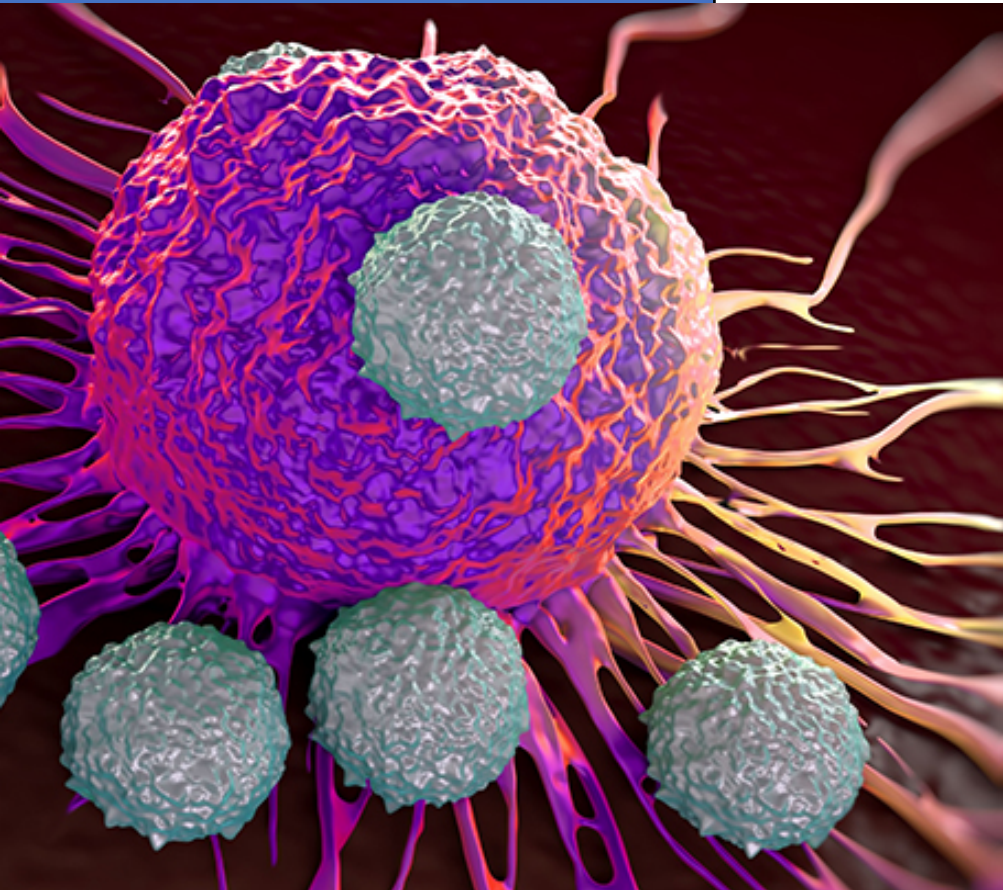


# Assemblase Pty Ltd



“The science of today is the technology of tomorrow.”  
- *Edward Teller*

# Contents

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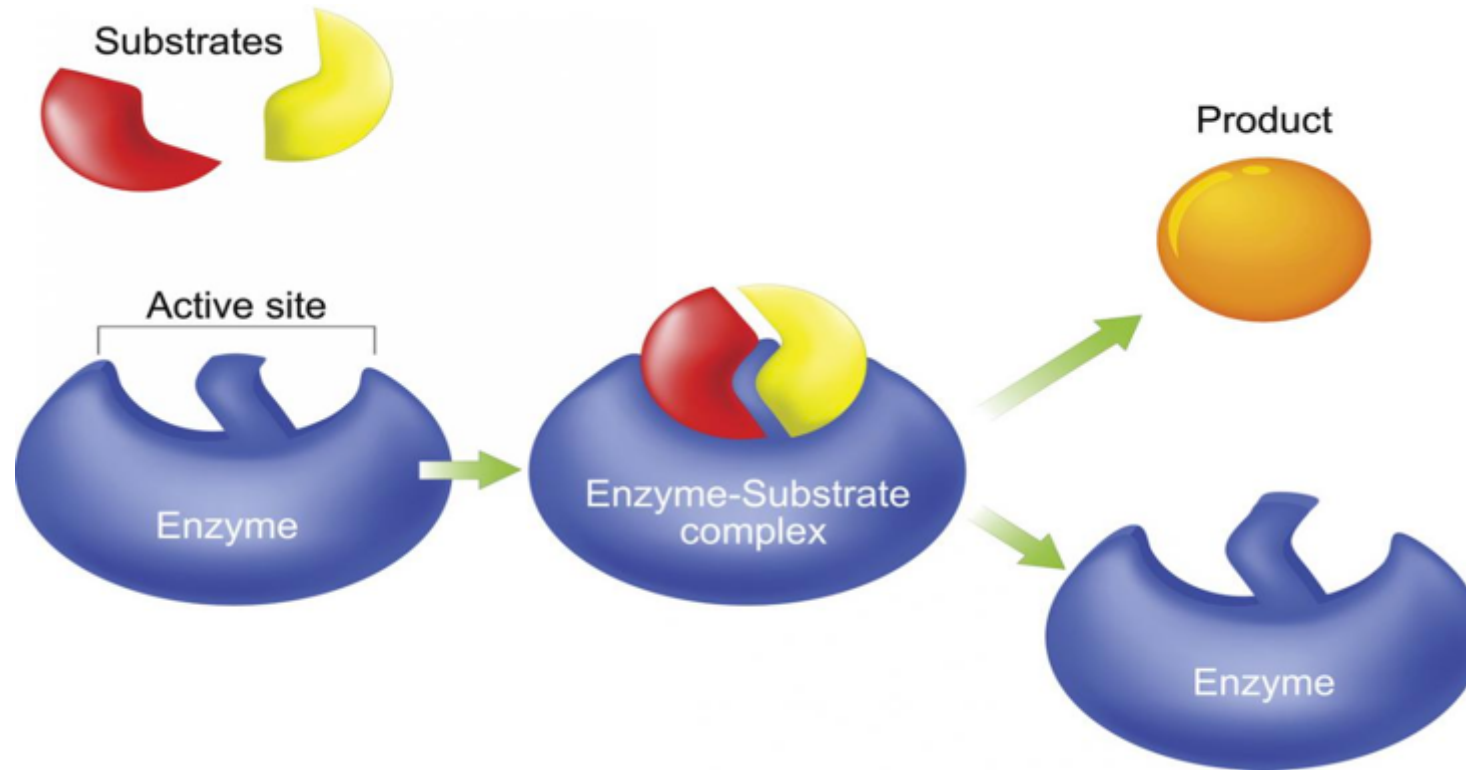
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- Assemblase is a company that aims to reduce reaction times allowing scientists to focus on the more important issues of tomorrow
- Assemblase is offering the market an enzyme scaffold as well as, a state of the art consulting service which will revolutionise how industry looks at producing therapeutics, consumer goods, textiles and industrials
- The total addressable market for Assemblase is valued at \$5.8 Billion currently with estimations of a value of \$6.4 Billion by 2020
- Key stakeholders that benefit from Assemblase's scaffold and service are government, global insurance companies, industry and consumers

- Sustainable practice is at the forefront of Assemblase's business working towards a cleaner future
- Assemblase advocates for ethical scientific practices
- Social responsibility is at the core of Assemblase's business educating and improving public engagement with synthetic biology
- With reducing inefficiencies in mind Assemblase is built by scientists for scientists
- Assemblase is on cutting edge of innovation centred around solving the problems of tomorrow

# What is An Enzyme?



A substance produced by a living organism which acts as a catalyst to bring about a specific biochemical reaction.

# Why Enzyme Markets?

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- Core Components of Life currently in every organism
- Longevity having been around a long time will be around for a lot longer
- Innovation as they are used to create the most innovative products
- Extensively used by industry, research scientists and students)
- Sustainable as they increase reaction rate removing inefficiencies
- Diverse Applications in pharmaceuticals, consumer goods, food and perishables, textiles, waste treatment, fuel production

# The Enzyme Market



- Total Addressable Market is \$5.8B
- From 2014 the market has seen a 7% growth rate valued at \$4.2 billion and projected to reach \$6.4 billion by 2020
- The current issue is wait time due to inefficiencies in enzyme interaction
- Multistep enzyme reactions are conducted with free floating enzymes in mixture
- Scaffolds can be used to reduce the wait time between multistep reactions due to localised nature of the input and output
- Currently there are no enzyme scaffolds commercial available

Industry	Enzyme	Use
<b>Baking</b>	Xylanase	Dough conditioning
<b>Diary</b>	Acid proteinase	Milk coagulation
<b>Brewing</b>	Pullulanase	Starch saccharification
<b>Industrials</b>	Lipase	Polycondensation, ring-opening polymerization of lactones, carbonates
<b>Detergent</b>	Lipase	Fat stain elimination
<b>Cosmetics</b>	laccase	Hair dye
<b>Waste Management</b>	Amyloglucosidase	Starch hydrolysis for bioremediation

# Case Study – Paclitaxel



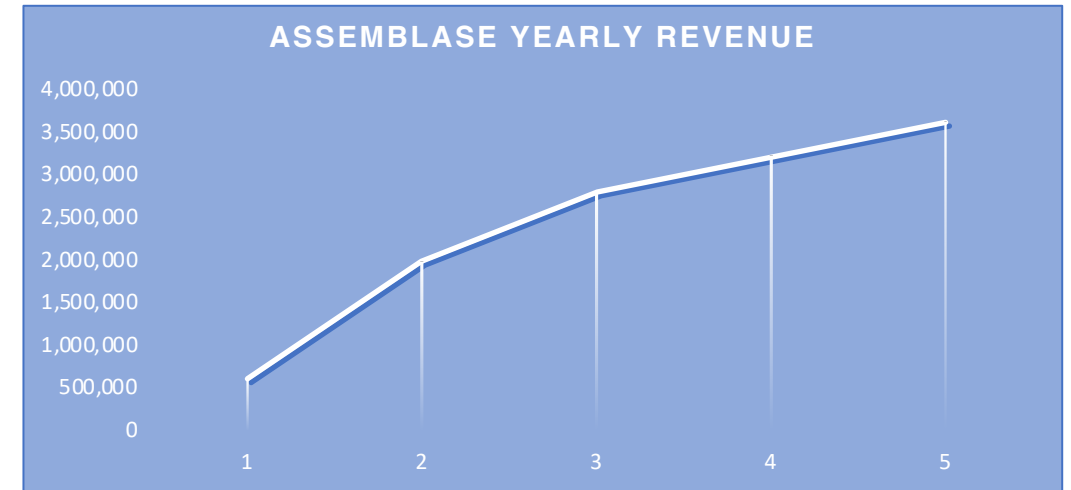
- Total Paclitaxel sales globally is \$200M per annum
- Paclitaxel is used to combat ovarian, cervical and breast cancer
- Paclitaxel works through promoting the formation of microtubules inhibiting cell division which leads to apoptosis
- It was the first blockbuster drug (>\$1B sales)
- It is also the precursor for many other chemotherapy drugs such as Abraxane, Taxoprexin, Opaxio
- Assemblase has been applied to paclitaxel manufacturing to demonstrate the adaptability of the structure

Main Stakeholders	Description
<b>Australian Paclitaxel Manufacturer</b>	Pfizer Australia Pty Ltd (anzatax)
<b>Australian Paclitaxel Manufacturer</b>	Juno Pharmaceuticals Pty Ltd (paclitaxel ACT)
<b>Australian Paclitaxel Manufacturer</b>	Accord Healthcare Pty Ltd (paclitaxel accord)
<b>Australian Paclitaxel Manufacturer</b>	Sandoz Pty Ltd (paclitaxel ebewe)
<b>Australian Paclitaxel Manufacturer</b>	Fresenius Kabi Australia Pty Limited (paclitaxel Kabi)
<b>Australian Paclitaxel Manufacturer</b>	Teva Pharma Australia Pty Limited (paclitaxin)
<b>Australian Government</b>	Public Benefits Scheme
<b>International Insurance agencies</b>	Insurance Companies



# Case Study – Paclitaxel

- Total Paclitaxel sales in Australia is \$11M annually
- Paclitaxel is an F2 drug under the Pharmaceutical Benefits Scheme this ensures constant price disclosure
- As a result any change in manufacturing is incorporated by all 6 manufacturers in Australia to remain competitive
- This ensures that Assemblase will be incorporated into all 6 manufacturers processes
- Using Assemblase scaffold, Paclitaxel can be produced 5 times more efficiently and significantly more sustainably than current production methods
- Assemblase could undergo expansion into the NAB Paclitaxel Total Addressable Market of \$25M as well as other derivatives



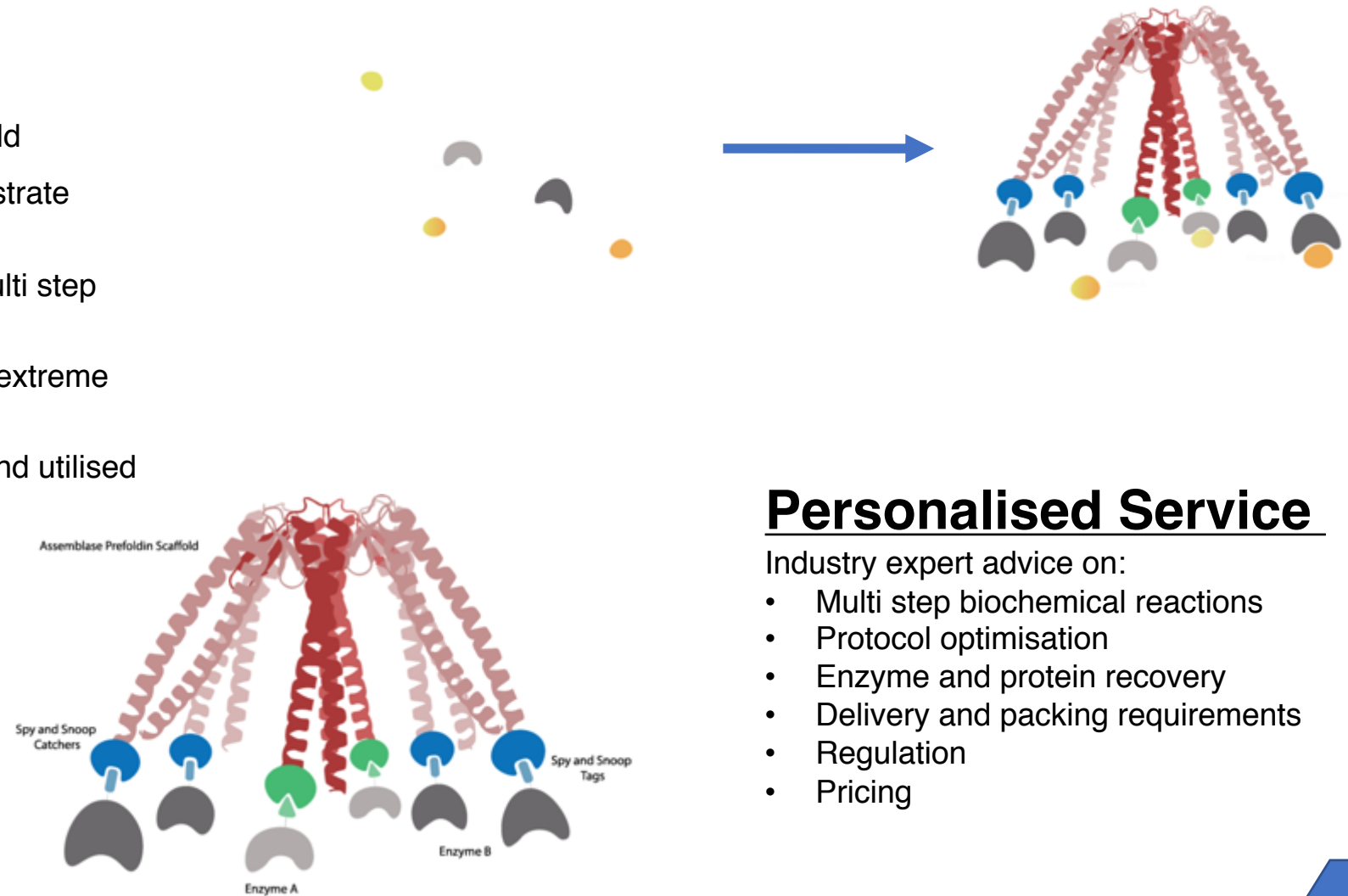
Assemblase will foster an elite service that will allow users to increase the rate of product formation of their biochemical processes. The Assemblase scaffold will prove to advance industry significantly removing inefficiencies and increasing production of units.

Users will either provide Assemblase Pty Ltd with the desired enzymes that they require for their reaction or alternatively, the description of enzymes which will then be sourced. These enzymes will be attached using a tag and catcher system. The scaffold will then be sent back to the customer and will be able to be added to the required reaction.

The user will be then sent the required scaffold dependent on how regularly they will require the scaffold and how often the customer is running the reaction. The user will incur an one off consulting and advising fees as well as, the unit cost for the Assemblase Scaffold.

## Assemblase Scaffold

- Self assembling DNA origami scaffold
- Increases reaction rate through substrate binding
- Attaches 2 or 3 enzymes making multi step reactions instantaneous in nature
- Adapted from *Archea* which habitat extreme condition
- Thermally stable being configured and utilised at higher temperatures
- Highly adaptable to any enzyme



## Personalised Service

Industry expert advice on:

- Multi step biochemical reactions
- Protocol optimisation
- Enzyme and protein recovery
- Delivery and packing requirements
- Regulation
- Pricing

# Minimum Value Proposition (MVP)



## Reaction Yield

Increase reaction yield by at least 10%

## Self Assembling

Can assemble independently with a reaction

## Stable & Inert

Scaffold stays intact with stability not being compromised during reactions

## No Interference

Does not interfere with undesired elements of reaction

## No Byproducts

No production of unwanted by-products

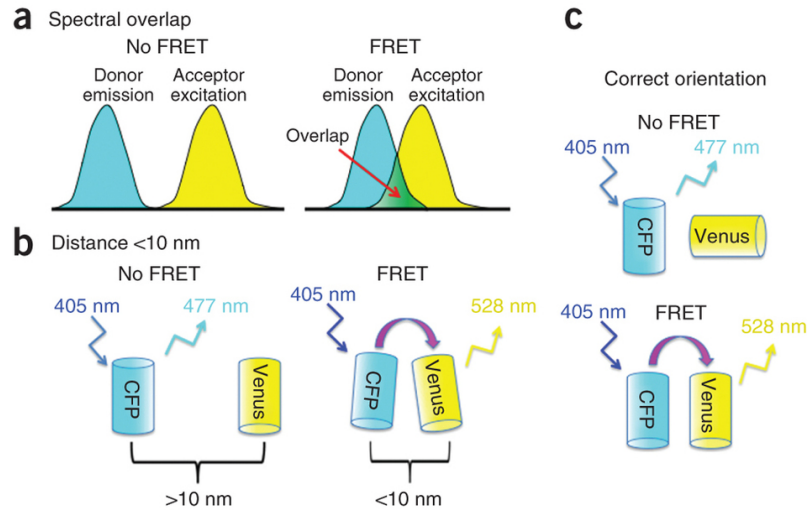
## Improvement

Does not hinder or to a reasonable level inconvenience current production method

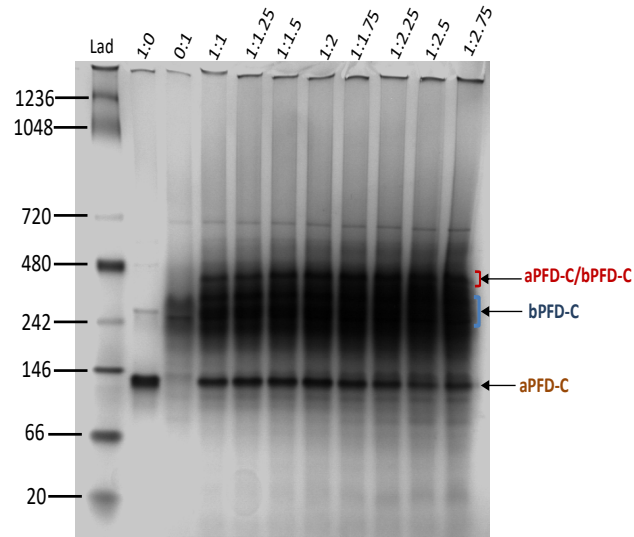
# Minimum Value Proposition (MVP) Continued

## Validation Methods

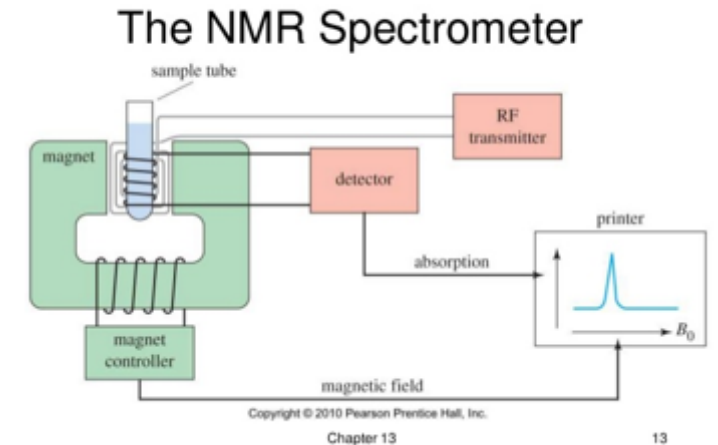
### Förster Resonance Energy Transfer (FRET)

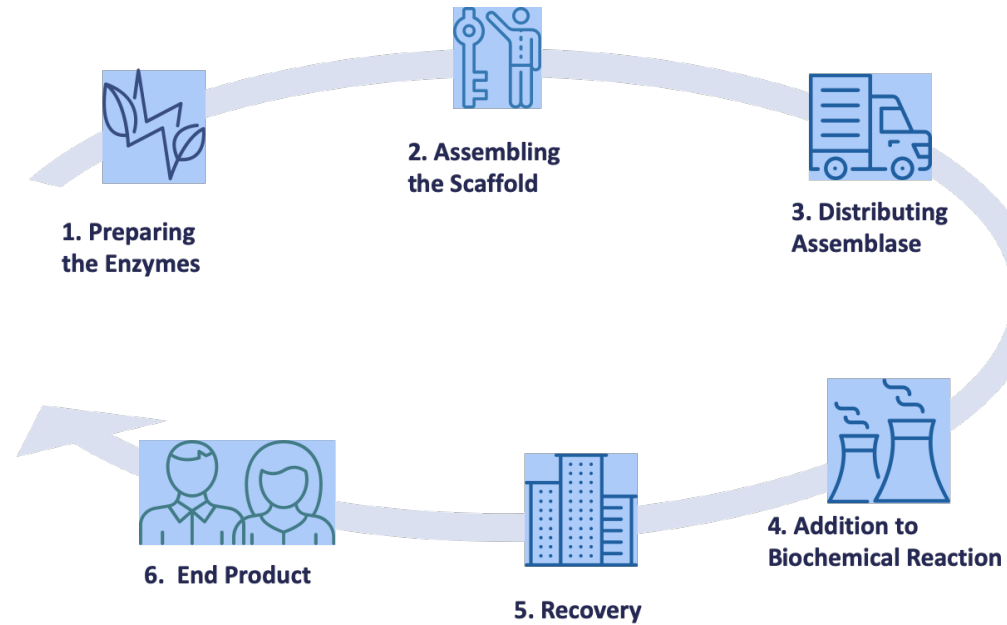


### Native Page



### Nuclear magnetic resonance (NMR)





## Client → Customer

1. The initial step involves client sending either sourcing an enzyme or receiving a sequence of the enzyme from the client which will then be attached to the Assemblase scaffold.
2. The components of Assemblase scaffold will then be produced by the Assemblase team.
3. The different components will then be sent in a biologically compliant storage device by Assemblase's distributor.
4. The user will then add the Assemblase components to their reaction.
5. The Assemblase team will provide information into the recovery process prior to bead immobilisation.
6. The customer can then distribute their product to the end user.

# SWOT Analysis

- Self-Assembling
- Ease of use
- Adaptable
- Thermostable
- Versatile pH
- Natural
- Environmentally friendly

## STRENGTHS

S

- Quantification methods needed
- Third party will be needed for scale up

## WEAKNESSES

W

- Redox market
- Extensive industry
- Enzyme market
- Drug production market

## OPPORTUNITIES

O

- Regulation
- Patenting
- Well established market
- Public Perception

## THREATS

T

# Competitors



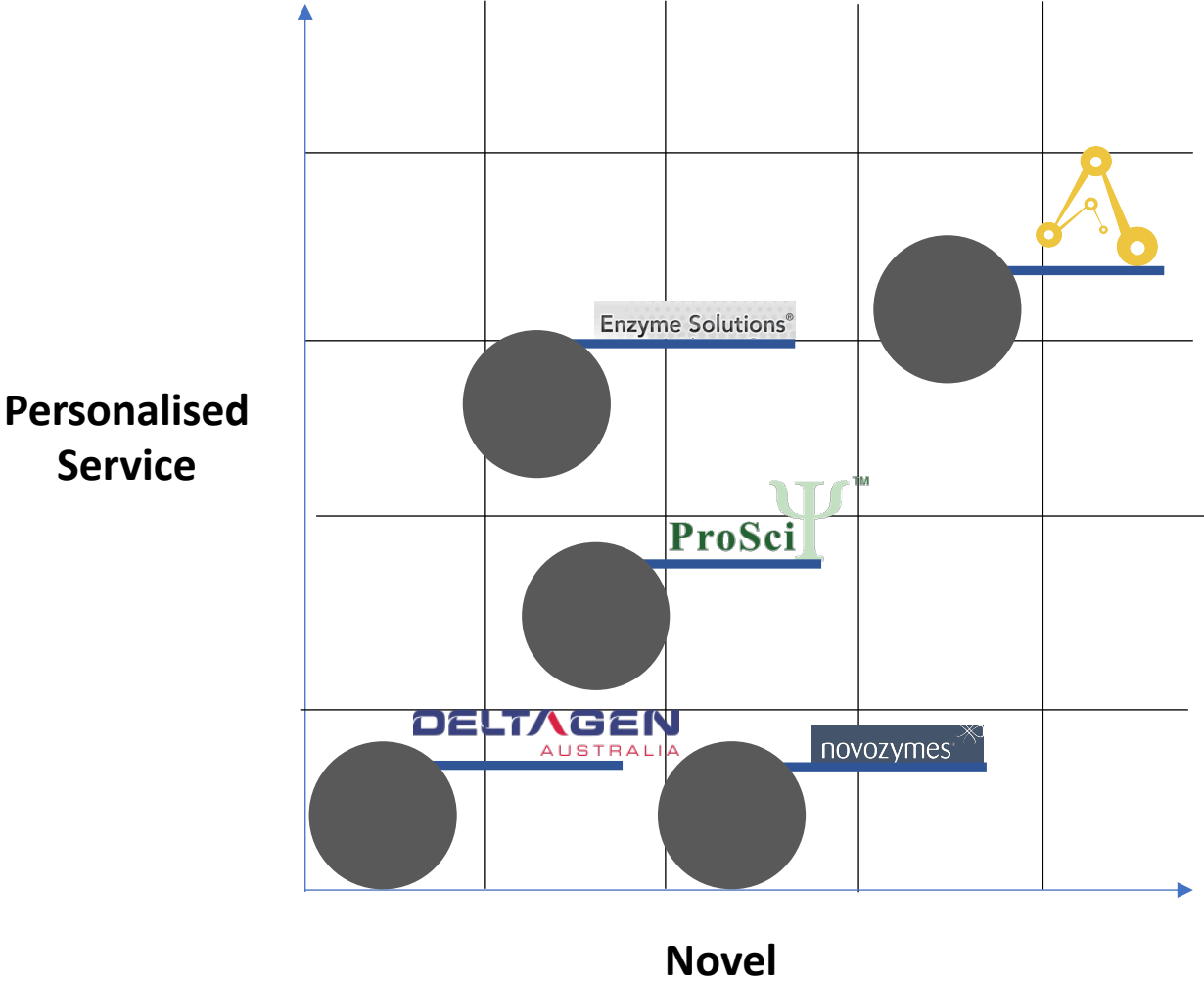
Name	ProSci	Deltagen	Enzyme Solutions	Novozymes
<b>About</b>	A leader in its field, ProSci's priority is to provide the highest quality monoclonal, polyclonal, and single domain antibody services in the industry.	Originally producers of high-grade enzymes for the wine and brewing industry, over the past two decades Deltagen has developed a position as a key supplier of food flavours, colours and processing aids to the food and beverage manufacturers of Australia.	Enzyme Solutions is involved in sales and distribution of Enzymes for many industries including Baking, Brewing, Cleaning, Dairy, Ethanol, Fruit Juice & Olive Oil Production, Grain Processing, Nutraceuticals Paper, Protein Processing, Specialty Enzymes, Textiles, Waste Treatment & Wine.	The company's focus is the research, development and production of industrial enzymes, microorganisms, and biopharmaceutical ingredients.
<b>Founded</b>	1998	1983	1997	1925
<b>Strength</b>	Provides a wide array of services and goods within therapeutics.	Provides both enzyme production as well as distribution and packaging services.	Provides a highly personalise service with education on how to use the enzyme as well as safety requirements and what enzyme is worthwhile.	Provides a wide range of enzymes across many industries leveraging long standing experience.
<b>Weakness</b>	Quite niche in the therapeutics market predominately established in the US.	Only provides products in food and beverage.	An international presence and established market presence have not been ensued to diverse product range.	Currently not employing novel scaffolding methods as well as less tailored service due to size of customer base.



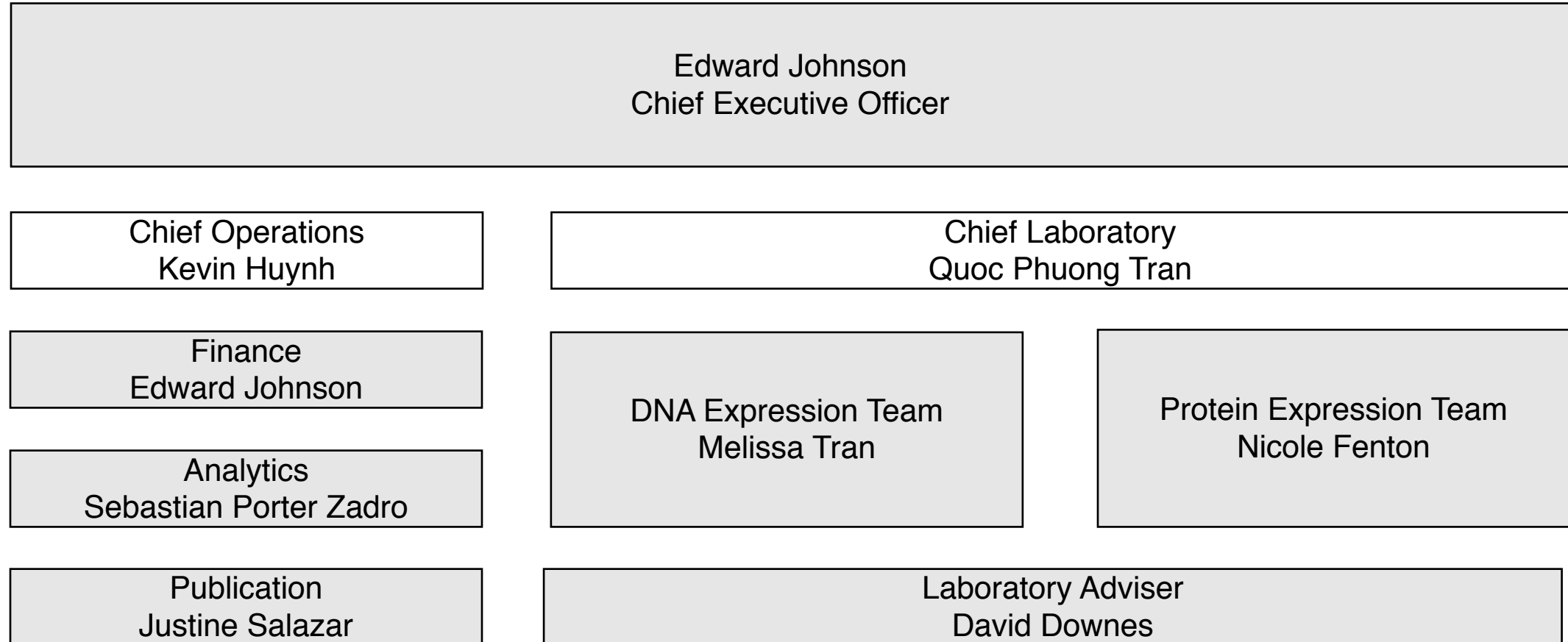
# Competitors Continued

Name	Assemblase	ProSci	Deltagen	Enzyme Solutions	Novozymes
Multi Enzyme	✓	✗	✗	✗	✗
Scaffold Structure	✓	✗	✗	✗	✗
Sustainable	✓	✗	✓	✓	✓
Personalised Service	✓	✗	✗	✓	✗
Consumer Goods	✓	✗	✗	✓	✓
Food and Perishables	✓	✗	✓	✓	✓
Textiles	✓	✗	✗	✓	✓
Waste Treatment	✓	✗	✗	✓	✓

# Competitors Continued



# Organisation Structure





## **Edward Johnson Chief Executive Officer**

Edward has a wealth of experience in corporate advisory having worked with investment bank Allen partners where he has worked on a range of asset manager strategies, as well as on research and business plans for an ASX listed medical imaging company. Prior to Allen Partners Edward was consulting at start up 'Sonder' producing a unique multi-platform marketing strategy.

Currently Edward is working towards a Dual Bachelor's Degree of Commerce and Advanced Science at the University of New South Wales. Additionally, Edward has studied behavioral and corporate finance at the internationally renowned Ludwig Maximillian University, Munich.

# Operations Team

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**Kevin Huynh**  
Chief Operations

Kevin is an experienced entrepreneur - from founding and developing his own start-ups, to working in Inc 5000 start-ups. His background in Information Systems allows him to work effectively in lean and agile work environments. Kevin's skills in laboratory supplemented by a strong knowledge of Enzyme markets position him well at Assemblase.

Currently Kevin is working towards a Dual Bachelor's Degree of Commerce and Advanced Science at the University of New South Wales.



**Sebastian Porter Zadro**  
Analytics

Sebastian is an experienced programmer and bioinformatician, working directly with Professor Paul Curmi. Sebastian has developed skills in organisation and teamwork through his involvement as Vice President of Basketball society. Additionally, his passionate nature has seen him coach multiple basketball skills utilising initiative and leadership skills to develop others.

Currently Sebastian is working towards a Dual Bachelor's Degree of Economics and Advanced Science at the University of New South Wales.



**Justine Salazar**  
Publications

Justine is highly skilled in organisation and administration due to extensive experience as an Events Coordinator at the Biotechnology and Biomolecular Sciences Society. Justine is a keen-learner, eager to build on her academic foundations in Biotechnology and her interests in Software Design. Having worked as a Student Ambassador for Science at UNSW, Justine has grown into a conscientious team-player, who can take initiative and perform tasks reliably.

Currently Justine is working towards a Bachelor Degree of Biotechnology at the University of New South Wales.

# Laboratory Team

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**Quoc Phuong Tran**  
Chief Laboratory

Quoc Phuong Tran is a highly developed researcher having been involved in multiple research projects within Biology and Chemistry. Quoc has provided insight into the origins of life chemistry through his previous work with Prof. Pall Thordarson and more recently Dr. Albert Fahrenbach. Recognized for his efforts, he has been included as a co-author on a paper soon to be submitted for publication in the Fahrenbach group. This experience has led to the procurement of core scientific skills including analytical techniques, most notably, high-performance liquid chromatography (HPLC), liquid chromatography-mass spectrometry (LCMS), and nuclear magnetic resonance (NMR) spectroscopy.

Outside of research, he has developed design skills through the production of a ground-breaking video game which deals with pressing issues in science.

Currently Quoc is working towards a Bachelor's Degree of Advanced Science at the University of New South Wales.



**Melissa Tran**  
DNA Team Expression

As a leader of the DNA cloning team, she has developed core personal skills in leadership, organisation and problem solving, as well as scientific skills including ligation (Gibson Assembly, enzymatic digest), transformations and PCR. Melissa is highly knowledgeable in the field of Synthetic Biology working closely with revered professionals Dr. Dominic Glover and Prof. Christopher Marquis.

Melissa has extensive mentorship skills through her role as a one-on-one and class tutor in HSC Biology and Mathematics. She has further developed her organisational skills, holding a former position in the Fundraising and Formal Committee. Additionally, Melissa has highly developed communication and presentation skills having led talks at the Biotechnology and Biomolecular Sciences Careers Night.

Currently, Melissa is working towards a Bachelor's degree in Advanced Science, with a dual major in Molecular Cell Biology and Psychology at the University of New South Wales.

# Laboratory Team Continued

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**Nicole Fenton**

Protein Expression Team

Nicole has highly developed communication and presentation skills having led talks at illustrious UNSW Synthetic Biology Symposium on the topic of sustainability and cancer therapeutics. Nicole is also a current member of the 2019 UNSW iGEM team where she works in the laboratory to plan, perform and troubleshoot experiments. Additionally, Nicole is well versed in working in a team due to her experience as a senior gymnastic coach. This role has seen her lead and organise group tasks to ensure smooth business operations.

Currently Nicole is working towards a Bachelor's Degree of Advanced Science at the University of New South Wales.



**David Downes**

Laboratory Adviser

David Downes has extensive teamwork and leadership skill holding a formative position on the Medical Science Students Society and Biotechnology and Biomolecular Sciences Society subcommittee. He has developed organisational skill with his position as Events Officer in the external organisation Youth Neuro Australia. Prior to starting his degree, David has spent time gaining extensive experience in the Victor Chang Cardiac Research Institute, the Westmead Children's Hospital, and the Randwick Sydney Children's Hospital. David's commitment to education saw him selected to take part in a Summer Internship at the highly coveted Cardiothoracic Surgical Skills hosted at Stanford University. Building on skills and experience gained through these opportunities, David now acts as a Laboratory member in the UNSW iGEM team.

Currently David is working towards a Bachelor's Degree of Medical Science at the University of New South Wales.

# Assemblase Objectives

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## First Horizon

- Optimising DNA process
- Signing initials clients
- Team development
- Brand recognition

## Second Horizon

- Australian marketplace integration
- Streamline production process
- Build a network of international distributors
- Global expansion



# Six Month Budget Forecasts



Year	2020	2020	2020	2020	2020	2020
Month	January	February	March	April	May	June
<b>Revenue</b>						
Sales	0	0	0	0	0	0
<b>Total</b>	0	0	0	0	0	0
<b>Six Month Revenue</b>	0					
<b>Expenses</b>						
COGS	0	0	0	0	0	0
Research and Development	16,667	16,667	16,667	16,667	16,667	16,667
Wages	0	0	0	0	0	0
Adminstration	1,667	1,667	1,667	1,667	1,667	1,667
Marketing	0	0	0	0	0	1,667
Distribution	0	0	0	0	0	1,667
Rent	1,667	1,667	1,667	1,667	1,667	1,667
Utlilities	750	750	750	750	750	750
Legal	1,000	1,000	1,000	1,000	1,000	1,000
Interest	0	0	0	0	0	0
Travel	0	0	0	0	0	0
Depreciation	0	0	0	0	0	0
Miscellaneous	500	500	500	500	500	500
<b>Total</b>	0	22,251	22,251	22,251	22,251	25,585
<b>Six Month Expense</b>	114,589					
Gross Profit	0	(22,251)	(22,251)	(22,251)	(22,251)	(25,585)
Income Tax	0	0	0	0	0	0
<b>Net Profit</b>	0	(22,251)	(22,251)	(22,251)	(22,251)	(25,585)
<b>Total</b>	(114,589)					

# Eighteen Month Budget Forecast



Year	2020	2020	2020	2020	2021	2021
Quarter	1	2	3	4	1	2
<b>Revenue</b>						
Sales	0	0	148363.28	148363.28	148363.28	148363.28
<b>Total</b>	0	0	148363.28	148363.28	148363.28	148363.28
<b>Total Quaterly Revenue</b>	0	0	148363.28	445,090	445,090	445,090
<b>Expenses</b>						
COGS	0	0	40000	120,000	120,000	120,000
Research and Development	50001	50001	50001	50001	50001	50001
Wages	0	0	0	0	0	0
Adminstration	5001	5001	5001	5001	5001	5001
Marketing	0	1667	5001	5001	0	0
Distribution	0	1667	5001	5001	5001	5001
Rent	5001	5001	5001	5001	5001	5001
Utlilities	2250	2250	2250	2250	2250	2250
Legal	3000	3000	3000	3000	4500	4500
Interest	0	0	0	0	0	0
Travel	0	0	0	0	3000	3000
Depreciation	0	0	0	0	0	0
Miscellaneous	1500	1500	1500	1500	1500	1500
<b>Total Quarterly Expense</b>	66753	70087	116755	196755	196254	196254
Gross Profit	(66,753)	(70,087)	31,608	248,335	248,836	248,836
Income Tax	0	0	12,643	99,334	99,534	99,534
<b>Net Profit</b>	(66,753)	(70,087)	18,965	149,001	149,302	149,302
<b>Total</b>	329,729					

# Five Year Budget Forecast



Year	2020	2021	2022	2023	2024
Month	December	December	December	December	December
<b>Revenue</b>					
Sales	148363.28	231,697	250,194	266,860	300,194
<b>Total</b>	148,363	231,697	3,002,323	3,202,323	3,602,323
<b>Yearly Total</b>	593,453	2,780,364	3,002,328	3,202,320	3,602,328
<b>Expenses</b>					
COGS	40,000	160,000	160,000	160,000	160,000
Research and Development	16,667	16,667	18,334	20,167	22,184
Wages	0	20,000	30,000	20,000	20,000
Adminstration	1,667	1,667	2,500	2,500	2,500
Marketing	1,667	1,667	1,667	1,667	1,667
Distribution	1,667	1,667	3,334	6,668	13,336
Rent	1,667	3,333	3,333	3,333	3,333
Utlilities	750	1,000	1,000	1,000	1,000
Legal	1,000	1,500	5,000	5,000	5,000
Interest	0	0	1,667	1,667	1,667
Travel	0	1,000	1,500	1,500	1,500
Depreciation	0	5,000	15,000	20,000	20,000
Miscellaneous	500	1,500	1,500	1,500	1,500
<b>Total</b>	65,585	215,001	244,835	245,002	253,687
<b>Yearly Total</b>	1,024,110	2,715,028	2,938,020	2,940,024	3,044,244
Gross Profit	(430,657)	65,336	64,308	262,296	558,084
Income Tax	0	26,134	25,723	104,918	223,234
<b>Net Profit</b>	(430,657)	39,202	38,585	157,378	334,850

# Funding Schedule



Round	Who	Amount	Investment to Date	Tranches	Date
Pre-Seed	University, government, accelerator, family and friends	\$100,000	\$100,000	Subordinate	H1 2020
Seed A	Venture Capital Fund	\$2,000,000	\$2,100,000	Senior	H2 2020
Seed B	institutional	\$10,000,000	\$12,100,000	Senior	H1 2022



## Outside Paclitaxel

Expansion into therapeutics and other biochemical reactions.

- Increase market share
- mitigating diversification risks



## Asia Pacific

Upon successful establishment in the Australian market movement within the geographic region will ensue.

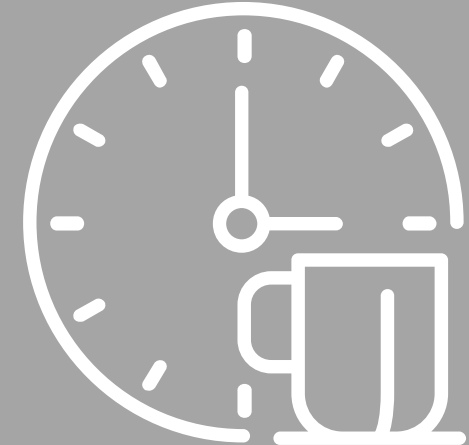
- Increase market share
- Exploit local knowledge and culture



## Acquisitions

Expand to Europe and America using these companies as a special vehicle for sales.

- Mitigate cultural fit risk
- Mitigate regulation risks



These strategies will require an extensive due diligence and market analysis and will only be pursued if there is no strain on domestic business within Australia. The expansion stage will require extensive capital expenditure and will therefore, only be realised once business in Australian has been extensively established.

# Thirty-Six Month Plan



Goals	H1' 20	H2' 20	H1' 21	H2' 21	H1' 22	H2' 22
1. Market Research		Landscape analysis		International Research		
2. Funding	Pre Seed		Seed A		Seed B	
3. Process Optimization		DNA Optimisation		Protein Expression Optimisation		
4. Distributor		Asia Pacific Distributor Signed			European Distributor Signed	North American Distributor Signed
5. Recovery Process	Nanofiltration Process Development		Bede Immobilisation Process Development			
6. Team Development	Marketing Team		Distribution Team			Global Office Team
	Laboratory Team		Finance Team			
7. Entrance Strategy	UNSW partnership		Sign Initial Clients	Marketing Strategy		
	Accelerator Program	Initial Marketing Strategy		Sign Interstate Clients		International Launch

# Thank You

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## Contact Details

**Edward Johnson**

Assemblase Pty Ltd

CEO

UNSW.iGEM@gmail.com



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