Executive Summary

casCADE is a synthetic biology company that is committed to research and develop better diagnostic kits which can enable people to test for diseases instantly, accurately and remotely. The company is based in Nanyang Technological University, Singapore and was established in 2021 by undergraduate students that had decided to participate in the international genetic engineering machine (iGEM) and identified the potential impact of their research application onto the pandemic affected world. The company pioneers in probe based LAMP assay kits that can detect diseases. Our mission and vision is not limited to outperforming different testing kits, but also includes providing education and awareness about the successful applications of synthetic biology to the general population and ensuring an egalitarian approach towards distribution and sales of our products. Our team envisages to bridge the gap between scientific research and market ready products by implementing engineering solutions to synthetic biology discoveries. We are driven by our passion to deliver high quality and value for money products that can contribute to saving lives and improving lifestyle globally.

We are currently on the prototyping stage and under the patronage of our university. However, we have gathered enough empirical evidence to move ahead into a phase of manufacturing and welcoming partnerships to raise funds and gain market insights. The field that our company is working in is volatile and demands dynamic responses to any feedback from our consumers. We have conducted all our experiments following safety regulations and have factored in sustainability of products and organisation within our core ethos.

Currently, we have only developed one market-ready product, the Vanguard. Our company decided to focus the majority of its resources into developing a better, faster testing kit for COVID-19 in light of the pandemic. Vanguard uses probe-based LAMP assay to detect and differentiate between different strains of COVID-19 and produces results in real time without compromising on the accuracy of the result. We have tried to optimize and calibrate our mechanical kit to make it user friendly and reusable to ensure customer satisfaction. Our team has also been researching potential testing kits for other diseases like tuberculosis and several STIs. We undergo extensive planning and research before launching a product and hence obtain complete scientific certainty before diving into market analyses. Therefore, our current business plan focuses on the launch and projections of our sole product Vanguard.

After accumulation of data from different platforms, we have identified the strengths and weaknesses of our product. The value proposed by our product and company lies in the credibility and certainty of empirical evidence gathered after several rounds of fine tuning. casCADE products also boast an array of features that haven't been seen in similar products before. Potential threats of running a synthetic biology company with competition from giants haven't shaken us down but have opened us to new opportunities and challenges that have been described in detail in the rest of the business plan. Our team has analysed the major competing products and have elucidated the key differences in Vanguard as compared to them. We have also focused on choosing a pricing option that is sustainable for our company and

affordable for the majority of our target audience. This has been achieved by understanding the target audience and linking it with our proposed distribution channels. The business plan also entails a thorough description of the production costs incurred by us as a research organisation and justifies our approach towards deciding a benchmark for product pricing.

Upon identifying the markets that we plan to enter with our products, we have also dedicated resources and a team to come up with a marketing strategy that can help us achieve our goal and help us communicate with our customers better. The operational needs have been laid out and the strategy to procure essential goods and services have been looked after. Our precision goes beyond the lab, and ensures that we offer a succinct and error-free financial plan to help understand our liabilities, financial projections and perform a breakdown analysis to show our commitment and dedication towards giving back to our benefactors and investors. We pride ourselves in being a well-oiled machine working with a small team of dynamic undergraduates ready for new challenges that are beyond the scope of their education. Without outsourcing services, we have completed assessing quality checks, legal documentations and developing our own website. Moreover, the sources of funding have been elucidated and we have obtained mentorship from the correct experts to develop our products further. .

Our company casCADE is built on the hardwork and ingenuity of our original team that has developed the technology under the able guidance of its mentors. The organization and management of casCADE has been structured in a flexible fashion to ensure individual roles for each team member based on their strengths and skill sets. Our plans for expansion have been laid out and serve as a reminder to our team to look forward to the opportunities that require all of us working our part like different gears that make up a clock. We have even included a brief description of our mentors who have guided us through the dark.

Company Description:

casCADE is a synthetic biology company interested and invested in developing reliable diagnostic kits that offer the patients a more user friendly experience by giving accurate and quick results. The company focuses on integrating the latest techniques of synthetic biology with software and electrical capabilities to serve a product catered towards the needs and wishes of the target customer.

Vision:

Developing integrated probe based diagnostic tools to facilitate early detection of diseases and accurate testing of viral infections.

Mission:

- Integrate state-of-the-art genetic engineering technologies with tertiary data processing tools to offer unparalleled user experience to patients.
- Bridge the gap between scientific research and market ready products in the field of probe based diagnostic assays.
- Ensuring equitable and sustainable distribution of testing kits around the world by introducing outreach channels to remote areas in developing countries.
- Generating awareness and education in order to foster trust in the science behind the upcoming diagnostic tools.

Values:

Our core ethos is central towards providing scientific solutions ethically and impartially. We want to create a healthy environment in our workplace that promotes scientific pursuit in the most responsible way possible. We want our ideals to be associated with quality, originality and ingenuity. We seek to open new channels to educate underprivileged people about the benefits of synthetic biology and introduce them to this cutting edge technology by making it more accessible and affordable. Our company plans to propel the world towards a science centric egalitarian society where innovation is celebrated and resources are optimally shared.

Purpose:

The motivation behind our company is to strive towards a society that utilizes the fruits of scientific discovery to uplift the quality of life for humankind. We believe that it is our responsibility to apply our expertise in probe based technologies and integrate it with appropriate electrical and software technologies to design devices that will revolutionize the process of testing for diseases. Currently, our surveys show that most people associate detection of certain genetic disorders with discomfort, time consuming and expensive. We hope that our products can change the experience and perception

of people towards the diagnosis of genetic diseases. We plan to make a difference by ensuring equitable distribution of our products to ensure that everyone has access to a faster, more reliable and less painful method of disease detection.

Background:

Our company started off in 2021 as an enthusiastic research team of undergraduate students attempting to showcase their passion and devotion towards genetic engineering by participating in the International Genetic Engineering Machine. Driven by the love for science and mentored by few of the World's leading researchers, our team of undergraduate, chemical and biomedical engineers strived to make the best use of resources and knowledge to present at the competition.

Our inception was almost parallel to the beginning and end of the pandemic caused by SARS-CoV-2 virus. The prevalence of the virus in almost every household did not only disrupt the healthcare industry, but also the personal and professional life of millions of people around the world. Seeing a global trend towards shifting towards a new normal, our team saw an opportunity in helping this movement. We decided to initially work on a COVID-19 testing kit using Loop Mediated Isothermal Amplification (LAMP) technique and probes that can give quick and accurate results to the users. Seeing the success of our lab results, we decided to shift gears and decided to convert the project into a business that caters to diverse applications of synthetic biology in the field of diagnostics.

Our efforts to help the world battle the pandemic and launch new technology for the common population to use have become the foundation of our company and the source of our inspiration.

Current status of Business:

We are currently in the research and development stage of our business. Our team is currently working towards putting together a working prototype for our expected product. The research team comprises two strands, namely, the dry lab and the wet lab, and both of the fronts have been working in close synchronization to prepare a biological assay that can be embedded into a user-friendly diagnostic device. These two strands have been given better direction, shape and strength by our outreach and human practices team that has been conducting market research and understanding the needs and expectations of possible users. Our company comes to life because of the double helix structure formed by the close cooperation of our dry lab, wet lab and human practices research team, much like a living cell. With our current rate of progress, we can swiftly move from product research phase to product development stage which will enable us to distribute our products far and wide.

Critical success factors:

The success of our company and the line of products we wish to offer depends on various factors. Our company is built on a promise to deliver better diagnostic kits to people in a more affordable and accessible fashion. We also rely on help from the various organizations around the world working on similar research topics and having the same goals towards helping the world. A healthy competition with our competitors is essential for us to learn and keep up with changing technology. Probe-based technology is volatile with new research being done every day, and our company's goal is to be up to date with new breakthroughs in this technology and find ways to find applications for the same. The most important factor for the success of our company is the trust our customers will have in us. We want to ensure our commitment towards quality assurance and constantly receive feedback from our customers to help us shape our products in line with their expectations.

Products and Services:

Product Description:

NTU-Singapore believes in the simplicity of products to make sure that our products are convenient to use for people with just the basic information. We want our products to be accessible and barrier free. Our design team has dedicated months of iterative planning to coming up with better products that use our world-class synthetic biology technology and encase them in simple kits integrated with cherry-picked features to ensure seamless user experience.

Currently, our focus is towards applying the latest probe techniques to develop diagnostic kits that can detect diseases/infections caused by genetic variations. Our team has persevered towards making products that are easy to manufacture, transport and utilize. The company is proudly founded by the ideals of young and enthusiastic engineering students driven by passion to impact the world for the better and spark creative innovation in every project they endeavour. This vibrancy of ideas and youth energy of our organization is reflected in our products.

Each of our products goes through multiple stages of scrutiny from experts in the field of diagnostics and genetic engineering. Our prototype teams are led by top notch researchers and student leaders of one of the finest universities of the world. [ ]. We have taken surveys to understand the expectations and needs of our customer base and have interviewed the relevant people from the industry and the customer base to better optimize our products.

Stages of Development:

Each of our products goes through the following stages of development in the respective fields:

a. Research and Development
    i. Literature review
    ii. Laboratory Testing
    iii. Lab result analysis
    iv. Device modelling
    v. Dry Lab prototyping
    vi. Integrating dry lab prototype with wet lab results
    vii. Optimizing biological sample
    viii. Customer Survey
    ix. Expert interviews
    x. Modifying Product based on survey

xi. Fine tuning the prototype until all sources of errors are eliminated
xii. Iterative approach for fine tune the product for mass manufacture
xiii. Testing the product and measuring its performance

b. Manufacturing
   i. Partnering with manufacturers for different components
   ii. Negotiations to ensure the best quality and cost
   iii. Setting up quality control officers for each partner company
   iv. Liasoning with shipping and storage facilities to store product

c. Marketing
   i. Setting up online presence for the product
   ii. Initiating pre-orders
   iii. Offering free samples to big corporations
   iv. Striking deals with marketing agencies to push product
   v. Participating in networking events and international conferences

Product feasibility:

We have empirical evidence from various tests conducted in our mechanical and biological lab to account for the successful performance of our Vanguard product for COVID-19 diagnosis. Our goal as a company was to integrate synthetic biology into a user-friendly kit and provide accurate results to our customers. We have enough evidence to believe that the device we have come up with can hold the required reactions and provide results within 40 minutes. We have achieved high levels of accuracy and reliability by calibrating our classified reaction specifics with our in-house display kit technology that can enable easy viewing of results.

We plan to find a manufacturing company to initiate large scale production of our testing kits that can be exported globally. Our plan is to form partnerships on the basis of giving a share of equity and set up a well defined supply chain to optimize the production and minimize waste. Our prototype is 3D printed employing commonly used materials like polylactic acid (PLA). After finalising the design of the product, we plan to use more rigid and better material such as PVC and aluminium that will enhance the durability of the product. Our company has a key advantage of being closely associated and sponsored by NTU for our research phase. NTU promotes up and coming startups that implement research results into practical applications and has been monumental in our journey. We believe that the networking opportunities garnered by NTU shall help us find the best fitting manufacturing partners in the shortest time.

Once we have proved our competence in research and manufacturing, the success of the product largely depends on the reaction of the customers to the product. We are a company willing to go above and beyond. We plan to employ young and

dynamic design experts from NTU that can bring versatility to our marketing campaign and help us educate our target audience about the benefits of our products. We also acknowledge our great fortune of being strategically located in Singapore which is a trade and information hub which provides us great mileage to help distribute our testing kits to a wider customer base.

Scientific Illustrations:
{parts of wiki which show empirical evidences for our product}

Range of Products:
Current Products:

1. *Vanguard*

COVID-19 testing kit

Vanguard will be our first product to be launched after a series of prototyping and data processing. Vanguard is a COVID-19 testing kit that uses LAMP (loop mediated amplification) technique coupled with probes to accurately test for the presence of the COVID-19 mutated gene sequence in the sample. Instead of the commonly used nose swabs which most of the users find inconvenient and painful, our testing kit uses saliva to collect samples from the patient. This sample is mixed with our proprietary solution and then placed inside our reusable diagnostic kit which is capable of identifying the type of mutant strain and provide results in under 40 minutes with an accuracy proximate to the gold standard of rtPCR. Our kit is also compatible with WI-FI which allows swift upload of results.

Potential Products:

Upon surveying, we have identified different potential products that require diagnostic kits similar to Vanguard. As a company, we are committed to grow and diversify by introducing a range of products that uses our synthetic biology expertise and implements real world diagnostic solutions to help people detect diseases and infections with a great deal of convenience and accuracy. However, experiments in synthetic biology are not always easily transferable to other similar looking applications. We plan to reinvest a part of our profits made from the sales of our initial product into developing disease specific diagnostic kits. Some of our future prospects that we are working on are mentioned as follows:

- Tuberculosis detection kit
- STI detection kit

Pricing:

After analysing our production cost and the surveys regarding the consumers' preference in terms of pricing of a kit, we have decided to set the price of each device for SGD$15. Besides that, the solution to test for SARS-CoV2 will be priced at SGD$1.50 per tube.

Market Analysis:

Business Model Canvas:

<table>
<tr>
<td rowspan="2">Key Partners
- Nanyang Technological University
- Raw material Suppliers
- Shipping agencies
- Drug store chains</td>
<td>Key Activities
- Product iterative fine tuning based on suggestions
- Product Promotion
- Legal and Patenting
- Packaging and distribution
- Quality control</td>
<td rowspan="2">Value Proposition

Probe based diagnostic kits that can display results quickly and accurately.

COVID-19 testing kit that can detect different strains of COVID using saliva and wirelessly upload results to an online database in less than 40 minutes.

Student led team under patronage of highly accredited university NTU.</td>
<td>Customer Relationship
- meetings with drug store chains
- TV and radio interviews.
- feedback hotline
- HR department</td>
<td rowspan="2">Customer Segments
- office and factory workers
- airport staff and flight commuters
- doctors and healthcare workers
- students and school faculty
- website and drug store visitors</td>
</tr>
<tr>
<td>Key Resources
- Laboratory infrastructure
- Manufacturing infrastructure
- Human resources
- Financial resources</td>
<td>Channels
Direct: via website or contacting sales head via email
Indirect: via networking events or partner companies.</td>
</tr>
<tr>
<td colspan="2">Cost Structure
- Raw material cost
- Research and development
- Packaging and shipping
- Buffer and storage
- Marketing
- Staff and expert payroll</td>
<td colspan="3">Revenue Streams:
- Direct liaison with corporations and educational institutes to test their employees and students on a regular basis
- Partnerships with organisations like airports, NGO's, f&b
- Direct sales from website</td>
</tr>
</table>

SWOT analysis:

Strengths:

- Our line of products are user friendly and offer high accuracy results to our users.
- Our company sets up a personal connection with our target audience and sets up channels of communication to welcome all suggestions from users.
- Our products have gone through multiple levels of safety assessment and have been thoroughly researched under the guidance of distinguished professors and researchers of Nanyang Technological University, Singapore.

- The team is composed of passionate students and experienced researchers which reflect a promise of a highly efficient and hardworking workplace environment.
- Our products are B2C (Business to Consumer) and products of similar application have been in high demand.

Weaknesses:

- All components of the kit must match biological and pharmaceutical high standards which makes procurement of materials expensive.
- Our company hasn't been established yet and therefore we have yet to form a brand image and get trust from the target audience.
- Currently, we are a small organisation backed by Nanyang Technological University and we have not approached any business partners for an investment in us.
- We have not figured out our mode of mass production and have yet to sign a contract with future manufacturing partners.

Opportunities:

- Imminent necessity of providing rapid testing kits for COVID-19 globally.
- As more countries start treating COVID-19 as an endemic rather than pandemic, the focus will shift from vaccines and safe distancing tools to rapid testing kits and therapeutics.
- Scope of diagnostic kits for STI, tuberculosis, etc detection by modifying the same technology.
- A lot of research organisations are focusing more towards synthetic biology, which will result in development of better technology over the years that can be adapted onto our line of products.

Threats:

- Inability to source for funding for the current project as biological research based products bleed through a lot of money initially.
- Different government regulations and policies of countries make equitable distribution and affordable pricing challenging.
- Brand image and trust of consumers is dependent on a lot of variable factors and can lead to unsatisfactory market response despite scientific proof of concept.
- Competitors are mostly subsidiaries of big pharmaceutical companies with deep pockets and well established pedigree which can pose a direct threat.
- Logistical difficulties of importing raw materials and exporting products

Competitor research:

Diagnostics is one of the upcoming fields in the realm of synthetic biology because of which a lot of research institutes are coming up with new companies that cater to the consumer. Amongst these are subsidiaries of pharmaceutical heads like Pfizer and Abbott, but also independent stand alone organisations that stem from application based research at reputable academic institutions. Although, we plan to go head to head with the likes of them, currently it is more suitable for our company to focus on competitors in specific products. probe-based technologies can be used to potentially detect and remediate any form of RNA disease, and hence each of those possible products are under our radar. We want our company to be an umbrella organisation that specializes in each and every diagnostic application of probe, but currently we are launching the company based off of our marquee products on which our teams have worked on for the longest time,

The first product that we plan to launch is a COVID-19 testing kit based on the aforementioned LAMP technique coupled with probes. After extensive research and comparison of different competitor products in the market, we have tried to work on the shortcomings of other products to ensure that the customer is satisfied and has no complaints. Based on our survey, we also realised how potential customers view existing testing kits and identified the lacking features that are now offered via our flagship product.

Our marketing team did an analysis of the different companies that also manufacture rapid testing kits for detecting SARS-COV-2 and have elucidated the striking differentiators in the table below:

	BinaxNOW by Abbott	**Lucira Check-It**	**Ellume COVID-19 Home test**	**casCADE by NTU-Singapore**
Country of origin	USA	USA	Australia	Singapore
Type	Antigen	LAMP	Antigen	LAMP
Price under $50	Yes	No	Yes	Yes
False Positive under 5%	No	No	Yes	Testing
False Negative	Yes	Yes	No	Testing

under 2%				
3 or less components per kit	Yes	Yes	No	Yes
Indication of incorrect testing				In progress
Bluetooth connectivity	Yes	No	Yes	No (WIFI)
Multiple use from single kit	Yes	No	No	(same device)
Detect different variants	Yes	Yes	Yes	Yes
Differentiate between variants	No	No	No	Yes
Mode of testing	Nose swab	Nose swab	Nose swab	Saliva

Target market research (TAM total addressable market):

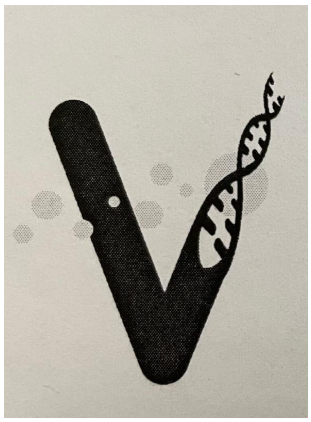
Our product Vanguard will be useful to people from all age groups, ethnicities, occupational backgrounds and geographical locations. We believe that we will first target and fulfil the need of regular testing kits in Singapore. Since Singapore is shifting its approach towards COVID by treating it as an endemic rather than a pandemic, the country shall put visible changes into the safety management measures associated with the virus. We believe that regular testing at workplaces, educational institutes, and households will become inevitable.

In a country like Singapore with the majority of the workforce employed in certain pockets of the city and a huge part of the population using public transport to move from one part of the country to other on a regular basis, the best bet of fighting the spread of the virus is if citizens are constantly and regularly testing themselves. Our survey shows that a lot of employers are willing to establish this methodology in their workplaces provided that it is convenient and financially feasible. We believe that Vanguard serves to be the correct product for quick regular testing in workplaces, food and beverage

centers and educational institutions like schools and universities. This shall prevent the disruption of education and business which are two strong pillars of Singaporean resilience.

Moreover, Singapore can begin opening up to other countries and tourism once regular testing is in effect. Therefore, our target market is mostly big corporations that require regular testing for their employees and educational institutes that provide their students with testing. However, we shall also open up a channel for individuals to buy our product directly via e-commerce and possible pharmaceutical shops.

Branding and product positioning:



Logo for Vanguard

Production Cost:

We have decided to calculate our production cost to ensure that we are able to have a space to develop our diagnostic kits conducively. The table below shows the breakdown of the cost for both the biological and mechanical laboratory. The total cost that will be incurred for starting up a company and prototyping is approximately SDG$120,000.

Biological Laboratory

	Items	**Quantity**	**Price (SGD)**	**Total cost (SGD)**
1	Biological & mechanical laboratory rental Location: Rutherford@89 Science Park Dr	1	$6300/month	$6300
2	Type II Biological safety cabinets	1	$15000	$15000
3	Autoclaves	1	$2000	$2000
4	Thermal Cycler	1	$5000	$5000

5	Biosafety Cabinet	1	$2000	$2000
6	Consumables (Gloves, PCR tubes, pipette)	-	$1000	$1000
7	Chemicals (PCR Reaction Mix - 100 Reaction, Primers/Probes)	-	$2000	$2000
			Total Price	**$33300**

Mechanical Laboratory

	Items	**Quantity**	**Price (SGD)**	**Total cost (SGD)**
1	Ultimaker S2+ 3D printing units	2	$4000	$8000
2	3D Printer Filament	5	$65	$325
3	Weller Soldering Set	1	$500	$500
4	PCB Printer Set (Voltera V-One)	1	$6000	$6000
5	Consumables (Microcontrollers, Wires, Resistors)	-	$1000	$1000
6	Oscilloscope	1	$500	$500
			Total Cost	**$15825**

Others

	Items	**Quantity**	**Price (SGD)**	**Total cost (SGD)**
1	Digital Marketing Campaign (Facebook, Instagram)	-	$2000	$2000
2	Patent and Licensing	-	$10000	$10000
3	Maintenance	-	$5000	$5000
4	E-commerce Subscription (Shopify)	-	$500	$500
5	Manufacturing	-	$50000	$50000

			Total Price	**$67500**

Promotion and Advertising:

Our brand image is the most important thing to make sure that our customers trust our technology and can actively rely on the results provided by our diagnostic test kits. For the initial promotion of our products, we shall be resorting to social media platforms like Instagram, Facebook, Twitter and LinkedIn to introduce our products to potential customers. The younger generation is very active on these social media platforms and they are welcoming towards newer products and technologies. It will be very crucial to educate them about the advantages of using our products. Therefore, to achieve so, we shall also dedicate a team towards creating infotainment and educational videos that can better illustrate the technology we use to the audience. These videos shall be posted on Youtube and TikTok and shared via social media platforms.

We have participated in the International Genetic Engineering Machine (iGEM) which is a symposium of the world's most enthusiastic synthetic biology teams that gathers every year to showcase a new project in the field of genetic engineering. We believe that recognition and applause from iGEM shall boost our company's confidence and provide our brand image a strong foundation for our consumers to rely upon. iGEM also opens us to hundreds of teams, many of which are working on the diagnostics track and others using different tracks that may link to our projects. We plan to benefit from these networking opportunities by connecting with research or industry specialists and set up collaborations to strengthen our brand value and open up to new opportunities.

Our company has also decided to dedicate a team towards developing a website that hosts all the information about our journey, our products and our success. We plan to have an integrated UI/UX that makes the user experience enriching and playful. Our website shall also be the main source of all our orders as we plan to use the tools of E-commerce to boost sales via our website.

Our company started off as a project in the labs of one of the most distinguished research institutions in Singapore and the world. The association with Nanyang Technology University gives our company a great deal of reliability and trust. NTU is home to some of the world's finest professors and industrial liaisons and we believe that we can use these powerful connections to strike deals with global organisations that will benefit from using our products.

Distribution Channels:

Our company is based off of Singapore which is one of the busiest trade hubs in the world. Our company seeks to use the geographical location to our advantage and benefit from the well established shipping and trade sector of Singapore. Our company believes that in the initial stage of production and sales, most of the orders shall be taken online via our website or via communication between us and organisations which prefer to buy in bulk. We shall also have schemes to offer certain kinds of customers with special offers to ensure that our product reaches far and wide and is as inclusive as possible.

Our company intends to deliver the products directly to the consumer by initiating partnerships with the shipping agencies already well established in Singapore. Our products are sensitive and need to be handled with care. Therefore, our company has planned to dedicate a team that looks after the logistical side of procuring raw materials and exporting finished products to ensure that our customers enjoy the customer service they deserve. Since self test kits are about to become a household name as prevalent as OTC pain killers, it is essential for us to contact popular drug stores with thousands of franchises across the world. We plan on closing a deal with one of these drug stores to sell our self test kits in their stores and set up channels to replenish their stock before it runs out.

Operational Plan:

Technological needs:

Our company is based on the cutting edge synthetic biology technology that keeps improving and evolving everyday. Our company stays aware of these changes and makes sure that it adopts new changes to keep up with the best technological solutions. Beyond that, our company envisages to prepare the consumers for these shifts and educate them about the new technologies so that maximum people can benefit from the fruits of scientific discovery. As a company, we have certain technological needs that need to be fulfilled to remain functioning and to be able to achieve our long term and short term goals. Our company needs a database management software to keep track of all the experiments and prototypes that we conduct in our respective laboratories. We also require a website development team to keep the website updated with the new advancements and achievements of our company. Since we also use an online model of selling products using our website, we also need to install a customer relationship management software. Marketing analytics and location tools to identify the demand of our products amongst different demographics are essential to better appreciate the impact our product has. Our company deals with a lot of confidential data and we need to use reliable software

which keeps our sensitive files, emails and all forms of information exchanges encrypted in a safe location.

On the lab end, we need the best equipment to ensure high precision and quality in our products. For our mechanical lab, we need 3D printers from reliable sources such as Ultimaker. In addition, to house electronic parts in a small device, a PCB printer would be required so that we can customise our own circuits. For our biological lab, we require BSL-2 Safety Laboratory in place to work with DNA fragments of the diseases. This ensures that the safety and regulations are met before handling these diseases.

Supply chain:
Since, in the current phase, our company is mostly handled by undergraduate students focused on developing groundbreaking science, we have decided to outsource consultancy firms to help us design our supply chain. We shall further explore our options after the prototyping phase.

Quality Control:
Our products are only as good until each of them has satisfied a customer and none of them have been reported faulty. A hint of distrust in a biotechnology company goes a long way. We have identified this and thus have decided to recruit a team under the leadership of our Chief Quality Officer that manages the quality of each of our components and keeps checks and balances on the manufacturing partners that decide to work with us.

Legal:
The most time consuming criteria when working with synthetic biology applications are the regulations that require companies to go through a plethora of clerical forms to assure that their product is suitable for public use. Our company has a strong reason to believe that our testing kit would make it to the marketplace with relative convenience. This is based on our assertion that the recent trend in Singapore has been towards expediting COVID-19 related products and devices to ensure a swift transition from a pandemic to an endemic.

The Health Sciences Authority (HSA) of Singapore has committed to ensuring rapid availability of diagnostic tests for COVID-19 in Singapore. HSA has been working closely with local companies to ensure the timely availability of good quality testing kits. Since our product Vanguard follows all the requirements elucidated in the regulations, we believe that the HSA will be inclined towards providing regulatory privilege and scientific advice to help push our product to the marketplace as soon as possible.

Considering the novel and useful application of our device, we also seek to apply for a utility patent to hold exclusive rights over our well researched technology. The design aspect of our products have gone through multiple rendering and optimizing. Through this, we have adopted a unique design principle that enables us to provide a diagnostic tool which is user friendly and accurate. Our team has been suggested to apply for a design patent for our manufactured parts of the product. The process of patenting is rigorous and requires guidance and preparation. Our company has looked into it and have set an action plan to apply for the necessary patents aligning our interests with the Intellectual Property Office of Singapore (IPOS).

Financial Plan:

Funding sources:

Our company was formed in the laboratories of Nanyang Technological University under the patronage of the university. We haven been currently funded by the funding provided by the university for research and documentation of the project intended to be presented for iGEM. We have not begun mass manufacturing of products and converted our research project into an enterprising business. After completing market research, consumer survey and product certification, we plan to seek further funding from external sources. NTU and Singapore serve as excellent hubs for a diagnostic startup as the market landscape is dotted with multiple companies and government bodies willing to invest in potential synthetic biology applications. We shall use our connections at NTU and NBS to negotiate with interested investors and pitch our products to third party agencies that can provide infrastructure, insight or direct monetary funding/ grants. But currently, it is an area less explored by our team and would be one of our major challenges as we step into the manufacturing phase. In addition, we will also explore the possibility of renting a small private lab to ensure that it does not affect the current laboratory objectives and goals.

Financial Projections:

	Year 1	Year 2	Year 3
Total Sales	$300,000	$750,000	$1,500,000
Investments	$63,000	$30,000	$100,000
Operating Expenses	$132,600	$100,000	$120,000
Manufacturing Cost	$60,000	$150,000	$300,000
Gross Profit	$40,400	$470,000	$980,000

Break Even Analysis:

Organization & Management

Roles and Responsibilities:

Our company has been formed based on the shared values of the team members to respect each other and celebrate our differences without having to associate hierarchy

within the team. We are proud to function more like a team rather than an organization with members having specific roles rather than positions.

Role	**Name**	**Responsibilities**
Chief Executive Officer	Safwan	Persuade investors and manufacturers to mass produce the diagnostic kits
Chief Financial Officer	Prasham	Handle the expenses and assets of the company
Chief Technology Officer	Victor	Look into developing new hardware to further improve the diagnostic kit
Chief Research Scientist	Wei Heng	Look into developing probes/reactions to reduce any false positives in the results
Chief Operating Officer	Valerie	Oversee the projects/experiments conducted in the laboratories
Chief Marketing Officer	Sharon	Focuses on creating Campaigns in social media to attract consumers
Chief Quality Officer	Tanya	Ensures that product manufactured by manufacturing company works as intended
Chief Information Officer	Adilah	Collect feedback regarding any issues with the products once it has been released
Chief Compliance Officer	Yingyue	Ensures that experiments done in the laboratory follow the safety procedures
Director (Logistics)	Zheng Qiao	Handle any new materials from delivery and call for maintenance if need any
Director (Human Resources)	Hui Min	Manages the people working and ensure that their mental health and performance is well maintained
Director (Media)	Michelle	Assist Sharon if there is a need to create infographics/videos regarding the product.

Deputy-director (Media)	Chun Ting	Assist in creating a website/e-commerce platform

Owners and Shareholders:

We have been under the able sponsorship of NTU for the foundational period. Our research has been funded by the university resources that are made available to passionate undergraduate students. We are grateful to our institution for giving us the wings, and are ready to fly on our own. Our team is constantly working on a plan of action to effectuate the roll out of our products in the market. We have decided to give up a part of our ownership to a manufacturing company in exchange for their trust and investment in our technology and their promise to help us mass produce our products using their facilities and connections. We have yet to negotiate how much of their share will be direct equity and the remaining shall be advisory.

After building our brand and satisfying our customers with our initial product, we shall set out to pay back on our dividends. Once we have settled our dividends, we plan to take the company public as it enables us to raise money based on the trust of our customers and benefactors and serves as a real-time indicator of our brand value and credibility.