

APPENDIX 1

MATE GROUP REPORT

BY

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Contents

List of Figures	vii
Chapter 1 Introduction	1
1.1 Pre Startup	1
1.2 Project options	1
1.2.1 Nacre	1
1.2.2 Auti	2
1.2.3 Sound concepts:	2
1.2.4 Dosimeter:	2
1.3 Team Formation: NacreTech	2
1.3.1 Ish Jimale	3
1.3.2 Liam Harker	3
1.3.3 Ian Walsh	3
1.3.4 Naomi First	3
1.3.5 Oliver Townend	4
Chapter 2 NacreTech	5
2.1 Project Background	5
2.1.1 Bone Augmentation	5
2.2 Team Roles	6
2.3 Market Research	6
2.3.1 Primary Research	6
2.3.2 Secondary Research	8
2.4 Results	9
2.4.1 Bovine	9

2.4.2	Equine	9
2.4.3	Canine and Feline	9
2.4.4	Key findings	10
2.5	Pivot from Veterinary Dentistry to Veterinary Orthopaedics	11
2.6	Pearl Seeding	11
2.7	Summary: Lessons Learned	11
2.8	Conclusion of NacreTech	12
Chapter 3	Sound Concepts	15
3.1	Background	15
3.1.1	Pod	15
3.1.2	TriForm	16
3.1.3	Return on Science	16
3.2	Objectives	17
3.3	Refined Team Roles	17
3.3.1	Ish Jimale	17
3.3.2	Liam Harker	18
3.3.3	Ian Walsh	18
3.3.4	Oliver Townend	18
3.4	Sound Concepts for Schools	18
3.4.1	Market Validation	18
3.4.2	Summary of the School Market	19
3.4.3	Pivot	19
3.5	Sound Concepts for Offices	20
3.5.1	Market Validation	20
3.5.2	Pelorus Architecture	21
3.5.3	TwentyTwo Property Advisors	22

Introduction

3.5.4	Summary of the office market	23
3.5.5	Pivot	23
3.6	Sound Concepts: Hyve.....	24
3.6.1	Return on Science	25
3.6.2	Trade Me.....	25
3.7	Supply Chain and Manufacturing Investigation	26
3.7.1	Calvert Plastics	26
3.7.2	Alternative Production.....	27
3.7.3	Anderson Design Meeting	28
3.8	Summary: Lessons Learned.....	28
Chapter 4	Hyv	31
4.1	Targeted market research: Open plan offices	31
4.1.1	Results.....	32
4.2	Conceptualisation.....	32
4.2.1	Refining the concept.....	33
4.2.2	Creative HQ.....	34
4.3	Prototyping.....	34
4.3.1	DoubleEco cardboard panels	35
4.3.2	Bending cardboard.....	35
4.3.3	Connections	37
4.3.4	Coverings and finishes	38
4.4	Testing and Feedback.....	38
4.4.1	Design School Workshop	39
4.4.2	Summary	40
4.5	Promotion and Branding.....	41
4.6	Summary: Lessons Learned.....	42

Chapter 5	Hyv2.0	43
5.1	Necessary next steps	43
5.2	Development Plan	43
5.2.1	The Lightning Lab MVP	43
5.2.2	Tertiary Education Commission.....	44
5.3	Manufacture / Licensing potential	44
5.3.1	Formway Design Connection.....	45
5.4	Texus Fibres Collaboration	45
5.4.1	Tech Jumpstart Summer Project	45
5.5	Overall Viability.....	46
Chapter 6	Conclusions.....	47
6.1	Ish - Overall Lesson Learned	47
6.2	Liam – Overall Lesson Learned	47
6.3	Ian – Overall Lesson Learned	47
6.4	Oliver – Overall Lesson Learned	48
References	49

List of Figures

Figure 1: Pod.....	15
Figure 2: TriForm	16
Figure 3: Hyve Partitioning	24
Figure 4: Hyv Screens	24
Figure 5:Hyv early concept	33
Figure 6: Bending cardboard and the finished panel	36
Figure 7: Hyv1.0 MVP	37
Figure 8: Installing the HYV1.0 prototype	39
Figure 9: HYV Brochure showing branding.....	42

Chapter 1 Introduction

The purpose of this document is to provide background information to support the individual Masters of Advanced Technology Enterprise (MATE) theses of Ish Jimale, Liam Harker, Ian Walsh and Oliver Townend (referred to as “the team” and later “Hyv”). It is a chronological record of the team’s work in 2013 on the NacreTech, Sound Concepts and Hyv projects and summarizes the key lessons learnt in order to provide context to the individual submissions. Team members contributed to different chapters based on their particular experience.

1.1 Pre Startup

The 2013 Masters of Advanced Technology Enterprise programme brought together graduate students from a broad range of disciplines with the goal of experiential learning through the development of commercial entities with roots in ongoing VUW research. The initial four week ATEN501 programme exposed the students to experts from both academia and business, and theoretical models, in particular the Lean Startup (Ries 2011) and Osterwalder and Pigneur’s Business model Canvas (2010).

1.2 Project options

Following this introductory stage, the MATE participants were tasked with assessing four potential projects and forming teams to begin commercialisation. Research projects that have shown latent potential for commercialisation were pitched by “project champions”, typically university academics leading ongoing research projects, who presented background information as well as an initial strategy for commercialisation.

1.2.1 Nacre

Professor Kate McGrath, School of Chemical and Physical Sciences, VUW

Professor McGrath’s research has resulted in a patented method for the production of synthetic nacre (“mother of pearl”). This biocompatible material has promising applications in the biomedical field as an alternative to current synthetic bone grafting

materials. Use as a void filling material in veterinary dentistry was proposed as a first market entry point from which to ultimately develop human orthopaedic applications. (McGrath, 2013)

1.2.2 Auti

Helen Andreae, VUW School of Design

Auti is a robotic toy designed to respond to and reinforce positive behaviours in children with autism. Auti was pitched to MATE as a working prototype that simulated the responsive functions of the device through remote control. Further research into the effectiveness of this type of treatment was being undertaken by the Helen Andreae as part of an unrelated masters program. (Andreae, 2013)

1.2.3 Sound concepts:

Natasha Perkins, Senior Lecturer, School of Architecture, VUW

Sound Concepts aims to develop and test forms that will help reduce reverberation times in interior environments. The commercialisation proposal centred on testing the viability of two existing prototypes: Pod, a freestanding breakout space for primary school classrooms, and TriForm, a hanging acoustic baffle system. Sound Concepts was further developed than the other potential projects and the prototypes had already undergone performance testing in school environments. (Perkins, 2013)

1.2.4 Dosimeter:

Dr. Grant Williams, Professorial Research Fellow, School of Chemical and Physical Sciences, VUW

Dosimeters are used to monitor and detect radiation doses and dose rates. The technology presented to the team focused on a novel method of detection and measurement using optically stimulated luminescence. The project champion had built a prototype and was interested in connecting with customers to test the effectiveness of the device in a real-world application. (Williams, 2013)

1.3 Team Formation: NacreTech

Having assessed the potential of the projects, with consideration given to the students' applicable skillsets, Jimale, Harker, Walsh, First and Townend formed a team around a common interest in the Nacre and Dosimeter projects. Professor McGrath's Nacre research (under the team moniker NacreTech) was ultimately chosen due to its clear development path and potential for wide-ranging commercial application.

1.3.1 Ish Jimale

Ish has a background in both business and science, having graduated with double degree in biotechnology, management and international business from Victoria University. He has been working for the Ministry for Primary Industries in an information management role.

Ish's attention focused on the customer development process, including primary market research and building relationships with potential customers.

1.3.2 Liam Harker

Liam has a background in science with a strong focus on biotechnology. In 2012 he completed a postgraduate diploma in bioscience enterprise at Auckland University graduating with merit. His previous experience in early stage technology validation has helped him develop skills in intellectual property and market validation and market research.

Liam's MATE focus has been project management and market research.

1.3.3 Ian Walsh

Ian has a business background with a focus on communications and customer relations. Ian is a customer support representative and strategy intern at Trade Me Ltd as well as being involved in the start-up community in Wellington, including Start-up Weekend and the Lightning Lab, New Zealand's first business accelerator. He is particularly interested in customer development, primary market research, as well as marketing activities including brand development.

1.3.4 Naomi First

Introduction

Naomi has a background in business and consulting, specifically strategy, planning and organizational design work for public sector clients, as well as experience in management, marketing and business development.

1.3.5 Oliver Townend

Oliver brings experience in industrial design, construction and small business operation. Following his design degree at Massey University Oliver moved into residential building to gain detailed insight into a vital industry, with the intent to apply his design skills at a later stage. In the MATE programme Oliver's focus is project management and product development.

Chapter 2 NacreTech

2.1 Project Background

The first commercial application proposed for synthetic nacre is an injectable dental gel for veterinary use, suitable for filling the void created by tooth extraction. Finely ground nacre powder would be loaded into a biocompatible gelling agent with appropriate setting characteristics to create an integrated gel that would harden rapidly in oral applications. The hypothesis is that the nacre gel will protect the extraction site, thereby preventing infection and reducing healing time. Over time the gel will be resorbed and the osteoconductive properties of nacre will allow the growth of new bone and maintain structural integrity of the jaw.

2.1.1 Bone Augmentation

Filling the void left by tooth extraction is an example of the use of bone augmentation (commonly referred to as bone grafting). In humans, this procedure is relatively common in order to repair the jaw bone and provide support for prosthetics (false teeth). Bone augmentation procedures are relatively common in both human and veterinary orthopaedic surgery, with uses ranging from dental implants to joint fusions. The majority of these procedures use grafting material taken from a healthy site within the patient (autograft), commonly the iliac crest. This requires additional invasive surgery and increases patient healing times. Another option is to use material from a donor of the same species (allograft) which is heavily processed to remove all organic material and prevent rejection.

A bone graft substitute can augment or even replace the need for an autograft, reducing the negative effects on the patient. Synthetic substitutes have been on the market for approximately twenty years, however to date no synthetic material has achieved all of the attributes of an autograft.

Ideally, a bone graft substitute will achieve:

- Biocompatibility – the ability to be in contact with living tissue without an adverse effect

- Bioresorption – the material will break down in the body and not require removal
- Osteoconduction – the material acts as a scaffold around which new bone can form
- Osteoinduction – the material actively stimulates the growth of new bone tissue
- A similar physical structure to bone

While most current substitutes achieve osteoconductivity, very few achieve osteoinductivity. It is this quality that synthetic nacre must strive for.

The market for bone grafting materials is large at \$1.9 billion and is forecast to continue growing for the next 25 years in line with ageing populations. Performance is valued more highly than cost in bone grafting materials, particularly in the human market where the material itself represents only a small percentage of the overall cost of procedure.

2.2 Team Roles

At this early point the team had yet to split into specialised roles and members were focussed on a sole task: the validation of the potential of synthetic nacre-based products in veterinary dentistry.

2.3 Market Research

This validation required a combination of primary and secondary research. Using the Lean Startup methodology the team set about gaining an understanding of the veterinary dental market.

2.3.1 Primary Research

Following Steve Blank's "get out of the building" technique (2007), the team sought direct interaction with the proposed market. Through conversations with specialist veterinarians we set about to establish the "pain" or level of need for synthetic fillers in veterinary dentistry.

WSAVA Conference

On Friday 8 March 2013 Oliver Townend attended the WSAVA (World Small Animal Veterinary Association) Annual Congress in Auckland, specifically to gain an insight into the global veterinary industry and make contact with specialists in veterinary dentistry and orthopaedics.

Generally veterinarians, both generalists and specialists, understood the NacreTech concept. It quickly became apparent that while veterinary dentistry is not a large market, there is strong interest in effective bone augmentation products for use in orthopaedic surgery. At present bone augmentation in animals is not common since current products are ineffective and provide no measurable benefit over the lifespan of the animal.

Key Points:

- Not one of these specialists immediately identified major flaws in what we were proposing, although the introduction to the technology was brief, and based on some early predictions.
- While New Zealand veterinarians tend to be generalists, internationally animal dentistry is a growing specialisation.
- There is growing recognition that dental health has a significant effect on overall health, and that while animals may not display obvious symptoms serious issues may be developing.
- A nacre-based bone augmentation product **MUST** have high osteoconductivity and **MUST** be absorbed by native bone cells fairly quickly in order to provide a significant benefit over existing products. It cannot be inert filler.
- Our product would need to be simple to use and inexpensive, allowing us to market it as having significant benefits for limited extra effort. This will enable the product to gain traction in a market that is currently happy without it.

Massey University

On the ninth of April 2013 the team travelled to Palmerston North to meet with veterinarians at Massey University. We were able to speak with two specialists with experience in bone augmentation:

- Dr Andrew Worth: Senior Lecturer in Small Animal Surgery (Orthopaedics)
- Dr Angus Fechny: Companion Animal Veterinarian (Dentistry)

Both expressed concerns over the lack of need for void fillers in veterinary dentistry, as they very rarely use these types of products. Generally if they are forced to remove a tooth from an animal it will heal naturally without the use of any additional products.

Andrew and Angus shared insights into the current use of bone graft substitutes, a market which they felt was saturated by products that did not deliver on their promised performance. Most of the industry uses autografts (tissue from the patient itself) or allografts (tissue from a donor of the same species) which have significant advantages over synthetic products - specifically the osteoinductive properties of natural bone which current synthetics cannot deliver.

Estendart

While in Palmerston North we took the opportunity to meet with Dr Alan Alexander from Estendart, a company operating within the Massey University Research Park which specialises in animal trials for development of medical products. The purpose of this meeting was to gain an understanding of the in-vivo (live animal) process, particularly to inform the in-vitro (laboratory) tests required initially. This process would ultimately test the safety of synthetic nacre as a bone grafting substitute.

The result of the meeting was a focus on in-vitro safety trials for synthetic nacre to prove that the material was non-toxic to living cells. Only after achieving successful results could we begin to look at setting up in-vivo tests in animals.

Phone interviews:

In February and March 2013, the team contacted eleven veterinary professionals within New Zealand including five specialist veterinary dentists.

2.3.2 Secondary Research

Most of the quantitative information gathered concerning market size, competitive products and market trends came from secondary research via industry reports and online databases, which provided an insight into the current state of the veterinary

dentistry industry. The team was quickly able to determine that multiple competitors existed and was able to compare their products with nacre. It was established that existing void fillers belonged to a larger market of products called “bone graft substitutes” and had been relabelled or modified to be used in veterinary dentistry rather than developed specifically for this application.

2.4 Results

2.4.1 Bovine

Our research determined that this is not a viable market as dental health is not an issue in cows. Chewing cud effectively cleans the teeth and gums and prevents tooth decay. Cow’s teeth continue to grow and to be ground down throughout the life of the animal. Tooth extraction is rare and when it does occur the site heals without issue.

2.4.2 Equine

Horses have a very different dental anatomy to humans. As with cows, the teeth continue to grow and are constantly ground down by mastication. When a tooth is removed the surrounding teeth will move to fill the space created and the forces involved are tremendous. According to Elizabeth Thompson from Blue Mist Equine Dentistry, if a material was implanted into the jaw it would need to have the strength of titanium to withstand the pressure of the other teeth. Infection post extraction is not a problem. Horses tend to easily react strongly to foreign bodies (for example calcium carbonate) in the mouth, and their introduction may lead to additional complications.

2.4.3 Canine and Feline

Dogs and cats have dental anatomies much closer to those of humans. Companion animal dentistry is a relatively new but growing field as pet owners become more aware of, and are prepared to spend more on their animal’s oral health. There have been marketing campaigns from both veterinarians and producers of dental health products to promote dental health awareness amongst pet owners.

In light of this information, the companion animal market was selected as the most suitable application for nacre as a dental filler.

Further exploration into this market revealed that while dental fillers were indeed used in the companion animal market, the number of veterinary dentists who use dental fillers following tooth extractions is extremely small. In fact, in most cases the resulting cavity was left to heal by itself without complication. Of the eleven veterinary professionals we spoke with, only two used dental fillers and they did so only when complications such as severe infection or trauma to the jaw bone were involved.

2.4.4 Key findings

Our research into the veterinary dental market has indicated that

- Dentistry in livestock (equine and bovine) is a small market. On those occasions where tooth extractions do occur there is no requirement for a filler or bone augmentation product.
- Dentistry for companion animals internationally is a developing market that is expected to continue to grow. However generalist veterinarians, who perform the majority of dental work on companion pets, rarely use a socket filler or bone grafting material following tooth extraction as sites usually heal well without the use of any specialised materials.
- The use of dental bone augmenting materials tends to be restricted to 'premium' veterinary practices that specialise in dentistry, of which there are few. Even in these practices void filling is often considered unnecessary as the introduction of a foreign body may exacerbate the condition.
- There is an abundance of products on the market that can be used for void filling.
- There are some oral conditions in animals where bone grafting material are more commonly used by the surgeons e.g. fracture repair and oral-nasal fistula. In these cases an integrated gel is likely to hinder the repair process.
- An ideal dental bone grafting material requires the following characteristics:
 - An osteoconductive matrix or scaffolding to support bone growth
 - Osteoinductive factors that stimulate and recruit host mesenchymal cells

- Osteogenic cells that survive transplantation with the potential to differentiate and stimulate the various phases of bone formation
- Structural integrity to ensure the graft won't collapse or be displaced

2.5 Pivot from Veterinary Dentistry to Veterinary Orthopaedics

In response to these findings, the team decided that veterinary dentistry is not a sufficiently large market for continued focus. Veterinary orthopaedic surgery offered a much better market entry point through the use of synthetic nacre as a bone graft substitute.

2.6 Pearl Seeding

As an alternative to medical applications, the team briefly explored an application of nacre to seed pearls in oysters. Currently, pearls are artificially created en masse by placing a “seed” inside of the shell of an oyster. The oyster then coats the seed in nacre to create a pearl over a period of time. Generally these seeds are pieces of mussel shell that are shaped into spheres. Larger implants are harder to come by as they require the use of mature shellfish with thick shells. These are not abundant given current practice of harvesting shellfish while they are still comparatively young. It was hypothesised that synthetic nacre could be used to create these larger implants.

Exploration of the market revealed that the pearl industry has recently undergone a dramatic shift that has reduced the overall production of traditional oyster grown pearls. Chinese pearl farms have developed a method of growing multiple pearls within fresh water mussels, greatly reducing the cost of producing high grade pearls and dramatically affecting the demand for seed material.

In light of this information it was clear that the solution offered by nacre was in the process of being phased out and would unlikely be needed in five years. The team made the decision to suspend research into pearl seeding at this point.

2.7 Summary: Lessons Learned

- Exploring customer need can often yield new information, leading to changes in product requirements and specifications. Be prepared to change.

- Effective communication between all those involved in a project like this is extremely important. Everyone should be involved and on the same page.

2.8 Conclusion of NacreTech

The following is an excerpt from the NacreTech final report, presented to Professor Kate McGrath on the 6th of May, 2013.

There is resounding evidence that current methods of treatment following a tooth extraction within the veterinary dental market are deemed acceptable. If and when fillers are required there are adequate products already in the market with features that include biocompatibility and osteoconductivity.

The wider field of synthetic bone grafting does appear to have some potential. There is strong evidence of a yet unmet need for a synthetic product that has all of the qualities of an autograft. There is a significant international research and development effort focused on developing this 'gold standard' product.

The ability of naturally occurring nacre to support the regeneration of bone has been demonstrated in published research trials on animals. If it can be shown that these properties can translate to synthetic nacre this material could be a promising candidate for use in bone grafts. This has applications for surgery on both humans and animals.

To enter the bone graft market, synthetic nacre would need to prove that it matched the properties of leading synthetic bone grafting alternatives. Once these properties have been verified, product development would be required to ensure the development of a viable product in forms that would meet market need, while being cost effective. Even with the right product, entry into this very crowded market would not be easy without the right partners and relationships in place.

Based on our understanding of the materials research to date, NacreTech do not believe that the testing necessary to prove synthetic nacre's properties could be completed within the timeframe of the 2013 MATE programme. The

NacreTech team has therefore concluded that product development at this stage is premature.

The NacreTech team recommends that work is not continued on the specific application of synthetic nacre as gel-based dental filler due to the low use of comparable products. Also, that testing is undertaken to assess the following properties of synthetic nacre before product development commences:

- biocompatibility
- level and speed of bioresorption
- level of osteoconductivity
- level of osteoinductivity
- structural integrity and strength.

Once testing has confirmed that synthetic nacre has the required properties, either Viclink or a future MATE team pursues product development and commercialisation.

Based on these conclusions the NacreTech team ceased work on the project, presented our report to the project champion and handed responsibility back to the researchers. Synthetic nacre shows strong promise for application to veterinary orthopaedics if it can be shown to meet the needs of the bone augmentation market. It is our hope that the technology will be picked up at a later stage for continued development.

At the completion of the NacreTech project, Naomi First made the decision to leave the MATE course for personal reasons, reducing the team to four.

Chapter 3 Sound Concepts

3.1 Background

School of Architecture Senior Lecturer Natasha Perkins has developed a series of products designed to reduce reverberation times in interior environments.

Technical research was undertaken during 2010-12 to develop and produce prototypes of a freestanding children's breakout space (POD) and an acoustic baffle system (TriForm) for pilot installation and testing in primary schools and community halls.

Companies that would use the products include architects and specifiers for commercial fit-out, schools, and council halls to upgrade acoustic performance of interior environments – this could be on a national and international level. Previous offshore market research with architects has shown a need for 3D acoustic forms within commercial and learning spaces.

3.1.1 Pod

Pod was designed as a freestanding acoustic product for use in primary schools. It is made up of hexagonal panels that form a structure for children to occupy and play in. The panels themselves are formed from a polyester acoustic material produced by Autex Industries.



FIGURE 1: POD

Sound Concepts

The product was designed to act as a passive absorber of sound within a classroom environment while providing a calming, quiet space to aid children, in particular those with central auditory processing disorder or other hearing impairments.

3.1.2 TriForm

TriForm is a series of individual quadratic components, joined together to form a geometric acoustic baffle. A system of these baffles can be incorporated into the ceiling space of classrooms and public spaces.



FIGURE 2: TRIFORM

With its suspension flexibility, the intention of TriForm was to be used in large quantities to absorb a range of sound frequencies and reduce reverberation in interior spaces.

3.1.3 Return on Science

Prior to the MATE team's involvement, start-up consultant Michael Elwood-Smith was contracted by VicLink to carry out a market scan on Sound Concepts to identify its commercial potential. He presented his findings to the Return on Science investment committee, a national research commercialisation programme that works with technology incubators to bring new research to market from universities, research institutions and private companies. His findings are summarised below:

- A growing global market is identified for products that improve room acoustics and are aesthetically pleasing.

- The combination of acoustic performance, aesthetic design and eco-friendly products is of interest to potential customers and users, and fits with market trends.
- There is potential added-value for a software product/service to support the application of products within rooms, which is likely to be used by architects.
- The best and first product/market fit and therefore the scalable business model is not yet clear.
- Commercialising this work would best suit a start-up company where the first objective is to discover the true market potential, product fit and scalable business model.
- Both current forms appear to have potential market fit. However, further work is required to define the initial target markets and the appropriate product to suit that market.

3.2 Objectives

The MATE team was expected to continue this assessment of the viability of Pod and TriForm in the school market. We were also given the opportunity to explore other markets to see if these products could be of benefit to a paying customer.

As a team we sought to broaden our exploration of customer needs rather than trying to fit a product into an existing market. We sought to better understand whether there is a need for acoustic products in various markets, how much of a pain point exists, find out how these prospective customers were currently addressing the issue and how much they were willing to pay to solve it. This broader approach saw the team undertake validation activities across multiple markets, as well as speaking with architects, designers and acoustic consultants.

3.3 Refined Team Roles

3.3.1 Ish Jimale

Ish concentrated on validating the market for the Sound Concepts products. The main objective was to collect market data that will be used to drive decision making processes.

3.3.2 Liam Harker

Liam tested assumptions about the products appeal and performance in the market by engaging customers and industry experts in phone and face-to-face interviews.

3.3.3 Ian Walsh

Ian focused on market validation efforts. He was responsible for contacting school principals and property managers around the country.

3.3.4 Oliver Townend

Oliver investigated the supply chain and manufacturing processes of the current products and explored potential alternatives.

3.4 Sound Concepts for Schools

The primary goal of this stage was to assess the commercial potential of Pod and TriForm's use in school classrooms, as proposed by the research team.

3.4.1 Market Validation

As an initial scan of the educational market, we canvassed school property managers across the country, in primary, immediate, special needs and secondary schools across the state and private spectrum. We made phone calls to managers asking them to express their problem, rather than trying to sell them our solution. We asked the following questions.

- Do you take acoustic performance and noise control into consideration when fitting out the interior of a classroom?
- Have teachers expressed concern about the level of noise in classrooms?
- What is your main motivation for improving acoustics in a classroom?
- How do you currently address this issue?
- What types of products do you use?

These questions allowed the customer to elaborate on needs, problems and issues that they deal with daily, and gave structure to the conversation. After interviewing twenty seven decision makers in schools, patterns began to emerge. Here is a sample of the feedback we received.

- Acoustics are taken into consideration when fitting out classrooms, although this is usually left up to the architect.
- Some teachers have expressed concern over interior acoustics and excessive noise but these issues are not considered a major problem on the whole.
- Current solutions include soft furnishings, acoustic ceiling tiles, carpet, pin boards.
- One respondent had recently installed Autex acoustic wall coverings, stating that it was “*very expensive*” but the “*best money ever spent!*”
- Amplification (speakers and audio equipment) are used with varying success.
- For many schools, interior acoustics are a “nice to have” but with limited budgets, priority must be given to seismic strengthening and other costs.
- There is growing awareness of the needs of children with hearing problems.
- Noise generally only given serious consideration in “special use” spaces: workshops, music rooms etc.

3.4.2 Summary of the School Market

- The acoustic environment of a classroom is a concern and a need that property managers consider when refurbishing.
- Private schools (primary and secondary) more often have the funds to improve the acoustic environments of their classrooms. However, this budget is usually spent on existing solutions such as acoustic ceiling tiles and wall linings.
- State Schools (primary and secondary) do not have large enough budgets to invest in acoustic products as they have other concerns.
- Although a need has been identified, there are dominant competitors in this space. In particular, Autex in the New Zealand market.

3.4.3 Pivot

Our research determined that the market for specialised acoustic products in schools is small and often restricted by budget constraints. The team began exploring alternative markets for Sound Concepts designs, identifying commercial office spaces as having significant potential. An increasing number of organisations are switching from traditional offices to more open plan, decentralised work environments. This can

be to encourage collaboration, promote good work habits and to save costs. Acoustics in this environment are consistently ranked in the top three “most important considerations” by architects when fitting out new office spaces. Many organisations introducing open plan offices have substantially larger budgets for acoustic issues than schools. In light of the team’s preliminary findings, we decided to focus on open plan offices as a market entry point for Sound Concepts.

3.5 Sound Concepts for Offices

The team began exploring this direction with the goal of identifying the key requirements of office spaces, in order to inform the development of further Sound Concepts designs.

3.5.1 Market Validation

Preliminary investigations into the commercial office market identified that workers in open plan offices consider noise to be a substantial problem. We spoke to office managers on the phone to ascertain the importance of reducing sound reverberation and to learn how they were currently addressing that issue. We discovered that office managers do actively consider the acoustic environment in the office and use a range of acoustic products to manage it.

Key findings:

- Significant acoustic consideration is given to meeting rooms, quiet spaces and video conference rooms, motivated by the need for client confidentiality and general staff productivity
- Acoustics accounts for roughly 5% of fit-out costs
- Current solutions include soft furnishings, perforated wooden wall panels, in-wall insulation, ceiling tiles, acoustic blankets.
- Acoustic engineers are sometimes contracted at significant cost to assess the requirements of spaces
- *“It all comes down to one person, the marketing guy next to the accounts guy.”*
Nigel Lloyd, Acoustic Consultant, Acousafe Consulting & Engineering Ltd

The following are case studies which provided key information on the feasibility of Sound Concepts in office spaces.

3.5.2 Pelorus Architecture

We interviewed Don Taylor on August 30 2013. Don is a ‘friendly contact’ introduced to us by Professor Sally Davenport, one of the MATE supervisors. Up to this point, most of the interviews with commercial architects were conducted by telephone. We now had an opportunity to speak face to face, which we found is the best way to get essential information in order to steer the team in a particular direction.

One of the key insights from this meeting was the confirmation that there is a need for customisable solutions that can create semi-private spaces within offices. Fuelled by the growing number of organisations switching to open plan offices, architects face the challenge of creating a range of work environments within a single space. In particular Don articulated the challenge he faces when trying to create semi-private spaces where employees can take phone calls, collaborate and have discussions without disrupting colleagues.

Don’s current arsenal for the creation of “breakout spaces” consists of either constructing bespoke solutions or specifying soft furniture. Depending on an organisation’s budget, bespoke jobs can range from low cost meeting spaces constructed from readily available materials, all the way to “showpiece” jobs that can cost in excess of \$30,000.00. The approach is limited by several factors:

- The lead time to get them built
- Requirements for sprinklers, lighting and air flow
- Difficulties in making changes to the structures once installed
- Added cost of restoring the premises to its original state at the end of the lease.

When quizzed about an ideal solution, Don spoke about the need for a product that incorporates an element of standardisation, which he can then use with his design expertise to add a customised dimension. He envisioned an easily assembled frame to which he can apply various materials, resulting in customised partitions. The ability to

use different materials was particularly appealing to him given the distinctive needs of different organisations. For example, organisations with limited budgets are more likely to cut costs by opting for simple, non-acoustic materials.

3.5.3 TwentyTwo Property Advisors

Over the course of the Sound Concepts project we spoke to several property advisors. These organisations often play a key role in all things “property”. For instance, when an organisation is moving into new premises or renegotiating lease terms, contacting a property advisory firm is often the first step. Sitting on top of the property “food chain”, these companies can negotiate lease terms and building modifications. Importantly for us, they have a wide range of industry contacts including with architects, designers, project managers and contractors. In essence they oversee the commercial office fit out process and bring together different parties as required.

Duncan Mitchell from Wellington company TwentyTwo Property Ltd is someone with whom the team built a close relationship with over the course of the Sound Concepts project. Duncan has shown real interest from the beginning of the project, partly because his firm conducts research into improving work environments. Duncan provided us with well-balanced feedback that took into account the various aspects his company must consider. In helping us validate the feedback from Pelorus Architecture and others, Duncan alerted us to the following key considerations:

- There is often a ‘disconnect’ between what architects perceive as an appropriate solution and the core requirements of the end users. This leads to too many custom solutions not being used as intended. Duncan recalls one incident where a firm invested substantial amount of money in a bespoke “creative space”; only for it to end up being used for people to eat lunch.
- He stressed that there is a need for a more customisable, reconfigurable way to meet changing business needs given the turbulent climate that most industries are currently experiencing. Further, any potential solution must be affordable.
- There are a few solutions already in the market, but most are very expensive and are thus not accessible to many organisations.

- Furniture solutions such as high-backed couches have their limitations, particularly in the lack of customisation. The cost per unit (approx \$7000) is not outrageous but the average organisation would need 3-5 units, which quickly escalates the total investment.
- Don advised us that the best people to talk to are the end users and property managers.
- He offered to trial prototypes with some of his clients.

3.5.4 Summary of the office market

We had validated our assumption that commercial office environments require acoustic treatment, however we had not validated whether Sound Concepts products would satisfy the customers' requirements.

The findings above demonstrate the need for acoustic products in certain areas such as meeting rooms and waiting areas. As there is significant competition in the field of acoustic ceiling tiles, the team decided to focus on customisable, versatile products for creating meeting spaces at *ground level* in open plan offices.

It was at this point we explored the potential for an adaptation of the Sound Concepts prototypes, to see whether it could be used to produce a meeting room shell or "room within a room" with reduced sound reverberation. This product would also act as a visual barrier, adding to the aesthetics of the office. We refined the focus of our research to the use of "breakout" spaces or semi-private meeting areas, which allow office workers to get away from their desks to have informal meetings.

3.5.5 Pivot

We understood the greatest need was to develop meeting spaces or "rooms within a room", but that the acoustic capability of the product could not be the defining value of our proposition to customers.

Having focussed on 'design' and 'aesthetic appeal' during the market validation, we now shifted our focus to a 'design-led acoustic solution' rather than simply acoustics. This strengthened our core aim of providing an attractive, productive space that would have some noise dampening qualities.

3.6 Sound Concepts: Hyve

Based loosely on the formed polyester structure of the Pod and TriForm concepts, and taking into account the market data we had gathered, we developed a series of designs to demonstrate a new concept: we sought to develop an aesthetically appealing breakout solution for office spaces; further, we sought to develop a product that was informed by customer feedback. We called this product Hyve, pronounced hive.

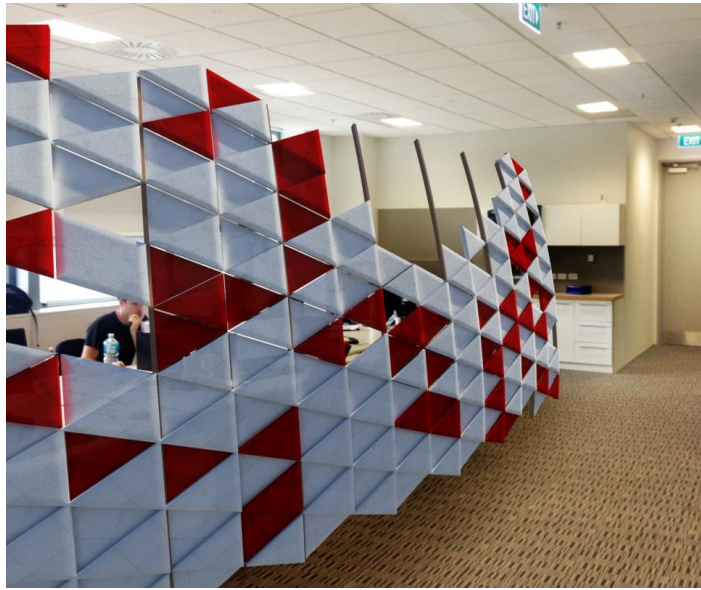


FIGURE 3: HYVE PARTITIONING

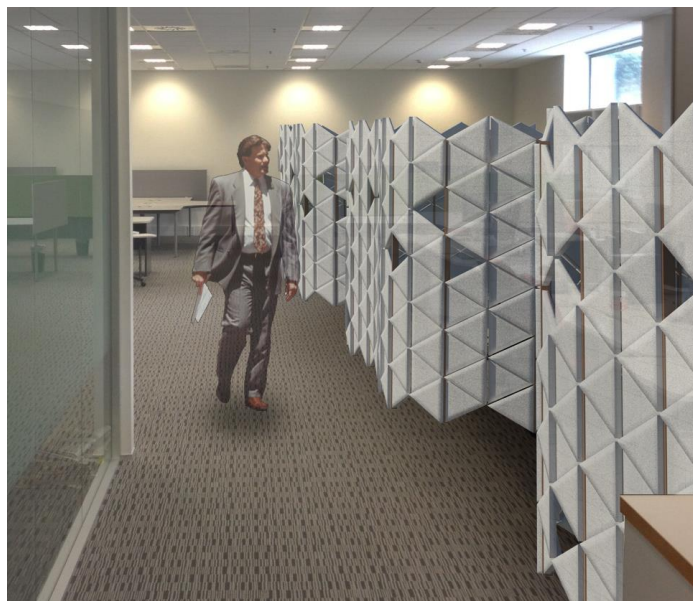


FIGURE 4: HYV SCREENS

3.6.1 Return on Science

The team returned to the Return on Science investment committee on August the 15th 2013, for guidance and potential funding through “Stage 1” of their commercialisation process. This would support further progress towards product development. We presented the following findings to support the case for developing Hyve.

- Office managers and workers are interested in ‘pop up’ meeting rooms or breakout spaces within leased offices and at conferences and tradeshowes where people are looking for a sense of privacy (visual and aural) to conduct meetings in crowded, noisy spaces.
- It is believed that such spaces can be designed and built with the PET material forms and framework at a competitive price, with good margins, and could find a significant market.
- The core value in the work is in product design rather than acoustic performance
- The raw materials and manufacturing rely on third parties.

Upon review, the committee felt that there was too much competition in the office furniture market and that the project lacked adequate “scientific” involvement (an important factor of their assessment criteria). The committee was concerned that there was no unique selling point that would set this concept apart from more established commercial office furniture suppliers. The lack of proven acoustic gains also caused concern. As a result the Return on Science committee decided not to fund the continued development of the project.

3.6.2 Trade Me

The team arranged to meet with Michael O’Donnell, Head of Operations at Trade Me, as they will be changing offices in 2014 and refurbishing three floors of office space. Michael arranged for all the parties involved in the new fit out to meet so that the team could ask them direct questions and gain insights into the refurbishment process. The main aim of the meeting was to understand:

- Who the key decision maker is within the group?

Sound Concepts

- Who selects the interior products, including acoustic products?

The meeting brought together Herriot + Melhuish Architects, L.T. McGuinness Ltd (construction contractors) and Trade Me's office managers. During the meeting we gained specific feedback about our direction, our approach and what we would have to do in order to make our proposition valuable to them as customers. We also discovered that the key decision maker in this process was the Head of Operations. However, he is still influenced by the recommendations of the architects and interior designers.

With this information we were in a better position to target our market validation efforts on senior executives rather than office managers. We also learnt that understanding the needs and motivations of architects is vital as they are key influencers in the customers' purchasing decision.

3.7 Supply Chain and Manufacturing Investigation

The primary goal of this stage was to understand the process currently used to produce the Sound Concepts prototypes, and to determine whether this method is appropriate for large scale manufacturing.

3.7.1 Calvert Plastics

The Pod and TriForm prototypes have been manufactured by local company Calvert Plastics, specialists in thermoforming of plastic sheet. On May 30th 2013 we met with Darryl Pickering to learn about their manufacturing process. Calvert are a manufacturing company and are not experienced or interested in directly marketing their products. They currently produce a range of formed polyester wall panels made from Autex material that are sold back through Autex.

- Calvert are looking to find new distribution channels (other than Autex) for their products
- They are conscious of the fact that Autex could manufacture in-house if they wanted to.
- They encouraged us to look into international markets immediately

Production

Sound Concepts designs are produced by heating and pressing (thermoforming) flat polyester sheet in a three-dimensional mould. The process is labour intensive and not currently set up for large volume production. If demand is high enough Calvert will purchase a new machine to dramatically improve the production times.

- Current machine setup can produce approx one unit every three minutes.
 - New machinery would do exactly the same process but with higher level of automation and faster turnaround, potentially two at a time.
 - New machinery built specifically for this process estimated to cost \$75,000
- Custom Fit outs

In 2012 Calvert Plastics were contracted to produce custom panels for the ceiling of the Air New Zealand Koru lounge at Christchurch Airport. Rather than manufacturing in their Lower Hutt factory they built a mobile jig to form the panels on site which made transport much more efficient and prevented damage prior to installation.

- Air NZ Koru lounge was essentially a prototype for future custom fit outs.
- Custom fit out was more profitable for Calvert as they can charge for design, prototyping, building jigs etc.
- Price obviously acceptable as Air NZ is in talks to do same with next Koru fit out.
- While these jobs are profitable, they are few and far between.
- They need a network of architects, especially from big firms such as Jasmax, to specify these fitouts.

Furniture

- *“This stuff is good for furniture as long as you don’t touch it”* – Polyester acoustic material is hard to clean.
- White surfaces are not advised as they look dirty very fast.
- Calvert are maintaining a focus on wall and ceiling panels, rather than sculptural forms

3.7.2 Alternative Production

Sound Concepts

Initial investigation into production methods was unsuccessful in establishing a viable alternative to Autex material and thermoforming to produce Sound Concepts products. Sourcing the raw material directly from manufacturers in China was considered however this would require large scale production to be feasible and if this scale was achieved production of the components would likely be offshore.

3.7.3 Anderson Design Meeting

Representatives of the team met with Ian Anderson of Anderson Design, specialists in the construction of custom fit outs for displays and exhibitions. Ian recognised the trend of communal “breakout spaces” - in fact Anderson Design have produced custom spaces in the shape of giant rugby balls for the New Zealand Rugby Union. Companies use commission pieces such as these to create a brand-specific atmosphere. Acoustics are a consideration. Andersons have been in discussion with Autex Industries about use of their materials, though acoustics are only one of many factors.

Ian believed a breakout space such as the Hyve office version could easily be manufactured “custom” but would be expensive and he didn’t see any market for mass-produced units. At the likely price level businesses would rather have a unique product - something that no one else has.

3.8 Summary: Lessons Learned

In the process of investigating open plan offices we interviewed approximately sixty people including office workers, property managers, architects and manufacturers to learn about the issues they face and their requirements for a product that will address them.

- Many people are not satisfied with their current open plan work environment.
- The majority expressed interest in a system that creates semi-private spaces within open plan offices
- The ideal solution should be versatile, simple to setup and affordable.
- It should control noise and provide a sense of privacy.
- Architects have considerable influence on product specification.

- The market for polyester-based acoustic sheet is dominated in New Zealand by Autex Industries.
- Aesthetics are important for some customers, but functionality is more important.
- Architects want better ways to improve acoustic performance of interior spaces.
- They are interested in a system that will improve their results without the need to hire acoustic consultants.

This feedback indicated an opportunity exists in open plan offices.

The Sound Concepts derived Hyve system could potentially address this opportunity, however:

- The concept was not considered sufficiently novel
- The level of functionality did not justify the predicted cost of production
- The aesthetics were polarising, indicating that it was best suited to custom installations rather than mass production
- Therefore, there was no product-market fit.

The team decided to set aside all existing prototypes and preconceived solutions and to build on the opportunity we had identified.

Chapter 4 Hyv

The team (now under the moniker Hyv) had a substantial body of information and a network of contacts with an interest in improving open plan environments. This put us in an excellent position to develop a market-driven solution. This required a shift in mindset from “technology push” to “market pull”. A market driven approach would differ from the technology push we had experienced through the NacreTech and early Sound Concepts projects in several ways:

- Any product or solution would be developed in response to market requirements gathered through our research
- These market requirements would be refined through feedback on a product specification
- Specification would be refined through iterative product development process

4.1 Targeted market research: Open plan offices

The team began by constructing a survey designed to empirically confirm the need for semi-private meeting spaces within open plan offices and to clarify their key requirements. We sought to quantify the information we had gathered thus far by re-surveying the contacts we had established during the phone survey process. We needed to determine the relative importance of the product requirements in order to distinguish between the “must have” and “nice to have” features. Further, we were keen to discover any requirements we might have missed during earlier interviews.

Based on our initial conversations, we now asked: “How important are the following attributes?”

- Simple to install, not requiring building consent, contractors or major construction.
- Lightweight (can be moved easily by one person)
- Reconfigurable for use in a variety of different spaces
- No higher than 180cm to avoid the need to move sprinklers or to get building consent.

- Freestanding without the need for additional supports such as bolts or ceiling suspension.
- Have acoustic properties that dampen noise
- Data/power options built into the structure of the product
- New Zealand made
- Environmentally friendly
- Cost effective

4.1.1 Results

Our contacts were asked to rank the importance of each product feature and how it would affect their purchasing decision on a scale of 1-10, with 10 being a feature of great importance or value. This provided an understanding of which requirements would influence the customer when making a decision. The market requirements determined for a meeting room product with acoustic benefits were, in order of importance:

1. Simple to install (not requiring building consent, contractors or major construction)
2. Freestanding without the need for additional supports such as bolts or ceiling suspension
3. No higher than 180cm to avoid the need to move sprinklers or get building consent
4. Data and power services built in
5. Acoustic properties to dampen noise
6. New Zealand made
7. Environmentally friendly
8. Lightweight (can be moved easily by one person)
9. Reconfigurable, for use in a variety of different spaces
10. Cost-effective

4.2 Conceptualisation

The team began work on a “green field” design, created from scratch in direct response to the requirements and feedback from our market research.

A concept was created in digital format that sought to address the user’s requirements while achieving appropriate cost effectiveness, manufacturability and aesthetic appeal.

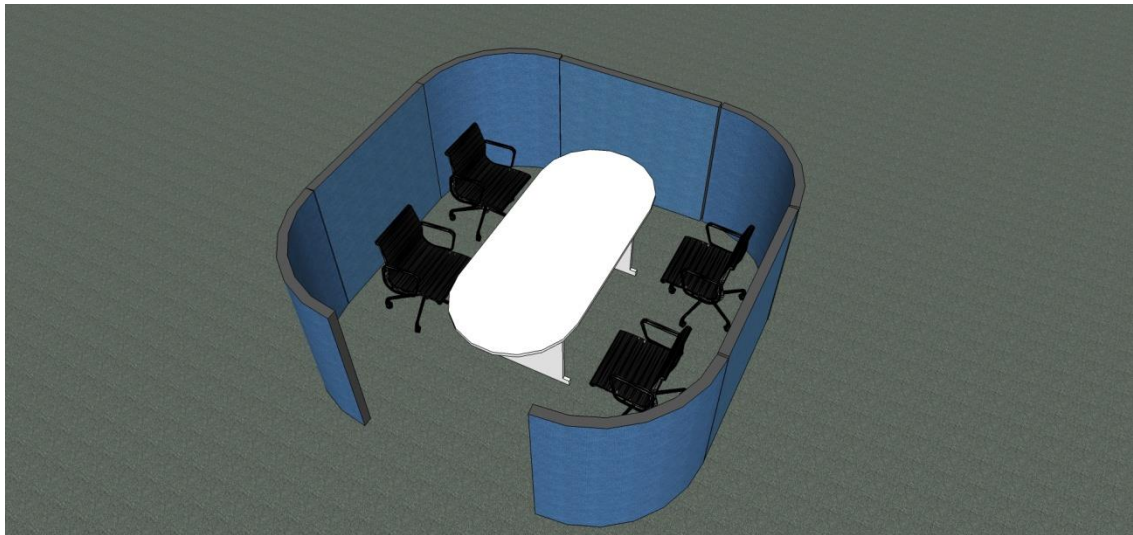


FIGURE 5:HYV EARLY CONCEPT

This design did not initially include any material or process considerations as the primary focus was to address the functional aspects. The proposed system consisted of two basic panels, straight and curved, from which a variety of configurations could be created to suit open plan office users.

4.2.1 Refining the concept

In the next part of the survey we attempted to demonstrate our understanding of the requirements through our digital rendering. The questions we asked attempted to find out whether the concept addressed the problems outlined in the first survey. Moreover, we also wanted to know what aspects of this concept would stop customers from purchasing it and what they thought was a fair price range.

The majority of respondents did not think the concept captured the requirements in the first part; however a small subset of respondents liked the concepts, one of these being Creative HQ, this indicated a niche market that could be targeted with the first version of Hyv.

4.2.2 Creative HQ

Creative HQ is the Wellington region's business incubator, housing some of the most innovative start-ups identified for their potential high growth. We contacted their property manager, Rebecca Hill, to take part in our survey. Rebecca's feedback stood out from the rest; she indicated a strong correlation between our early concept and the requirements of the Creative HQ office. To find out why her feedback was so different, we followed up with a meeting at the Creative HQ office. We learnt that currently their work stations are separated into cubicles using aluminium-frame partitioning. Teams used a central table to host informal meetings and other collaborative activities.

Creative HQ is contemplating an open plan office when they relocate to a new office in 2014. They require an open plan set up with semi-private spaces that teams can use for meetings, collaboration and other activities, to avoid disruption to people working at their desks.

Rebecca expressed her need for an affordable, simply installed, customisable solution that can be configured in various spaces. She proposed an opportunity to fit-out The Lightning Lab (a three month business accelerator program which Creative HQ supports) to refine the product and provide proof of the concept's functionality. Following that, she foresaw potential for the team to be involved in the Creative HQ fit out in 2014.

4.3 Prototyping

Having assessed user responses to the digital concept, work began developing a full scale prototype that would allow interaction with the space and test its performance. Material and processes were considered that would allow the team to build this prototype, using an adaptation of Lean Startup Minimum Viable Product (MVP) theory, with the aim of gathering the most validated learning from the least investment. By quickly creating a full scale, low cost model that could be shown to, and interacted with, by users we aimed to quickly establish what aspects of form and function were most critical to the products success.

Cardboard panels were settled on as a suitable material for these early prototypes, as for a modest expense we could create lightweight, self supporting structures that were robust and easily modified. While initially cardboard was proposed purely as a prototyping material it quickly became apparent that it had some permanent potential, particularly as a substrate upon which to apply a range of finishes and coverings. The fundamental physical characteristics of the material are well suited to the requirements of the proposed system and its sustainability and recyclability fitted our ethical position as an enterprise.

4.3.1 DoubleEco cardboard panels

DoubleEco is a Wellington business that manufactures cardboard pallets suitable for freight and storage. Cardboard pallets can withstand large loads, do not require fumigation and can be recycled at the end of their useful service life. The corrugated card used by DoubleEco is locally manufactured from sustainably grown wood fibre and glued together with non-toxic adhesive.

4.3.2 Bending cardboard

The curved elements of the initial concept provided a point of difference and a degree of aesthetic variation to what was in effect a very simple panel structure. They were initially proposed, as mentioned earlier, with no consideration of how they would be created. This provided a valuable experience in interdisciplinary product development for the team.



FIGURE 6: BENDING CARDBOARD AND THE FINISHED PANEL

Once again cardboard was well suited to this prototype development. By layering and glueing single layers of corrugated card around a mould (a concrete drain pipe) we were able to create a cardboard cylinder of the required dimensions which was then cut into quarters to create the curved corners of the prototype. This experimentation proved that curved panels could be created relatively easily with a dedicated production process (rather than outdoors round a drain pipe), while providing an indication of the labour (and therefore cost) involved in their creation. The laminated structure is robust and holds its shape well, and provides support to the attached straight panels.

Creating full scale pieces highlighted several issues with curves, in particular the bulk and difficulty of flat packing. Curves also created issues for connecting the panels and, and applying finishes and coverings.

The second generation of corner panels sought to address the drawbacks of curves while retaining the interesting aesthetic elements, improving configurability and allowing for flat packing. By cutting “V” grooves into a flat sheet of card we were able to create corners that could be installed in a variety of angles, and laid flat for storage. These are also simpler to connect and cover and can potentially be produced using existing processes without the need for the custom built jigs needed for curved panels.



FIGURE 7: HYV1.0 MVP

4.3.3 Connections

As customisation, configurability and versatility were important user requirements, the connections that would secure the panels and coverings were crucial and complicated details. To connect two straight panels permanently is relatively straightforward; to do so with a permanently fixed covering (acoustic fabric, decorative prints etc) is also relatively simple. However, to create a connection from scratch that allows for a variety of configurations, repeated tool-less assembly and disassembly, using coverings of different materials and dimensions, while remaining cost effective, very quickly proved to be beyond the capabilities of our team.

Following this period of frustrated conceptualisation it became clear that we were getting ahead of ourselves. In order to test the concept most functional elements of the prototype could be faked or created in “bare bones” form.

4.3.4 Coverings and finishes

Coverings and finishes serve several purposes when applied to the proposed concept: firstly they allow for customisation and variety, allowing the basic units to be matched to colour schemes, themes and branding of the user; secondly coverings can add to the performance of the system, particularly with regard to acoustics.

One of the most spirited team discussions of the year was about whether to cover the cardboard prototype before showing it to potential customers. On one side, some team members felt that by exposing the bare cardboard structure to the customer we would run the risk of creating an impression of “cheap”. Others had the view that covering the cardboard could prove unnecessary if the users did not see coverings and finishes as crucial. In the end the debate boiled down to how we presented the prototype and what we were attempting to test through this customer exposure - whether it was the aesthetics and perceived value, or the core functionality and user interaction attributes.

There was agreement that as completely uncovered panels the cardboard presented poorly. Debate continued over whether to disguise the structure (favoured by the marketing team) or embrace the materiality of cardboard and use its recognisable structure to our advantage (favoured by designers, but more polarising to the customers). A minor breakthrough came with the application of tape to the exposed edges, which hid the corrugations and prevented paper cuts. Suddenly the material began to come into its own as a presentable product.

4.4 Testing and Feedback

Having refined our concept and translated the validated digital renderings into a full scale prototype we were ready to show it to a panel of potential users.

In short, the prototype simply consisted of cardboard straight panels and flexible angled corner panels with taped edges and simple acrylic connections. By presenting it

clearly as an early prototype and encouraging discussion around the pros and cons of the concept we sought to gather a vital body of information from the very people we hoped the system would appeal to.



FIGURE 8: INSTALLING THE HYV1.0 PROTOTYPE

4.4.1 Design School Workshop

The team organised a showcase event for our network of potential customers where they could experience the prototype, set up in a space at the VUW School of Design. Up to this point most potential customers had only seen the digital renderings. This was a chance to further refine the product's specifications. Customers invited to participate in the showcase were informed beforehand that this was not a presentation of a final product or even the final prototype. Rather this was a chance for them to tell us whether we had understood their requirements correctly. Internally, we also viewed this as an information gathering exercise by setting out the following key objectives.

- Refine the physical features including;
 - dimensions
 - height
 - configurability (and reconfigurability)

Hyv

- Confirm the intended use and furniture fitting.
- Clarify performance related features i.e. acoustics, level of perceived privacy and whether this was fit-for-purpose in terms use as a meeting room.
- Clarify our understanding of what customers think of the cardboard material, covering options and functional add-ons (whiteboards, pin boards etc.).
- Get an indication of what price people would pay for a finished version.

Key feedback on the Hyv1.0 prototype from the Design School showcase:

- It would be useful for cell phone calls and informal meetings of 3-4 people
- 1.8 metres good for visual privacy, although significant variation in responses
- Cardboard should be covered for a more “professional” look, although some users appreciated the funky cardboard aesthetic
- Strong interest in being able to move, reconfigure and store the product easily, though unlikely to occur frequently
- Some interest in users being able to customise a “basic” model
- Would suit informal furniture, coffee tables etc. Formal meetings can happen in the board room
- General acceptance of \$900.00 for a basic “booth”
- General surprise at the decent level of acoustic separation between two showcase booths

4.4.2 Summary

The majority of the respondents expressed interest in the Hyv1.0 solution for informal meetings of roughly three people. The heights of the panels were deemed appropriate by the customers for the purpose of use. Participants also indicated the need for affordable pricing, which in the end was closely aligned with our cost predictions. Use of cardboard panels did not significantly detract from the concept, although covering it with a more aesthetically appealing material would be the preferred in a corporate environment, regardless of cost. Furthermore, the results point to the importance of the ability to reconfigure the system in various spaces, while also indicating the likely frequency rate of reconfiguring the meeting rooms is not as high as we had expected.

The results indicate a market opportunity for an affordable, simple to install and easily configured partitioning system that can be used to create a variety of semi-private meeting spaces. This market is characterized by organizations who are seeking a temporary solution, most probably while they look for a new, permanent office space. Based on our research there is a strong indication that this is a niche market. Therefore the current Hyv1.0 MVP is unlikely yield a highly profitable business that can employ all of the founding members on full-time basis. Exploring a more permanent solution based on the same concept is one interesting avenue to explore further as feedback indicates a bigger market. Extensive market validation is required to confirm if there is indeed a market for a 'permanent' version of Hyv.

4.5 Promotion and Branding

At this stage in the project we decided to execute some promotional initiatives, to actively spread the word about our team work. We created a temporary landing web page and experimented with using Google Adwords in an attempt to drive traffic to the site and to gain the email addresses of interested parties.

We engaged graphic designers Nandini "Nanz" Nair and Rose Wu from GoodieTwo to create a brand identity around "Hyv" for promotional materials and for use on social media sites.

The designers' brief focussed on our business entity and the customer benefit we sought to create – productive meeting spaces in busy environments - rather than branding a specific product. Our hope was that companies would eventually refer to a meeting room or meeting space as a "Hyv".

The team had discussed names that would suggest the benefits of the product (creating productive, quiet meeting spaces in busy environments), such as cocoon, hub, hive, shell, etc. We settled on the name 'Hive' as it suggested a productive working space, this subsequently became Hyve, then Hyv.

With the brand identity in place and the latest version of the prototype built, we began creating promotional materials to enable us to communicate the value to customers. After previous discussions with a number of potential customers, we

understood what benefits, features and wording to use in targeting their interest. The designers created a brochure that sought to communicate the key benefits of the product. It also sought to catch the attention of customers through its innovative design. The brochure was folded in a way which resembled the panel product that we had produced. That enabled multiple brochures to be assembled to create variations of meeting rooms. This brochure achieved and demonstrated the core characteristics of the product: “flexible, lightweight, reconfigurable, versatile and simple”.



FIGURE 9: HYV BROCHURE SHOWING BRANDING

4.6 Summary: Lessons Learned

- A user-centred, iterative product development process highlights whether the project is on the right track as early as possible.
- It is never too early or too late to include the customer in the product development process.
- Office workers and managers recognise value in what Hyv1.0 is aiming to achieve, however the form of the prototype has room for improvement.

Chapter 5 Hyv2.0

At present the Hyv project is based around the team's understanding of the need for furniture solutions that address issues of privacy and acoustics in open plan offices. Our prototype - Hyv1.0 - has shown potential as a concept for addressing these issues but requires substantial refinement.

5.1 Necessary next steps

In order to develop Hyv as a business, several key activities are necessary.

- **Product Development:** The current prototype requires significant development to become a product as either a cardboard MVP, or to develop into a more substantial "permanent" product. This development requires product design and engineering input.
- **Customer Development:** Refining the prototype requires continued development of relationships and communication with potential users who will ideally become customers.
- **Business Development:** As the project makes the transition from academic project to independent business, the ongoing structure of the entity must be determined. This relies on the commitment of the team to continue development, which itself relies on the underlying potential of the current concept.

5.2 Development Plan

As the team will no longer be students, the economics of continuing to develop the Hyv system take on new importance in 2014. The ideal situation is to generate early revenue to fund further development; this is where the minimum viable product technique becomes truly valuable.

5.2.1 The Lightning Lab MVP

The MVP, as distinguished from the prototype, is the first version of the product that we hope to sell to a paying customer. While the MVP may not include every function

proposed it does include those features most critical to success in order to meet the requirements of a particular user (the early adopter) to the point where they are ready and willing to spend money on it.

The second annual Lightning Lab business accelerator program will run in Wellington from March to May 2014. As a short term entity incorporating a number of autonomous startup businesses the Lab has a fairly unique set of office fit out requirements. We are in discussions to provide cardboard Hyv1.0 breakout spaces to the Lab to allow teams collaborative spaces where they can get together for meetings, Skype calls or to escape their desks for a spell.

5.2.2 Tertiary Education Commission

Following the December MATE presentation the Hyv team were approached by Chris King, Manager of corporate support projects and services at the Tertiary Education Commission (TEC), to discuss the potential of trialling the Hyv1.0 prototype. Chris was intrigued by the concept and wants to explore options for an upcoming re-fit of the TEC offices. The new space will be largely open plan and will require configurable spaces to provide staff with space to collaborate. The trial has been confirmed for two months beginning in March 2014. This will allow a fresh look at the concept and the prolonged trial will allow the TEC staff to experiment with the system and provide valuable feedback which we can use to iteratively improve it.

Following this trial, we will hopefully have a completely validated concept specifically tailored to a particular customer. While this will not necessarily translate into a repeatable product the opportunity to create part of the TEC fit out would be a revenue generating process that could ultimately support the continuation of the business.

5.3 Manufacture / Licensing potential

Should the TEC trial prove successful, the team will look to outsource production of the product. As a startup business Hyv lacks facilities and equipment for in-house manufacture. Further, the skill sets of the team members are better suited to validation, research and sales than manufacture.

5.3.1 Formway Design Connection

We have established a relationship with Formway Design, a local business who have built a global presence in the field of furniture design. Formway no longer manufacture their designs in house, instead licensing them to established international manufacturers and thereby gaining support and exposure to a global market. This is a hugely relevant model for us as a business as we would seek to follow a similar path in order to broaden our market without going head to head with established players. Formway have offered to provide feedback from a mentorship position for the ongoing product development work. This is invaluable experience and further reinforces the learning and process we have undertaken through the MATE programme in taking a concept from academic roots towards commercial realisation.

5.4 Texus Fibres Collaboration

Through VicLink Hyv came in contact with Timothy Allan of Locus Research, a Tauranga based market research and product development company. Timothy is on the board of Texus Fibres, a manufacturer of non-woven coarse wool fabric (felt) who are looking to find applications for their material.

As well as being a locally produced renewable material with a high level of aesthetics, Wool has excellent acoustic properties and the potential for passive air filtration, meaning that it has the ability to trap and store harmful vapours which are off-gassed by some building materials and furniture.

Initial market validation has shown that there is growing awareness of issues around air quality in response to sick building syndrome, and by combining our concept for highly reconfigurable office furniture with acoustic control and improved air quality we believe we have a unique value proposition with wide ranging applications, however this is a hypothesis that is yet to be fully tested.

5.4.1 Tech Jumpstart Summer Project

We have a Memorandum of understanding with Texus fibres for material supply and process assistance to develop a prototype based on our market research that will

explore the use of wool fabric in acoustic furniture. Our work will include exploration of methods of forming Texus material into rigid three dimensional structures that could be built into self supporting structures, applied as panelling to ceilings and walls or used in conjunction with the Hyv1.0 system to improve the acoustic performance.

This work is ongoing thanks to a grant from VicLink and KiwiNet via the Tech Jumpstart summer programme. This funding has allowed us to engage the services of recent graduate industrial designers James Bennett and Lucy Mangin to work on the Texus collaboration and fine-tuning the cardboard prototype.

5.5 Overall Viability

Our research has shown that there is a market driven opportunity to develop furniture-based versatile work spaces for open plan offices. Potential users have expressed genuine interest in our concept; however significant development is required to get the current prototype to a finished product.

Our work has identified a business opportunity based on the design and manufacture of commercial furniture-based products. While this model has potential for growth it is unlikely to present a case for significant investment and would be better suited to development by a founding team with appropriate technical skills.

Further product development in conjunction with established market contacts will determine the ultimate viability of the current Hyv concept. As the physical form of the product is refined, the viability of the business model will become clearer.

Chapter 6 Conclusions

6.1 Ish - Overall Lesson Learned

One of the key learning outcomes for me this year is the importance of starting with a clear vision as a tool to guide the enterprise development. Over the course of the year we worked on different projects, pivoted several times with some projects and experienced moments when there wasn't a clear path we should take next. Having a clear vision of what we wanted to achieve from the outset would have been quite valuable as we progressed through the many changes we experienced. While changes are inevitable in highly uncertain environment, such as a start-up, having a clear and consistent overarching vision that binds expectations and helps the team move forward as unit can make huge difference.

6.2 Liam – Overall Lesson Learned

An important lesson that I have taken away from this experience is the benefit of using thorough market research and customer feedback to define both products and projects early on in the development process, long before turning to prototypes and building products. More accurately defined projects and products have fewer complications in later stages of their development and are less likely to result in products that customers do not want. Getting a user-defined product specification right requires a lot of up front work, but ultimately leads to more successful ventures in the long run.

6.3 Ian – Overall Lesson Learned

Continuous customer feedback – a key learning for the team this year was the importance of maintaining active relationships with our prospective customers. The process of market validation does not stop after the initial contact. We learnt that it is important to involve the prospective customer within the product development process. We were able to make iterative adjustments to our prototype and overall business strategy after conferring with customers and gaining further feedback. We

Conclusions

also found that building this type of relationship with a customer would encourage them to become invested in the success of the product.

6.4 Oliver – Overall Lesson Learned

In order to successfully commercialise ongoing research projects, interdisciplinary MATE teams require strong support and direction from the research team to compensate for a lack of internal domain knowledge. Alternatively, in order to build experience of entrepreneurship through startup enterprises and resultant constructive failures, teams need complete autonomy and freedom to develop opportunities they have identified themselves and are therefore hopefully able to generate momentum and belief in the value of the venture. Either way it must be understood and accepted that academic research and commercial enterprises do not always share common objectives. Therefore, commercialisation teams must be prepared to pivot, adapt and occasionally walk away from projects as they search for the elusive viable business model.

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