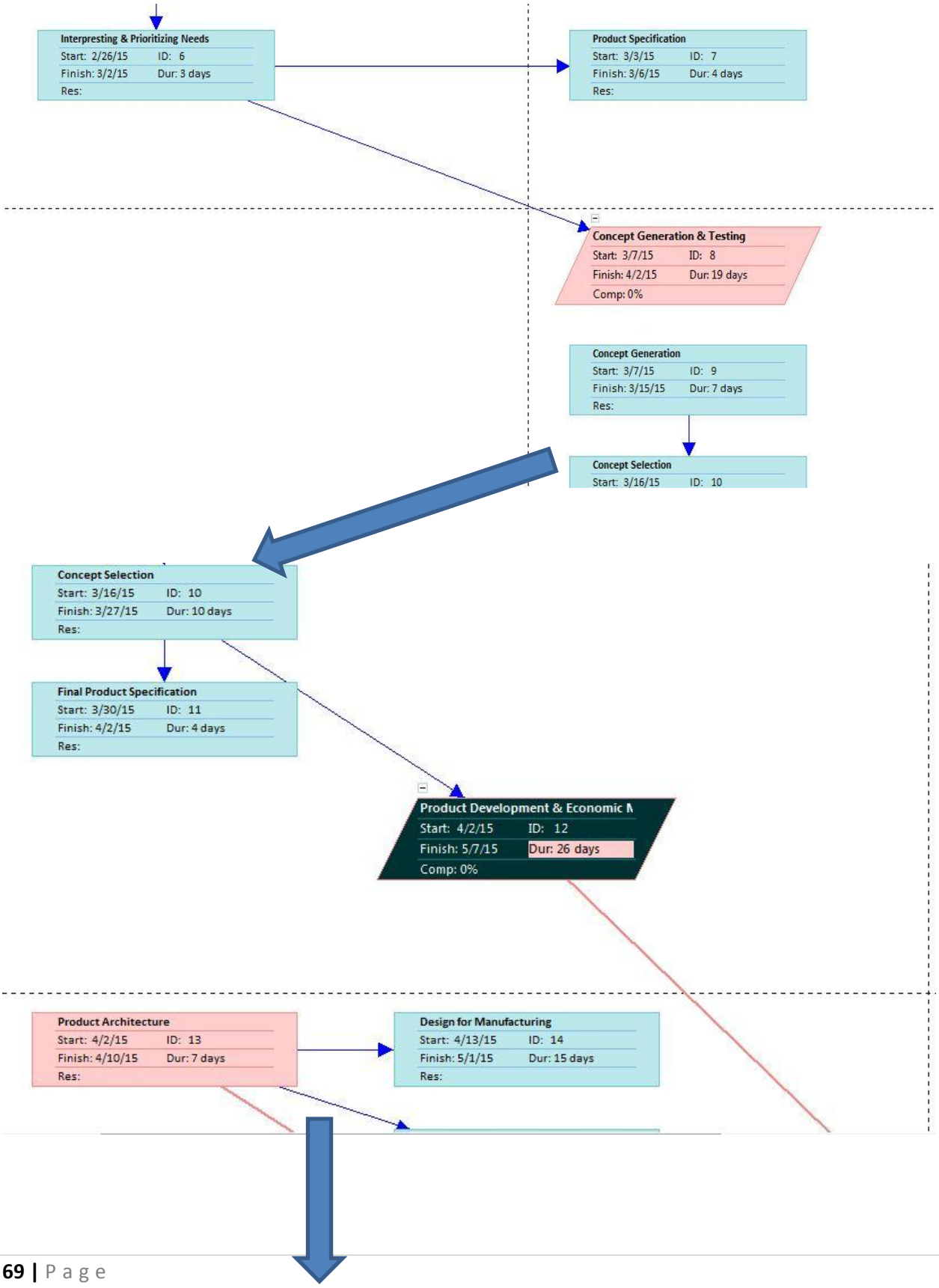
	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Intra-Splash Development**	**255 days**	**Mon 1/12/15**	**Mon 1/4/16**	
2		**Idea Generation & Screening**	**40 days**	**Mon 1/12/15**	**Fri 3/6/15**	
3		Problem Recognization	6 days	Mon 1/12/15	Mon 1/19/15	
4		Product Idea	13 days	Tue 1/20/15	Thu 2/5/15	3
5		Customer Survey	14 days	Fri 2/6/15	Wed 2/25/15	4
6		Interpresting & Prioritizing Needs	3 days	Thu 2/26/15	Mon 3/2/15	5
7		Product Specification	4 days	Tue 3/3/15	Fri 3/6/15	6
8		**Concept Generation & Testing**	**19 days**	**Sat 3/7/15**	**Thu 4/2/15**	**6**
9		Concept Generation	7 days	Sat 3/7/15	Sun 3/15/15	
10		Concept Selection	10 days	Mon 3/16/15	Fri 3/27/15	9
11		Final Product Specification	4 days	Mon 3/30/15	Thu 4/2/15	10
12		**Product Development & Economic Modelling**	**26 days**	**Thu 4/2/15**	**Thu 5/7/15**	**10**
13		Product Architecture	7 days	Thu 4/2/15	Fri 4/10/15	
14		Design for Manufacturing	15 days	Mon 4/13/15	Fri 5/1/15	13
15		Design for Environment	9 days	Mon 4/13/15	Thu 4/23/15	13
16		NPV Analysis & Finance	19 days	Mon 4/13/15	Thu 5/7/15	13
17		**Prototype & Manufacturing**	**16 days**	**Fri 5/8/15**	**Sun 5/31/15**	**12**
18		Finalized Prototype	7 days	Fri 5/8/15	Sat 5/16/15	16
19		Samples Manufacturing	12 days	Sun 5/17/15	Sun 5/31/15	
20		**Quality Testing**	**122 days**	**Thu 7/2/15**	**Sat 12/19/15**	**17**
21		ISO 9001	113 days	Thu 7/2/15	Sat 12/5/15	
22		Bluetooth Testing	53 days	Wed 7/8/15	Fri 9/18/15	
23		EMC Compliance	100 days	Wed 7/15/15	Tue 12/1/15	
24		Product Safety	84 days	Wed 8/26/15	Sat 12/19/15	
25		**Market Testing & Commercialization**	**110 days**	**Mon 8/3/15**	**Mon 1/4/16**	
26		Trial Version - Beta	44 days	Mon 8/3/15	Thu 10/1/15	
27		Product Imporvement	29 days	Fri 10/2/15	Wed 11/11/15	
28		Manufacturing Improvement	40 days	Sun 11/1/15	Thu 12/24/15	
29		Sales Launch	0 days	Mon 1/4/16	Mon 1/4/16	

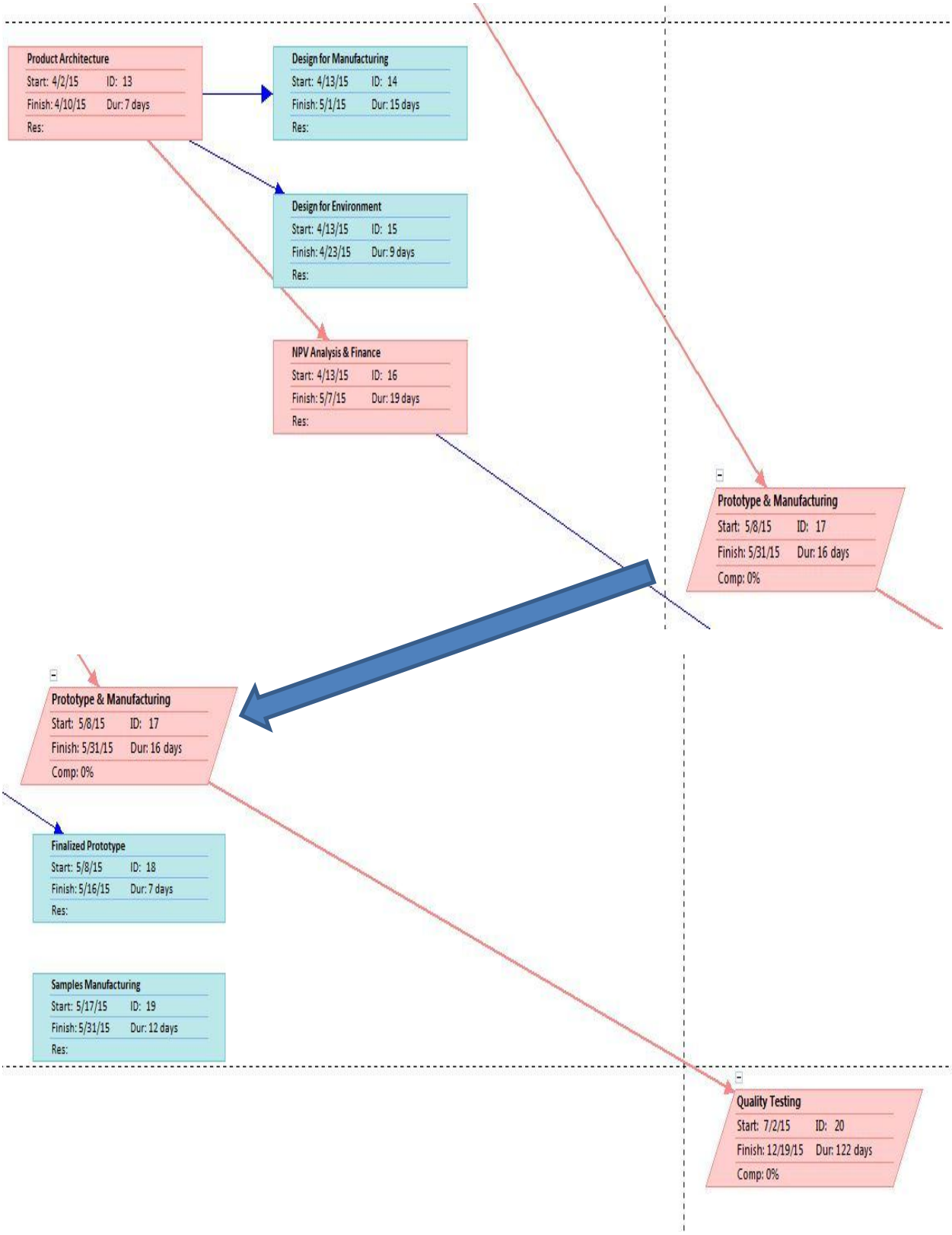
Time Line from Gantt chart



7.3.3 Network Analysis



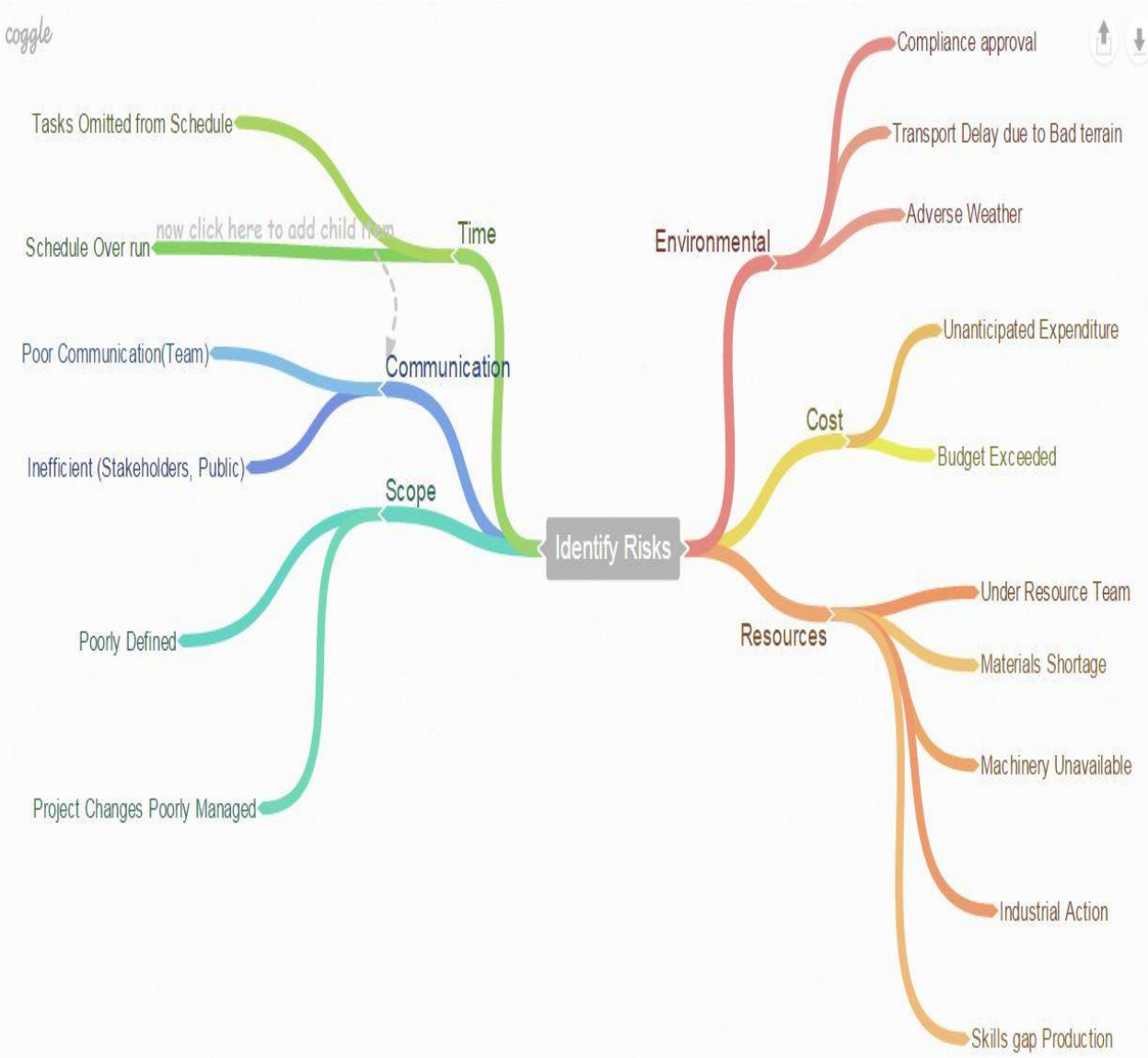

Interpresting & Prioritizing Needs
Start: 2/26/15 ID: 6
Finish: 3/2/15 Dur: 3 days
Res:
Product Specification
Start: 3/3/15 ID: 7
Finish: 3/6/15 Dur: 4 days
Res:
Concept Generation & Testing
Start: 3/7/15 ID: 8
Finish: 4/2/15 Dur: 19 days
Comp: 0%
Concept Generation
Start: 3/7/15 ID: 9
Finish: 3/15/15 Dur: 7 days
Res:
Concept Selection
Start: 3/16/15 ID: 10
Concept Selection
Start: 3/16/15 ID: 10
Finish: 3/27/15 Dur: 10 days
Res:
Final Product Specification
Start: 3/30/15 ID: 11
Finish: 4/2/15 Dur: 4 days
Res:
Product Development & Economic N
Start: 4/2/15 ID: 12
Finish: 5/7/15 Dur: 26 days
Comp: 0%
Product Architecture
Start: 4/2/15 ID: 13
Finish: 4/10/15 Dur: 7 days
Res:
Design for Manufacturing
Start: 4/13/15 ID: 14
Finish: 5/1/15 Dur: 15 days
Res:


Product Architecture
Start: 4/2/15 ID: 13
Finish: 4/10/15 Dur: 7 days
Res:
Design for Manufacturing
Start: 4/13/15 ID: 14
Finish: 5/1/15 Dur: 15 days
Res:
Design for Environment
Start: 4/13/15 ID: 15
Finish: 4/23/15 Dur: 9 days
Res:
NPV Analysis & Finance
Start: 4/13/15 ID: 16
Finish: 5/7/15 Dur: 19 days
Res:
Prototype & Manufacturing
Start: 5/8/15 ID: 17
Finish: 5/31/15 Dur: 16 days
Comp: 0%
Prototype & Manufacturing
Start: 5/8/15 ID: 17
Finish: 5/31/15 Dur: 16 days
Comp: 0%
Finalized Prototype
Start: 5/8/15 ID: 18
Finish: 5/16/15 Dur: 7 days
Res:
Samples Manufacturing
Start: 5/17/15 ID: 19
Finish: 5/31/15 Dur: 12 days
Res:
Quality Testing
Start: 7/2/15 ID: 20
Finish: 12/19/15 Dur: 122 days
Comp: 0%

7.4 Risk Analysis of Product and Management

This is the first rule and it is essential in product development to the success of project risk management. It is an indispensable process as it will help identify the unforeseen or inevitable possible problems and scenarios. The areas of risk are not only limited to process of production and product itself but also technical communication and project timeline.
Both threats and opportunities have to be considered for the product success and project financial investments. Furthermore, the risks are identified and management tools are used to communicate among the team members, prioritizing risks, analyzing risks and most importantly, plan and implement risk responses. Therefore, it would allow the stakeholders to have proper plan to management the risk and overcome the problems, allowing the enforcement effectively. The risks are added drawback to the operational cost, investment, and product launch in negative ways. Thus, the plan is set out to track risk and its associated as well as risk management to bring about the success of the project.

Risk Assessment



Internal Risk

Type of Risk	Risk Level	Mitigation Factor
Intellectual Property Risk	Moderate	Patents will be applied to ensure the necessary protection and imitators
Product Risk	High	Product Performance and quality assurance for customers. Necessary check needed to be done.
Production Risk	High	Machinery & Human resource at the production side. Delays due to transportation.
Compliance Risk	Moderate	Enforcement and Application of Product compliance from Regulatory bodies and third body certification bodies for compliance testing & Product Launch.
Financial Risk	High	Asset-backed Risk, Credit Risk, Expected Loss Hedging for reducing risk.

External Risk

Type of Risk	Risk Level	Mitigation Factor
Market Risk	High	The four standard market risk factors are equity risk, interest rate risk, currency risk, and commodity risk
Competition Risk	High	Incompetency in ability of firm to offer products that can satisfy the customer needs compared to other firms. It could be in terms of quality, service, prices and resources employed.
Supplier Risk	High	Necessary costs and services delivered by supplier must be in contractual agreement and action to enforce them.

7.5 Risk Assessment & Management Plan

Risk Factor	Risk Rank	Risk Contributors	How to manage the Risk?
Technology	Medium	Bluetooth Technology, Software Capability	Necessary to go through testing of hardware & software
Interfaces	High	Involved high level application of IT infrastructure, BT budge and Server for data logging	Consult with highly skilled professional for medical IT services
Safety	Low	User Safe use of Bluetooth Badge and Compliance system.	Bluetooth radiation power is Tested.
Political Visibility and Stakeholder Involvement	High	Government budget on health care and policy changes. Hospitals purchasing department high involvement.	Observe government budget for hospitals and its spending pattern.
Funding	Medium	Investor needs time & analysis for funding (est. 6 months)	Direct loan from banks or business presentation to Ministry of Health
Time/Schedule	High	1 year for product launch	Extend 6 months
Site Characteristic	Medium	IT Infrastructure is needed for installation in Hospitals	Liaise with hospital IT department
Labor	Low	Skilled workers are need for medical application. Even in manufacturing.	Recruitment for sales/application team. Ensure outsource manufacture has adequate labor supply.
Quality Requirement	High	Medical Application needs high quality assurance	Acquire necessary certification
Number of Key Participants	Low	External will be manufacturers & suppliers.	Written contracts for delivering services
Contractor Capabilities	High	Manufacturers sometimes short on machines or labor	Sales focused and stock extra products
Regulatory Involvement	High	Several regulatory bodies are monitored medical application market	Before product launch, consult with agency to obtain necessary approvals

8. Quality & Reliability

After all the design and development phase of the product, quality testing and certification is the must and inevitable process for product launch. The testing of product performance, quality, safety and compatibility are carried out by third body certification bodies such as TUV SUD, UL, and SGS and submit to the accreditation bodies for approval signed. The evaluation process is done by referencing the technical files of testing and product performance submitted. Only when the requirement is met by international and national standards as defined and governed by LAW, the product obtains the clearance to launch into the specified market.

As intra-splash is the complex medical system, the testing is intensive and several requirements are needed to be fulfilled. Therefore, for the clear vision of its certification and testing process, the timeline of testing and the standards to be compiled will be described here.

8.1 Approach of Testing in Intra-Splash Hand Hygiene System

Product/Technology	Test Standards	Technical Files
Bluetooth®	SIG—qualification and declaration	Declaration of Compliance (DoC) Referencing the Qualified Design (QDID)
Wi-Fi / Ethernet (Information Technology Equipment)	• CISPR 22 / EN 55022 • EN55024	Declaration of Compliance (Doc) CE (Conformité Européenne)
RF Devices	ETSI 300-328	Declaration of Compliance (Doc) CE (Conformité Européenne)
Medical Application (Devices)	IEC 60601	Declaration of Compliance (Doc) CE (Conformité Européenne)
Information Technology Equipment	FCC Part 15B	Declaration of Compliance (Doc)
PCB	UL 94, UL 746	Recognized UL Safety Mark
User Safety	Consumer Protection (Safety Requirement) Registration Scheme	Safety Mark
Product Safety of Information Technology Equipment	IEC 60950-1	Certification Body (CB) Scheme Test Report and Certification

8.2 Bluetooth®

As the intra-splash main technology is Bluetooth, it is vital to get certified by The Bluetooth SIG which offers tools and services to developers seeking to test their *Bluetooth*® enabled devices.

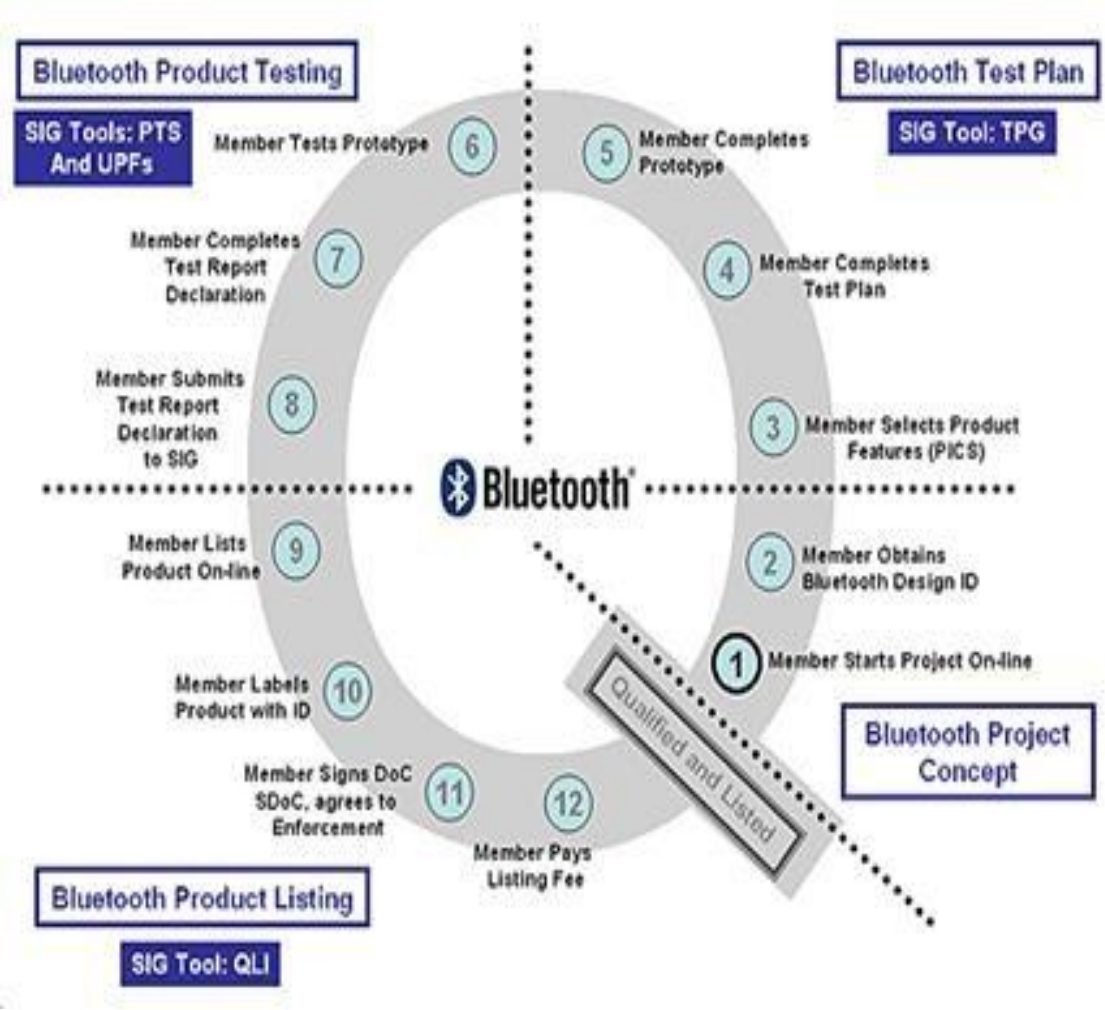


Fig8.1. Bluetooth Certification Process

8.3 EMC Testing

It is a series of tests to ensure the product's electromagnetic compatibility. The EMC compliance is a mandatory requirement in most markets such as Europe, U.S, Singapore, China, Korea, Australia and New Zealand. The EMC standards for Information technology devices are covered under EMC Directive 2004/108/EC.

EN55022 for Radiation Emission for ITE

EN55024 for Radiation Immunity for ITE

ETSI 300-328 Radio Equipment and Systems (RES) Wideband data transmission systems Technical characteristics and test conditions for data transmission equipment operating in the 2,4 Ghz ISM band and using spread spectrum modulation techniques

IEC 60601-1:2005+A1:2012(E) contains requirements concerning basic safety and essential performance that are generally applicable to medical electrical equipment.

FCC Part 15 covers the regulations under which an intentional, unintentional, or incidental radiator that can be operated without an individual license.

8.4 Product Safety Testing

UL 94 & UL 746

This requirement is mainly for PCB manufacturers that are outsourced by Tolystol Technologies. These tests include the materials quality assurance, flammability, for PCB boards that are to be installed in Intra-splash Hand Hygiene system.

ROHS Compliance

The **Restriction of Hazardous Substances Directive** 2002/95/EC, short for **Directive on the** restriction of the use of certain hazardous substances in electrical and electronic equipment, should be compliance in the product development.

IEC 60950-1

As the important aspect of the system, it will undergo IEC 60950-1 to assure the product safety for the clients. IEC 60950-1:2005+A1:2009+A2:2013 is applicable to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a RATED VOLTAGE not exceeding 600 V. Also applicable are components and subassemblies intended for incorporation in information technology equipment.

Fig. Conformity European only)

Fig. Safety Mark for Singapore (for illustration Purpose

Fig. UL Recognized Mark

Fig. Medical Standard Compliance Mark

8.5 Quality Assurance for the firm and Manufacturers

8.5.1 ISO 9001:2008

The firm is needed to comply with ISO 9001:2008 for the following reasons:

1. *Complies with Customer Requirements*
   It is a requirement that many companies will only engage with vendors that are ISO 9001 compliant. As the hospitals and government required accredited ISO vendors, Tolstoy technologies need to get ISO certification for its quality management service.

2. *Generate More customers & Revenues*
   Promote the quality compliance to increase the system quality awareness to clients, thus bringing in more customers and revenues

3. *Product Quality Improves*
   Implementing quality management system of the products will necessary improve the whole firm quality and provide values to the clients.

4. *Relate Company Procedure to Customers*
   This in turn helps the business procedure and clears any uncertainty on what exactly the company does for the customers.

5. *Customer Satisfaction*
   With ISO 9001 certification, it is proved that the service and products meet the expectation and quality requirement of the customers. Therefore, it brings the preset standards of quality to clients, creating customer satisfaction.

6. Company Management Improvement
   By keeping the ISO 9001 compliance, the company management system is improved and clear target needs to be accomplished. The client will notice that the firm is the industry leader and it is a promise that the product or service is delivered with optimized values.

ISO 9001:2008 sets out the criteria for a quality management system and is the only standard in the family that can be certified to. It can be used by any organization, large or small, regardless of its field of activity. In fact ISO 9001:2008 is implemented by over one million companies and organizations in over 170 countries.

8.5.2 ISO 13485

Together with ISO 9001, it is also necessary to comply with ISO 13485: requirement for a comprehensive quality management system for the design and manufacture of medical devices. It is the harmonized standard with ISO 9001 and bring values to clients that the product is assured for its great quality.

Compliance with ISO 13485 is often seen as the first step in achieving compliance with European regulatory requirements. The conformity of Medical Devices and In-vitro Diagnostic Medical Device according to European Union Directives 93/42/EEC, 90/385/EEC and 98/79/EEC must be assessed before sale is permitted. The preferred method to prove conformity is the certification of the Quality Management System according ISO 9001 and/or ISO 13485 and ISO 14971 by a Notified Body. The result of a positive assessment is the certificate of conformity allowing the CE mark and the permission to sell the medical device in the European Union.

8.5.3 GMP (Good Manufacturing Practice)

It is important to assure that their outsource manufacturers for the Intra-Splash are also complied with GMP. It is a boost point of quality assurance of the product values to clients.

Good manufacturing practice guidelines provide guidance for manufacturing, testing, and quality assurance in order to ensure that a drug product is safe for human consumption. Many countries have legislated that pharmaceutical and medical device manufacturers follow GMP procedures and create their own GMP guidelines that correspond with their legislation

Fig. IS0 9001 Certification Mark

8.6 Testing Budgeting & Timeline

Test Standard	*Budget Allowance*	*Certification Body*	*Timeline*
Bluetooth®	4000 USD	TÜV SÜD	August 2015 – September 2015
EMC Compliance	8000 USD	TÜV SÜD	August 2015 – January 2016
Product Safety (Reliability)	10000 USD	Underwriter Laboratory	August 2015 – March 2016
ISO 9001: 2008	6000 USD	TÜV SÜD	August 2015 – January 2016
Total Cost:	28000 USD	Total Time Needed:	7 months

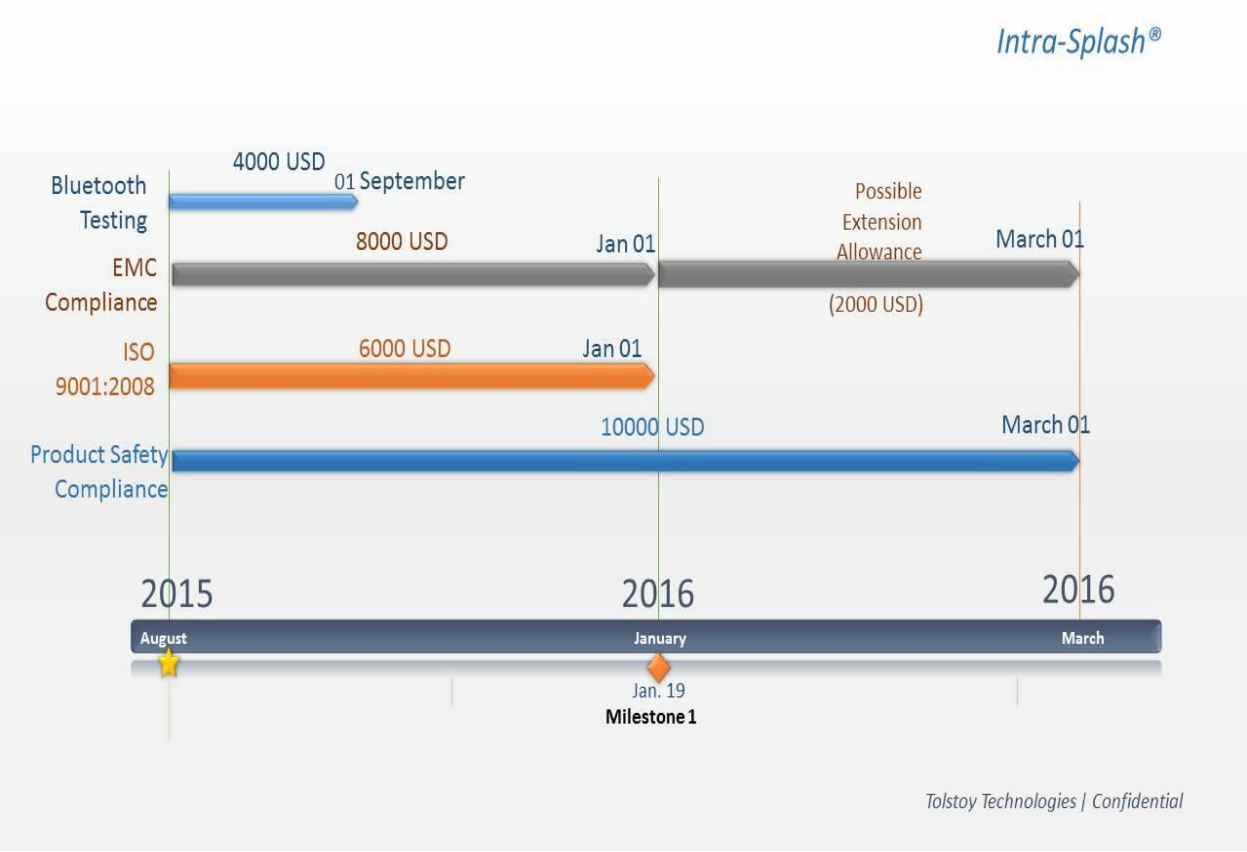


Fig. Testing Timeline Management

9. Intellectual Properties

9.1 Intellectual property

Intellectual property (IP) is an intangible asset created by human intellectual or inspirational activity. It is a legal term that refers to creations of the mind. Examples of IP include inventions; literary and artistic works; designs; and symbols, words and phrases used in commerce. Under the laws of intellectual property, owners of IP are granted certain exclusive rights. There are many types of IP, for example trademark, copyright, patents, trade secrets and etc which enable people to earn recognition or financial benefit from what they invented or created. By striking the right balance between the interests of innovators and the wider public interest, the IP system aims to foster an environment in which creativity and innovation can flourish. Intellectual capital is recognized as the most important asset of many of the world's largest and most powerful companies; it is the foundation for the market dominance and continuing profitability of leading corporations. For fortune 500 companies, the value of IP ranges between 45% - 75% of total assets.

9.2 Trademark

A trademark is any word, name, symbol, or design, or any combination thereof, used in commerce to identify and distinguish the goods of one manufacturer or seller from those of another and to indicate the source of the goods. The trademark owner can be an individual, business organization, or any legal entity. A trademark may be located on a package, a label, a voucher or on the product itself. For the sake of corporate identity trademarks are also being displayed on company buildings.

The trademarks used on the product name **Intra-Splash®** belong to The Tolstoy Technologies Company or to right holders who have The Tolstoy Technologies Company to use them. These trademarks cannot be used without the permission of the right holders. Below Fig9.2 shown the Trademarks of **Intra-Splash®** which belong to The Tolstoy Technologies Company. The Tolstoy Technologies Company has policies that govern the use of its product name **Intra-Splash®** and its trademarks. The use, reproduction, copying or redistribution of its trademarks without the prior written consent of The Tolstoy Technologies Company is prohibited.

*Figure 9.2: Trademarks of **Intra-Splash®***

9.3 Copyright

Copyright is a legal right created by the law of a country that grants the creator of an original work exclusive rights to its use and distribution, usually for a limited time, with the intention of enabling the creator (e.g. the photographer of a photograph or the author of a book) to receive compensation for their intellectual effort. The exclusive rights are, however, not absolute and do not give the creator total control of their works because they are limited by limitations and exceptions to copyright law.

Copyright is a form of intellectual property, applicable to any expressed representation of a creative work. It is often shared among multiple authors, each of whom holds a set of rights to use or license the work, and who are commonly referred to as rightsholders. These rights frequently include reproduction, control over derivative works, distribution, public performance, and "moral rights" such as attribution.

All material in the development of The Tolstoy Technologies Company is, unless otherwise stated, the property of The Tolstoy Technologies Company. The contents are subjected to copyright protection under the laws of Singapore and, through international treaties, other countries. The copyright in the materials related to **Intra-Splash®** as a whole is owned by The Tolstoy Technologies Company. Reproduction or retransmission of the materials, in whole or in part, in any way, without prior written permission of The Tolstoy Technologies Company, is a violation of copyright law.

9.4 Patent

A patent is a set of exclusive rights granted by a sovereign state to an inventor or assignee for a limited period of time in exchange for detailed public disclosure of an invention. An invention is a solution to a specific technological problem and is a product or a process. Patents are a form of intellectual property.

The procedure for granting patents, requirements placed on the patentee, and the extent of the exclusive rights vary widely between countries according to national laws and international agreements. Typically, however, a granted patent application must include one or more claims that define the invention. A patent may include many claims, each of which defines a specific property right. These claims must meet relevant patentability requirements, such as novelty, usefulness, and non-obviousness. The exclusive right granted to a patentee in most countries is the right to prevent others, or at least to try to prevent others, from commercially making, using, selling, importing, or distributing a patented invention without permission.

Under the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights, patents should be available in WTO member states for any invention, in all fields of technology, and the term of protection available should be a minimum

of twenty years. Nevertheless, there are variations on what is patentable subject matter from country to country.

In order to give The Tolstoy Technologies Company the right to exclude others from practicing the invention of the system Intra-Splash®, The Tolstoy Technologies Company has applied patent for the concept and design of Intra-Splash®. The Tolstoy Technologies Company planned to apply patent start from Singapore, and then Thailand follow by USA based on business strategy. Figure 9.3 below show the concept and design of Intra-Splash® which has been patented.

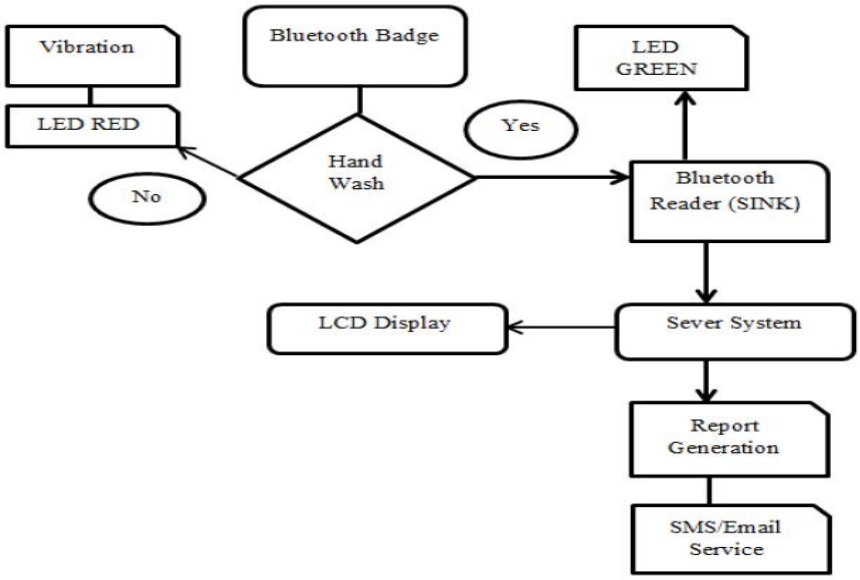


Figure 9.3: The concept and design of Intra-Splash® which has been patented.

9.5 Intellectual Property Application Timeline and Strategy

Country	Intellectual Property	Certification Body/Office	Timeline
Singapore	Trademark	Intellectual Property Office of Singapore (IPOS)	1st quarter of 2015
Singapore	Copyright	Intellectual Property Office of Singapore (IPOS)	1st quarter of 2015
Singapore	Patent	Intellectual Property Office of Singapore (IPOS)	1st quarter of 2015
Thailand	Patent	Department of Intellectual Property (DIP) Ministry of Commerce	1st quarter of 2016
USA	Patent	United States Patent and Trademark Office (USPTO)	2nd quarter of 2016

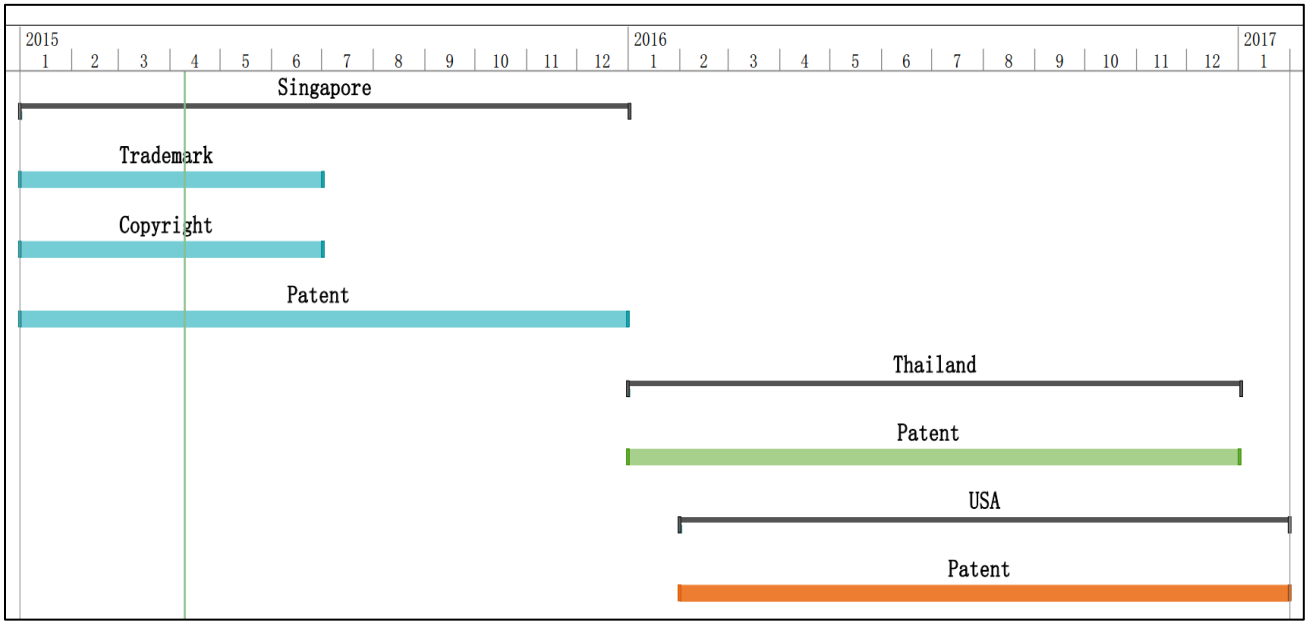


Figure 9.5: Gantt chart for Intellectual Property Application for Singapore, Thailand and USA

10. Values Creation, Sales & Marketing

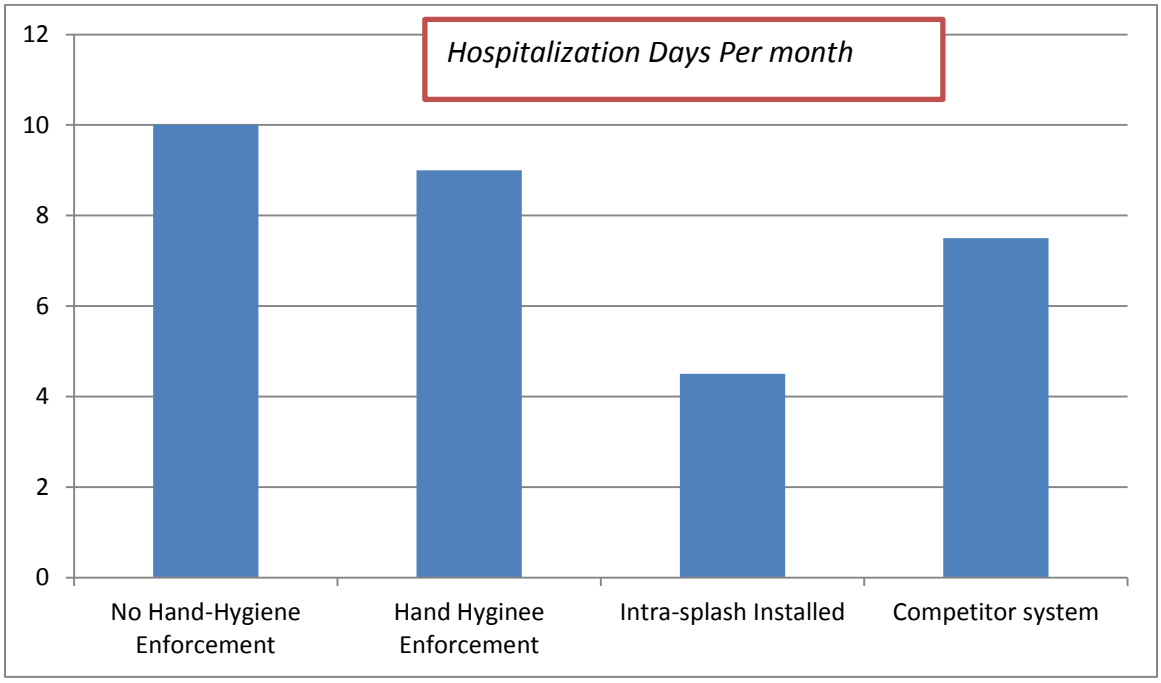
10.1 Economic Values of the System (Values Creation)

Economic value is a measure of the benefit provided by a good or service to an economic agent. It is generally measured relative to units of currency, and the interpretation is therefore "what is the maximum amount of money a specific actor is willing and able to pay for the good or service".

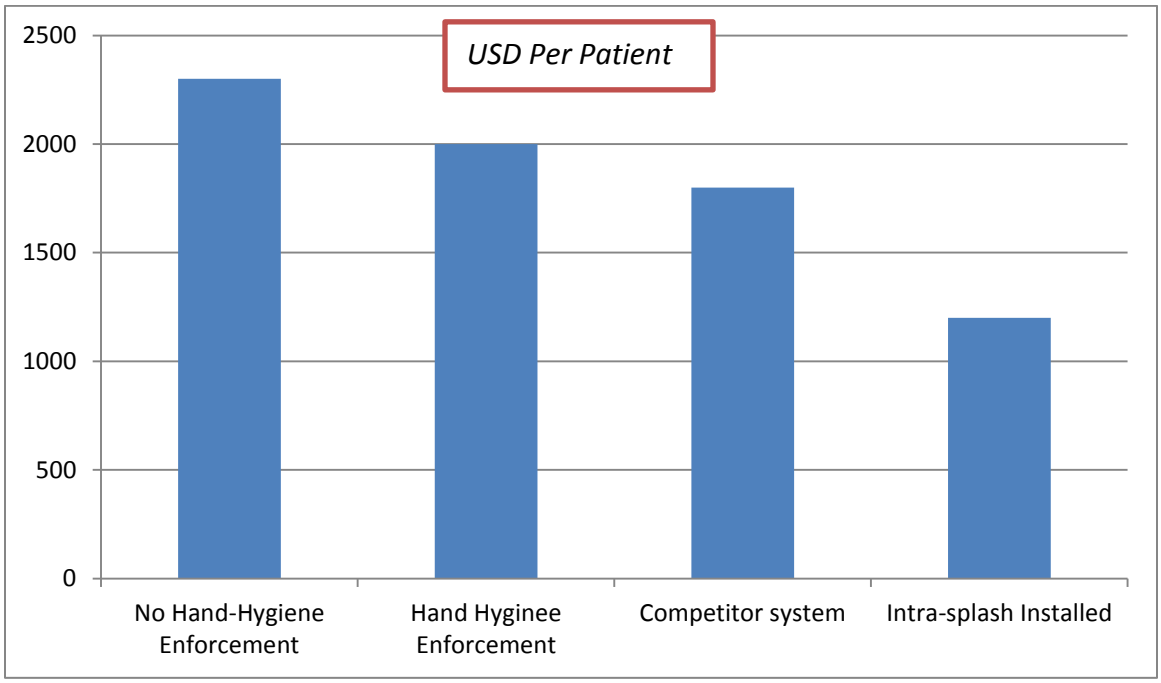
The meaning is not the same as market price or market value of the system. The Intra-splash offers the values to the customers which is not visible with monetary values. Therefore, it is necessary to translate the intangible economic values to the tangible dollar and sense. The purchasing department and the users of the system will determine how much is the product worth or the amount they are willing to pay for the products benefits.

As intra-splash is not the consumer products, it cannot be sold product-benefits focus. It can only be sold through Economic Values which touch on the intangible values such as lower infection rate and improving healthcare as well as it is important to speak different languages when meeting with healthcare professional, users, and finance departments or government bodies.

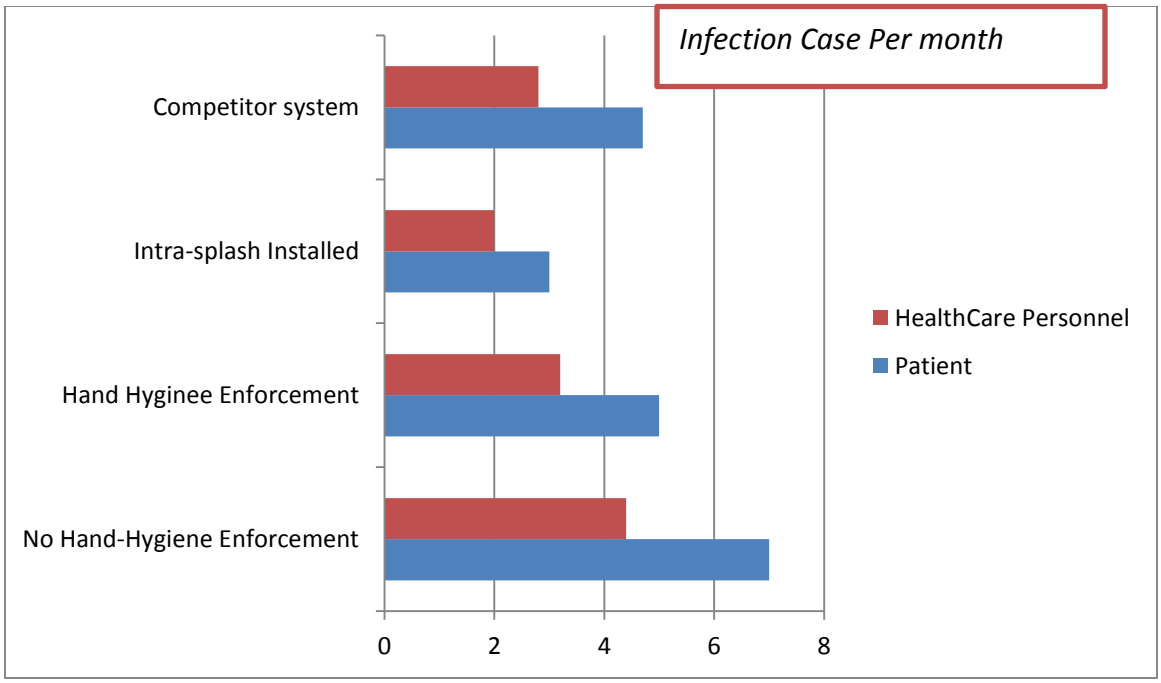
Impact on length of Hospital Stay



Impact Reimbursement System



Impact on Infection Control



10.2 Market Landscape

10.2.1 Singapore Market Structure

Following is the List of Singapore Hospitals; broken down into three sections according to the business nature. For intra-splash the 1st year of the target segment will be public sector.

Public Sector (Primary Target)

Name of Hospital	*No. of Beds*
Alexandra Hospital	400
Changi General Hospital	790
Ng Teng Fong General Hospital	700
Sengkang Health	1400
National University Hospital	952
Khoo Teck Puat Hospital	550
Singapore General Hospital	1700
Tan Tock Seng Hospital	1500
KK Women's and Children's Hospital	830

Private Sector (Secondary Target)

- Adam Road Hospital
- Camden Medical Centre
- Farrer Park Hospital
- Gleneagles Hospital and Medical Centre
- Mount Alvernia Hospital and Medical Centre
- Mount Elizabeth Hospital and Medical Centre
- Mount Elizabeth Novena Hospital and Specialist Centre
- Novena Medical Center
- Paragon Medical Centre
- Parkway East Hospital and Medical Centre
- Raffles Hospital
- Thomson Medical Centre
- WestPoint Hospital

Upcoming Medical Centers (Keep in View Market)

- Health City @ Novena
- The Royal Square @ Novena (171 medical suites with shops/restaurants/hotel)
- The Flow @ Katong (a freehold shopping mall with top floor medical suites)
- [SBFC medical suites]
- Vision Exchange at Venture Avenue, Jurong.

10.2.2 Thailand Market Structure

Thailand is well known for its medical tourism and obtained reputation for high quality healthcare. Therefore, Intra-splash should be looking forward to enter Thailand market right after 1st year of product launch.

As of 2010, there are 1002 public hospitals and 316 private hospitals are registered with the Ministry of Public Health's Medical Registration Division. However, it is not practical to include all hospitals in the area of focus. Therefore, the target segment is selected with the criteria of number of bed size more than 100. So, it will help the firm to focus and easy to follow up for marketing and closing deals.

Thailand Primary Target (Public/Private Sector)

Name of Hospital	*No. of Beds*
Bumrungrad International Hospital (Private)	538
Bangkok General Hospital (Private)	400
Kasemrad Hospital Bangkae (Private)	500
Chonburi Hospital	832
Maharaj Nakorn Chiang Mai Hospital	2279
Central Correctional Hospital	320
Charoenkrung Pracharak Hospital	417
Galaya Rajanakarindra Institute	330
King Chulalongkorn Memorial Hospital	1433
Lerdsin Hospital	528
Phramongkutklao Hospital	1236
Priest Hospital	937
Siriraj Hospital	2265
Taksin Hospital	393

Thailand Secondary Target (Public/Private Sector)

Name of Hospital	*No. of Beds*
Yanhee Hospital (Private)	400
Ayutthaya Hospital	433
Buriram Hospital	522
Chainat Hospital	417
Chaiyaphum Hospital	444
Phrapokklao Hospital	755
Chiang Mai Ram Hospital (Private)	220
Chiangrai Prachanukroh Hospital	757
Chonburi Hospital	832
Bangkok Metropolitan Administration General Hospital (Klang Hospital)	408
Bangkok Hospital Pattaya	400
Kalasin Hospital	505

10.3 Sales Plan (FY2016-2017)

Market Analysis	
Customer Group	Singapore Public Sector for FY2016 and Private Sector for FY2017
Market Size	Approximately 40,000 healthcare professionals. Public Healthcare system is in the pipeline to recruit additional 32,000 healthcare works by 2030.
Market Share	It is targeted to secure 40% of Market Share by FY2017.
Changes in the Market Now? Future Trends??	Upcoming Medical Centers and number of healthcare professionals are more likely to be recruited in mass.
What factor are influencing growth or decline in your industry	Singapore Government dedicated 4% of the GDP to healthcare system. The Medical Tourism is booming as well. Therefore, this is a likely hood of growth in the product sales in FY2017.

Sales Goals Revenue	
Market Players/Competition	There is no Direct competition in Singapore market yet. However, there are similar systems developed in U.S. Therefore, Market landscape is new and untouched.
Competitive Advantages of Current Players	Locally developed. Marketing Campaign is effective. Service is prompt and customers relationship can be built upon good pricing, quality and after sales services.
SWOT Analysis	Strength: Quick service and local present Weakness: New Start up, some approval and procedure could hinder sales process. Opportunities: There is high volume of Hospitals and Employees locally. Threat: Normal Infection control or refusal of technology application from end users.
Statement of overall competitive position	Locally Presence Clinically effectiveness Efficient services and support for Pre/Post Sales cycle

Sales Goals	
Revenue goals	2.88 million for FY2016 and FY2017
Revenue by product Type	System Installed: 1.9 million Service: 0.98 million
Revenue by Customer Type	Government Funded Hospitals: 2.52 million Private Own Hospitals: 0.252 million
Revenue by Territory	Singapore (Primary Target)
Existing Clients	Non
New Business	Tan Tock Seng, National University Hospitals, Singapore General Hospitals, Changi Hospitals and KK Women & Children Hospital by FY2017

Overall Sales Position Plan	
New Business Acquisition Plan	Wrap Around Programs in Hospitals
New Business Acquisition Tactics	Clinical Needs Awareness Follow up Government Tenders
Existing Business Growth Strategies	Customer Engagement Ministry of Health Approval and Encouragement
Existing Business Growth Tactics	Holding Clinical Events Trial Installation in Hospitals
Statement of overall competitive strategy	Trail Installation will prove how the system is efficient Hands on experience with products, User familiarity
Pricing Strategies	Contribution Margin Based Pricing

Sales Activity Plan	
Milestones	Jan 01 2016 (Product Launch), July 2016 (Capture 30% of Market Share)
Trade Shows	Medical Fair ASIA (2016 – Exact Date to be announced) Arab Health (25 -28 January 2016, UAE) International Vision Expo & Conference West 2016 (14 – 15 Sep 2016, Las Vegas, USA)
Key Sales Events	01 Jan 2016 (In house Event) 05 May 2016 (Hand Hygiene Day Event)
Key Sales Activities	Benefits & Economic Values Presentation Trial Support and Clinical data collection

Resources and Staffing	
Staff Requirements	Recruit 2 staffs for Sales & Marketing by Nov 2015.
Budget Required	USD 20000 quarterly
Competencies	Clinical and technically Astute
Other Resource Requirement	Training Materials and lessons Sales Training and Basic Clinical Aspects
Briefing and Communication	Weekly Team meeting Monthly Board Meeting
Monitoring	Online System to key in the progress and any query on job related questions
Feedback	Team Meeting Online Platform for feedback directly

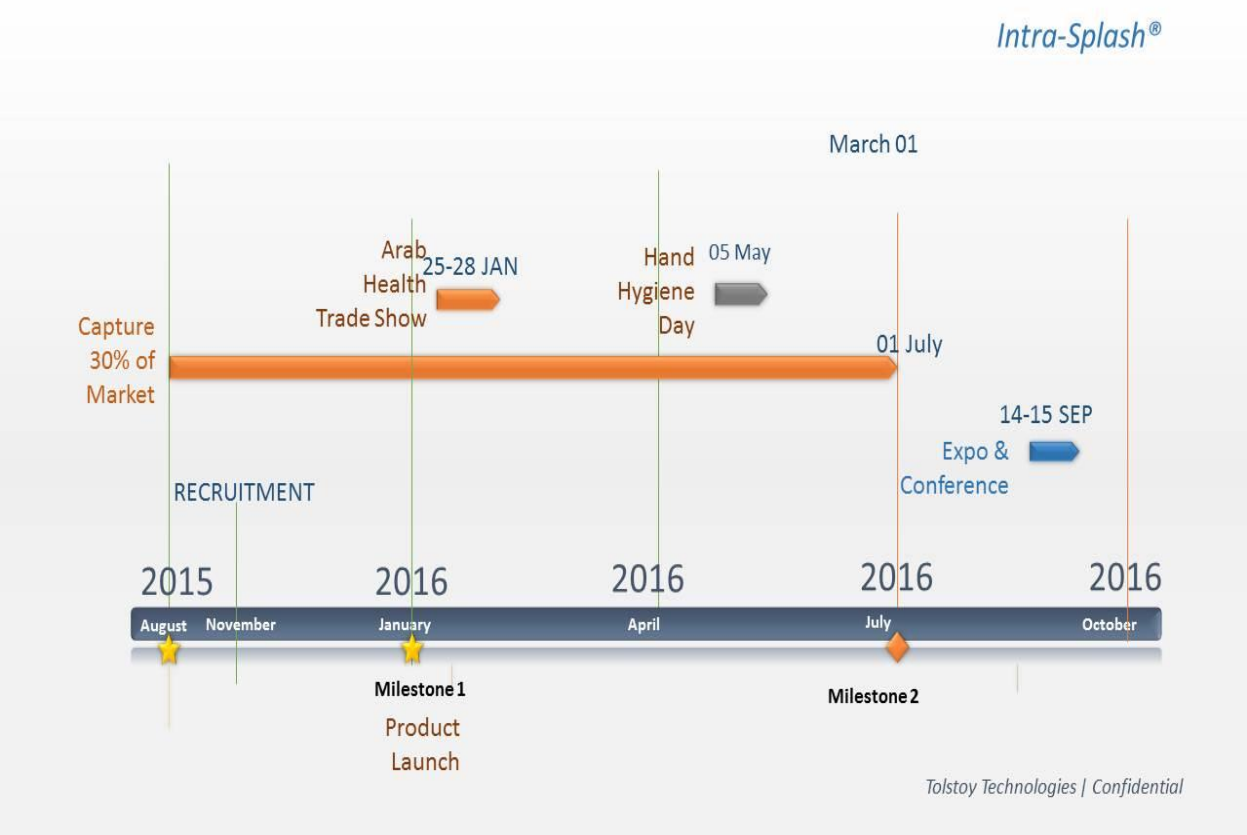


Fig10.3 Key Events for FY 2015-2016

10.4 Distribution & Services Expansion Plan

The availability of the products and its distribution channel is the method of "Placement" in marketing strategy. It is important to secure distribution channels to the ultimate purchaser or end-user. In this activity, the focus will be out of Singapore Market as the firm doesn't have office or base on the target market which is Thailand for Intra-Splash.

For intra-splash as it is clinical application system, it will be through agent/distributor from manufacturer. However, the agent/distributor will be solely under the firm control and responsibilities as intra-splash is not a consumer product.

It is decided that the distribution & services will be done under the Vertical Marketing System (VMS) – under corporate characteristic. For distribution and services, the VMS will ease the firm to control channel behavior, eliminate the conflicts when independent channel members pursue their own objectives. Furthermore, it improves the distribution efficiency under the sole control for size, bargaining power, and eliminating of duplicating services can be achieved.

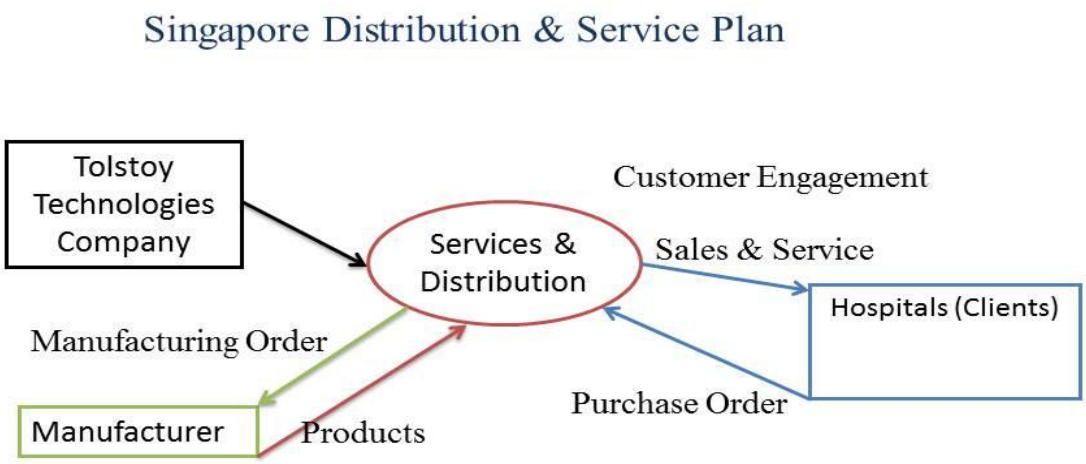


Fig10.4a. Singapore Distribution Structure

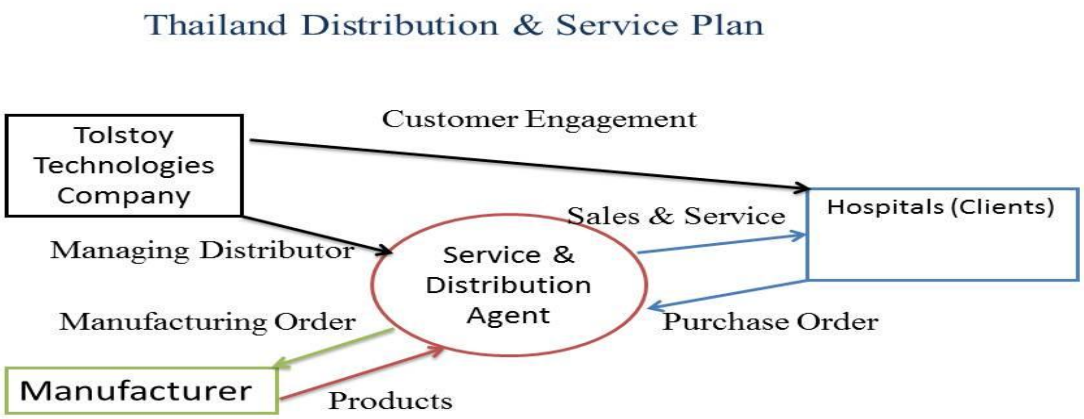


Fig10.4b. Thailand Distribution Structure

10.4.1 Distributor Sales & Service Training Plan

The training should be provided to the distributor/agent as well, it is the face of the firm in the overseas. The impact is huge on the firm if the distributors are lack of services and training. Therefore, it is wise to invest on the distributor training and development.

Area of Training	*Budget Allowance*	*Timeline*
Product Features & Benefits	USD 3000	By January 2016
Sales Engagement Training	USD 2000	By March 2016
Customer Service & Technical	USD 2000	By August 2016
Yearly Distributor Engagement	USD 4000	April 2017

10.5 Organizational Development Plan

Strategies	*Key Action Items*	*Timeline*	*Assignment*
Achieve International Engagement	U.S Market Penetration Europe Market Penetration	April 2017	Chief Executive Officer
Economic Values	Engage with health care professionals and collect clinical data	June 2016	Chief Executive Officer
Legal Patent & Compliance	Application of Intellectual Property and Product Compliance for Market Launch	January 2016	Chief Executive Officer
Secure Funding for Next Phase of Development	Contract with Investors and hire key accountants to manage the Cash Flow	April 2017	Chief Financial Officer
Implement Effective Communication	Develop strategic marketing and Communication Plan	January 2016	Vice President of Marketing
Increase Sales	Special Offer for Long term installment and Trail Periods	March 2016	Chief Operating Officer
Increase Visits to potential clients and Events	Develop marketing Budget and marketing event	April 2016	Vice President of Marketing
Achieve Long term funding commitment	Request semi-annual meetings with Ministry and potential bank investment	July 2017	Chief Financial Officer
Increase Organization Size	Head hunt potential talents and train up for next phase of development	August 2016	Chief Operating Officer
Marketing Strategies	Train Marketing Personnel and prepare Standard Marketing Kits	June 2016	Vice President of Marketing
Implement Manufacturing Strategies	Organize manufacturing and implement cost reduction	April 2017	Chief Financial Officer & Chief Operating Officer

Appendix

NUS invention disclosure form

INVENTION DISCLOSURE FORM- BACKGROUND INFORMATION

INFORMATION FOR COMPLETION

(i) Some informal advice:

1. Do not hesitate to contact us if you are unsure about the process or concerned whether your research is at the right stage of development to pursue patenting or you would like to informally run your findings by us first. Please send an e-mail to ilobox3@nus.edu.sg and a person with an appropriate technology background will contact you for discussion.

2. In the attached form, boxed areas under each sub-heading are merely placeholders and not meant to be restrictive or limiting, add as much material as needed under a particular subheading- there's no limit to the number of paragraphs, pages, volumes etc. you can add.

3. If you have a manuscript or in-press paper, feel free to copy and paste its contents into appropriate sections of this form. It will help very much if you add additional statements and information as needed.

4. Inventorship is a big deal with legal implications and consequences. If new at this and unsure, please call us to determine who should be listed as an inventor on the form.

5. Please include key references ONLY. Including several background publications as you would in a scientific publication, may impact patentability as well as delay proper assessment of the technology.

(ii) Some applicable rules and practices:

1. The NUS Industry Liaison Office (ILO) manages all intellectual property generated by staff and students of NUS. According to NUS' Rules Relating to Inventions, Innovations and Other Works, all intellectual property generated should be disclosed to ILO. If you need help or clarification please send an email to ilobox3@nus.edu.sg

2. The Invention Disclosure Form serves as an official notification to NUS on the conception of an intellectual property. Upon receipt of the completed Form, ILO will conduct the due diligence to evaluate the intellectual property for protection and commericalization within 90 days.

3. Each invention should be described clearly outlining the technical merits, usefulness, and applications of the invention.

4. Please complete all sections of the form (indicate "Nil" or "NA" where appropriate) and submit both a soft (to ilobox3@nus.edu.sg) and hard copy to address in point 6 below. A copy of the form should also be sent to the Head of Department and the Dean of Faculty/School for their information.

5. Please note that *any public disclosure* prior to submission or confirmation from ILO would jeopardize the application for a patent protection.

   The following constitute a public disclosure:

   - Publication in journals, magazines, booklets of funding agencies, etc.
   - Publication in any journals, magazines or booklets deposited in the NUS Central library or any other library that is freely accessible to the public.
   - Posting information on the Internet.

- Oral or written disclosure including abstract and poster session at scientific meeting.
- Presentation at a seminar, lecture or symposium (where non-NUS members may be present).
- Disclosing to visitors who have not previously signed a Confidential Disclosure Agreement.
- Posters in NUS corridors where the public has access to.
- Announcement of experimental trials that include enabling disclosure of the invention.
- Advertisement, sale, demonstration or use in public of the invention

6. Please submit the original completed Invention Disclosure Form, duly signed to:

Director
NUS Industry Liaison Office

21 Heng Mui Keng Terrace Level 5
Singapore 119613

Tel: 6516 7175 (Gen. Line)

Fax: 6777 6990

Checklist

1) **Please sign the form. Note that we require the originally signed document. We apologize that digital signatures e.g. scanned documents are not acceptable.**
2) **Please forward a WORD version soft copy of your write up and/or publication to ilobox3@nus.edu.sg.**
3) **Forward to us the list of mentioned references listed in your write up and/or any publication(s) on which the disclosure is based.**

4) **Please notify deadlines to us as soon as possible if results in this I.D. are to be presented or published.**

INVENTION DISCLOSURE FORM

Date of Submission: 16th March 2015

1. TITLE OF INVENTION *(a short but sufficiently descriptive title to identify the general nature of the invention.)*

Hand Hygiene System

This invention is a monitoring, reminder, detection system for everyone (staff, public) with user settings. It is a system that preventing spread of infection across everyone.

2. DESCRIPTION OF THE INVENTION

Paying particular attention to A and B, please provide as complete a description as possible. This is essential to obtain an enforceable patent.
A. The purpose of your description is to enable a person with similar skills in your field to be able to make and use the invention you describe.
B. Please do not withhold any key elements of the invention (you are obliged to describe the best way of making and using the invention known to you at the time of submission).

2.1 **Field Of The Invention:**

*A sentence or paragraph identifying the general **field of technology** to which the invention relates and **keywords** that will help define publication and patent searches.*

This invention generally in the field of Communication and Information Technology system in Medical institution settings. Mainly consists of *Bluetooth*® Technology and Web2.0 technology.

2.2 **Summary of the Invention:**

A brief paragraph (similar to the abstract of a scientific paper) describing the key feature(s) of the invention with some background context

This invention is operating on Bluetooth Badge and Reader Integration to record down the frequency of hand washing. Bluetooth badge would also serve as a reminder if the frequency of hand washing does not meet the desired setting. The server would serve as a database for the record of the hand washing. It provides analysis and report of the Hand Wash Patterns of the staff align with Hand Hygiene Compliance.

Prior Arts

1. Hand hygiene (US 20140110427)
2. Hand hygiene reminder system (CA 2807337 A1)

Claims

Independent Claim

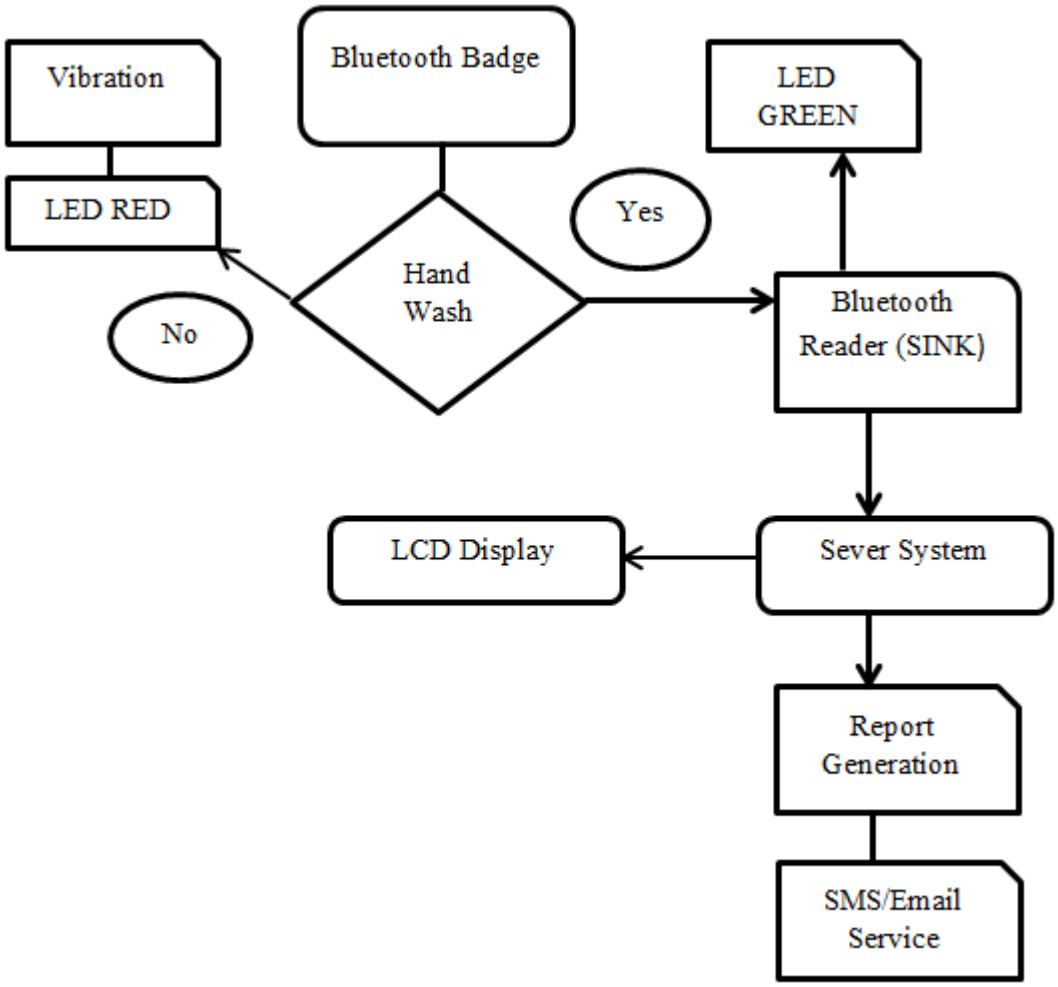
1. The invention is a solution for monitoring, reminding, and reporting of hand hygiene compliance.

Dependent Claim

2. The invention of claim 1, wherein said device consists of Bluetooth Technology, Indicators, tactile feedback and counter.
3. The invention of claim 1, wherein said sink consists of Bluetooth device, sensor control, Ethernet access device, and WIFI.
4. The invention of claim 1, wherein said server consists of operating system, software of facilitating HTTP communication and generating report, Ethernet access device and WIFI,
5. The invention of claim 1, wherein said display consists of mobile app, operating system, Ethernet access device and WIFI.

2.3 **Brief Description Of The Drawings** (if any)

Listing of the captions of each drawing or figure relevant to the invention that you have attached to this invention disclosure.



System Design of Hand hygiene system

2.4 **Detailed Description Of The Preferred Embodiments:**

This section should be detailed enough for a person having ordinary skill in your technical field to construct and use the invention you describe.

(i) A full description of the invention including background, preferred mode of practice of the invention e.g. basic nature or structure of invention, how it works with reference to relevant attached drawings etc.

Hand hygiene is now regarded as one of the most important element of infection control activities.

In the wake of the growing burden of health care associated infections (HCAIs), the increasing severity of illness and complexity of treatment, superimposed by multi-drug resistant (MDR) pathogen infections, health care practitioners (HCPs) are reversing back to the basics of infection preventions by simple measures like hand hygiene.

This is because enough scientific evidence supports the observation that if properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities.

Thus, in the environment of Hospitals, Operating Theaters and medical institutes, the keeping track of employee's awareness and following infection control procedure is essential.

It always been a challenge that failure to enforce and coercive the hand hygiene practice is the major issue of health care associates. If one product could solve the infection control – hand washing practice with the simple steps is the answer needed by all healthcare centers.

New product opportunity is raised up to address the above issues. The new product is Intra-Splash® hand hygiene system which is a reminder, monitoring, detection system.

Hand Hygiene System with Bluetooth badge and Reader Integration. The Employee will be equipped with Bluetooth badge, logging the action whenever they practice hand wash.

The information of employee, time and pattern of hand washing practice will be logged via Wi-Fi/Ethernet to the system. The system can generate the reports of user hand wash patterns which can be used by Infection Control Enforcement team to engage more activities.

There is no product of this kind in the market yet.

(ii) What problem(s) the invention solves and advantages over existing methods, devices or materials?

The existing hand hygiene system is a reminder system. With this new combination of reminder, monitoring, detection system, it can increase the effectiveness of the campaign and the interaction within the user and the system.

The LCD display of this system is a great example of it. For example, the LCD display would show the personalized message; the user will get personal involvement feeling and how their efforts are greatly appreciated.

(iii) What are the possible specific industrial applications?

This invention can be installed in both private and public hospitals and medical institutes worldwide.

(iv) Does your invention possess any disadvantages or limitations? Can they be overcome? What are the competing ways to solve the same problem(s)?

Since this system involves in hardware and software, they may have some malfunctioned issues.

This system has to be maintained in reliable and consistent performance. On top of that, The data must be in real time and accuracy.

Thus, a professional, well trained and experienced specialist and technicians are needed to provide the top quality service and troubleshooting skills on these issues.

2.5 **Modifications Of The Preferred Embodiments: (if any)**

Discussion of other modes of practice of the invention.

NIL

2.6 **References:** *Please list literature references that most closely describe your invention. You may if desired, conduct a patent search at http://ep.espacenet.com and http://www.uspto.gov*

List of references cited in this write-up.

1. Hand Hygiene Reminder System (Online). Retrieve from Google Patents

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[Accessed: 14th March, 2015].

3. SOURCES OF SUPPORT AND GRANT RELATING TO INVENTION *Please identify all outside agencies, organizations, or companies that provided funding to the research that led to the conception of the invention. Obligations of the research sponsor(s) will have to be met if patent protection and/or licensing of the technology is pursued Please also disclose any other contractual obligations entered into to come up with the invention including collaborations, research contracts material transfers etc.*

Source(s) of Funding *(eg. MOE ARF, A*STAR, EDB, etc. Please also include the grant no.):*

DSTA/DSO: Ref No. Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**	**NMRC: Grant No**. Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**
MoE: Grant No. Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**	**A*STAR(BMRC/SERC): Grant No** Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**
SMA/SMART: Ref No. Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**	**Other Agency: Grant No.** Title of Project Funded: Collaborators (if any): Was there a formal agreement signed? **No** Have University resources or facilities been used? **No**

4. DATES OF CONCEPTION & PUBLIC DISCLOSURE *Please defer publication if you think that you may have patentable subject matter. Public disclosure of an invention before filing a patent application will render the invention not patentable in most countries.*

Date of documented conception of invention: **16th March 2015**

Date of first public disclosure that describes invention, if any: **N/A**

Attach copies materials if possible.

Do you intend to disclose the invention publicly in the near future? **No**

If yes, when and where?

Has this invention been reduced to practice? **No**

Please indicate the status and intention for your invention. (You may ☒ more than one box)

~~Project ongoing~~	Looking for collaborators for further R&D	For information only
~~Project ended~~	~~Ready for Commercialization~~	Application to file a patent
Further R&D	~~Others (please specify) :~~	

5. CONTRACTUAL OBLIGATIONS: *(Research Collaborations Agreements, Material Transfer Agreements etc.)*

(i) Title of Collaboration (RCA/MTA/Other): **N/A**

(ii) Reference Number (NUS and/or external): **N/A**

(iii) Name of Collaborator or Provider of Material: **N/A**

(iv) Relevant Details of Collaboration or Material: **N/A**

6. COMMERCIALISATION *Please identify any potential licensees or collaborators interested in the invention*.
List companies or organizations, if any, that could be interested in using this invention. Hospitals worldwide, Example in Singapore are Tan Tock Seng Hospital, Singapore General Hospital, Mount Elizabeth Hospital.
Do you have plans to spin off a company based on your invention? Yes
Would you be willing to participate in the marketing of this invention by explaining it to potential commercial partners? Yes

7. SOFTWARE DEVELOPMENT (*If your invention involves or includes software, please answer the following questions. Else, you may skip this section*.)
Is the software standalone? If not, list associated software that is required for the invention to work. **Mobile Platforms (Android, iOS), Java, C Language, C++, C#**
What language is the software developed in and what platforms is it designed for delivery on? List the minimum hardware specifications required. Server (Window, Mac OS, Linux) Language: Visual Studios Language on LCD display: Objective-C(iOS), Java (Android)

Was any of the source code obtained under an open source license (e.g. BSD, GPL, Apache, etc.) or from any other source? No If yes, a) Please provide a list of the sources: N/A b) Explain how the sources listed above have been used in the invention: N/A
Are there any third party rights associated with the invention of the software? List grants or contracts if any, with third parties. **N/A**
Is the software an improvement of existing software? Has a license been obtained on the existing software? Provide details. **N/A**
Is the software a proof-of-concept, a demonstration, prototype or fully functional end user version? **A proof-of-concept**

8. INVENTORS' PARTICULARS & DECLARATIONS *Original signatures are required. Inventorship is defined as person(s) who contributes, individually or jointly, to the inventive steps that make the invention workable.* ***Do not list any inventor gratuitously****. The rules for inclusion are not the same as a scientific publication.*

I / We* hereby declare to the best of my / our* knowledge the information provided in this invention disclosure form are true and correct.

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Mailing Address:	Home Address (if different):
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Co-Inventor 3		
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University Position: ☐Faculty ☐Post-Doc ☐Research Scientist ☐Student ☐Technician ☐Non-NUS	NUS Staff or Student ID No.:
Faculty/Department/Institution:	Tel. No. Office: Lab: Mobile: Fax:
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Signature & Date:	

NB: *Please attach pages as required for additional inventors

Kindly keep us informed of permanent/home address changes to ensure you do not miss patent-related notifications or revenue payouts

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