Theme: Strategies for ag growth

POSITIONING NEW ZEALAND'S PRIMARY INDUSTRY TO TAKE ADVANTAGE OF OPPORTUNITIES PRESENTED BY NEW AND EMERGING TECHNOLOGIES IN THE PRODUCTION AND MARKETING OF FOOD PRODUCTS

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Abstract

The sheer scale of technology developments in the agricultural and food sectors is moving at a speed we have simply not experienced before. Significant advancements are already being made in the development of plant-based meat and milk alternatives, big data, artificial intelligence, lab cultured food proteins and blockchain technology, to name a few.

We should not underestimate the effect of advanced technology developments occurring in the production and consumption of food proteins, and how these could irrevocably disrupt existing business models that have largely served commodity producers and processors for a long period of time.

Critical to the future success of New Zealand's agricultural sectors will be our ability to quickly build the capabilities of highly motivated and talented individuals and entrepreneurial organisations in becoming more adept and agile in sensing and exploiting opportunities presented by new technologies and changing consumer preferences in an increasing dynamic market environment.

This paper considers five different approaches that could be used in developing an innovative ecosystem and culture to build and develop the confidence and conviction of individuals in exploring new opportunities for New Zealand's agri-food and fibre products, or perhaps some other industry we haven't even thought about yet.

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Background

In 2017 I received a Winston Churchill Fellowship that enabled me to travel offshore and meet with over 40 thought leaders, academics and industry representatives in the United States, Canada and Europe to discuss and debate the impact of new and emerging technologies likely to occur on-farm and through to the marketplace.

During this Fellowship I became increasingly interested in how to create environments to allow individuals and entrepreneurial businesses to become more adept and agile in sensing and exploiting opportunities presented by new technologies, and increasingly attuned to changing consumer preferences.

This paper is an abridged version of my full Winston Churchill Fellowship report which can be found at https://www.nzipim.co.nz/BlogPost?Action=View&BlogPost_id=14

The technology effect

The New Zealand primary industry has rarely hesitated to embrace new production-based technologies that clearly and overwhelmingly demonstrate improved ways to lift the productivity and profitability of farming operations and manufacturing processes.

While we can expect this practice to continue, what we are now witnessing is the roll-out of new technologies that could radically change the way food is produced, manufactured and consumed. It would appear that the technology sector and investors have set their eyes on the food industry and we should expect the pace of technology change and investment to accelerate substantially in the future.

Already we are seeing rapid technological advancements in the development of plant-based meat and milk alternatives, 3D printed food and blockchain technology, to name a few. All of these new technologies could seriously challenge current business models that have served New Zealand's commodity producers and processors for well over 130 years.

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But how much of this is 'hype' generated by the companies and investors directly involved with new food technologies, industry commentators and media through the effective and smart use of new media technology and social networking platforms (e.g. websites, blogs, multimedia, etc)?

In forecasting the possible long-term effects of technological change, United States researcher and futurist Roy Amara coined the phrase:

> *We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run (2006).*

It can take a considerable time before a new technology is widely accepted and adopted in everyday use. A good example of this is the Global Positioning System (GPS). Originally designed for military and intelligence applications by the United States at the height of the Cold War in the 1960s, GPS started in 1978 as a constellation of 24 satellites placed in orbit.

In the 1980s, GPS was released for use in civilian applications after a United States civilian aircraft was shot down after losing direction and venturing into Russian airspace. It wasn't until the early 2000s that we started to see the application of GPS for everyday use.[1] Now GPS is incorporated into a wide range of applications and has been at the forefront in the development of precision agriculture.

As the GPS example shows, it can take a long time for the technology to establish itself in the market. But when the application and integration of a new technology is used to make our lives easier and clearly better, the momentum in its uptake is unstoppable.

Opportunities presented by new and emerging technologies

New Zealand is generally regarded as a highly successful exporting nation of agri-food and fibre products. We have lead the way in the application of world-class science and innovative practices in temperate grass-based farming systems underpinned by a relatively stable commodity market, which has largely served us well for over a century.

[1] Rodney Brooks: *The Seven Deadly Sins of Predicting the Future of AI*

However, since the start of the new millennium we have seen the erosion of our agricultural sectors' comparative advantage, marked by the loss of our internationally competitive position as a low-cost producer of agricultural products brought about by increasing input costs and expanding compliance requirements, exacerbated by high land costs.

Our farming community and the wider industry have been commendably fast adopters of new production-based technologies. However, more often than not this has been through producing more of the same types of products at less cost, rather than necessarily developing higher value products or services able to attract significantly higher price premiums in the marketplace.

New Zealand's agricultural sectors are facing some very stark choices. We can continue on our current trajectory and remain a low-value commodity player that will inevitably face diminishing ongoing returns in the future. Or we can look to trade-up and add greater value to our agri-food and fibre products that improve profitability and extract greater returns from the marketplace. Of course, this is very easy to say, and there are many reports from credible sources advocating the same approach.

So why do we find it so difficult to move beyond our existing business models to seek out the opportunities presented by new and emerging technologies? To explore this question further I spent time in San Francisco to develop a better understanding of what a vibrant, fast-paced and rapidly changing technology-driven environment looks like.

Powering up the innovation ecosystem

It is estimated that 50 percent of the world's start-ups are now based in the San Francisco Bay Area, most of which are chasing venture capital wealth, looking to access world-class universities and private research institutions, and connecting with highly talented people. All of which has created a unique and self-sustaining innovation ecosystem.

The energy and level of technological innovation in the San Francisco Bay Area is hugely impressive and incredibly fast moving. In speaking with Tim Brown, the CEO of IDEO, he noted that the San Francisco Bay Area innovation ecosystem has a high tolerance for risk and doesn't fear failure. This allows start-ups to try out ideas and fail fast and move

on quickly, thus accelerating the speed of learning. This has been made increasingly easier through the application of technology to test and prototype new ideas more quickly and cheaply through 3D printers, computer modelling and complex data analysis.

The start-up culture in the San Francisco Bay Area is truly unique. There seems to be a willingness by start-ups to test out new ideas with seemingly greater access to capital and highly capable people than would be seen anywhere else in the world. Should the start-up not demonstrate promise and/or prototypes fail, developers take on board the lessons learnt and move on to the next idea to present to another venture capitalist, or simply walk down the road to find employment in a different tech firm.

In his yearly Letter to Shareholders released in April 2017, the founder and CEO of Amazon Jeff Bezos discussed the decision-making process within his organisation. Amazon's goal is to make fast quality decisions, which can often be done when about 70 percent of the information you wish you had is available. Waiting for 90 percent means going too slow and Bezos advocates for 'disagree and commit' as a way to save time. His teams don't have to persuade him to take a particular route; they just have to convince him enough so that he is willing to take a gamble.[2]

In a further variation to this, the 'maker movement' provides an environment for inventors (or makers) to crowd source information from their peers to make products. The maker movement has a DIY culture that intersects with the hacker culture, and revels in the creation of new devices as well as tinkering with existing ones. Rather than test and fail fast, and try something else, makers often redesign from failure following a process to 'iterate and change' → 'iterate and change' → and so on.

Dale Dougherty of Maker Media describes the maker movement as being based on community ideals, evoking the spirit and passion of building stuff yourself. The maker movement provides an opportunity for makers to share and develop their ideas, building greater connection points with other makers to develop prototype products. It would be interesting to see whether individuals tinkering in sheds and garages across New Zealand would be similarly open to crowd sourcing information and innovative ideas without the fear of losing any perceived intellectual property.

[2] USA Today: 'Disagree and Commit' Jeff Bezos *Words to Live By In Annual Letter*' [14 April 2017]

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What the above shows is a strong willingness by individuals and organisations to explore new ideas and test these within a highly supportive innovative ecosystem.

As noted, the innovation ecosystem within the San Francisco Bay Area is unique. Despite the best intentions of various organisations in New Zealand and abroad to replicate elements of Silicon Valley through innovation hubs and the like, they don't have the same access to investment capital, the depth of talented people, world-leading research or the right culture.

We also often look to the technology achievements of the San Francisco Bay Area as a relatively new phenomena. Yet an often overlooked factor behind its success has been decades of intensive and sustained federal government investment in research and development in the technology sector, which has been critical in building people and research capability in the region.

In traveling across the vast expanse of the mid-West of the United States and discussing the innovation ecosystem in the San Francisco Bay Area with leading academics in the mid-West, they noted that the appetite to take on risk by farmers is low. Their monoculture farming systems and considerable investment in infrastructure required to support this provides little appetite to take on risk. As one academic noted, 'they don't want to be the generation that loses the family farm', which is strikingly different to the DNA of Silicon Valley where risk and change are embraced and seen as a pathway to potential opportunities worth exploring.

Sustaining the condition of 'not knowing'

In the New Zealand agricultural industry we have been highly successful in implementing and codifying systems around the production and processing of our commodity products, which has contributed to the sector's overall success.

Our farming enterprises, processing and marketing companies, and education and research institutions involved in the primary industry, have become intimately and firmly established within this ecosystem, which has largely delivered the familiar types of outcomes expected by the parties involved over a long period of time. We shouldn't be surprised by this as generally people and institutions like rules and predictability and to

know where the boundaries are. The risk, however, is that our intimate knowledge and closely-knit support structures within this ecosystem may create resistance to rapidly changing circumstances that openly challenge and disrupt the status quo.

In using design thinking lead approaches, Bruce Corson of Corson Associates notes that there needs to be a willingness by individuals and businesses to acknowledge that they don't know everything and to be able to move then from a state of comfort to one of exploration.

He notes that as we try to understand and address systems whose nature and extent are unclear, we routinely discover our models for understanding them are insufficient. With disconcerting regularity we discover they are clearly wrong. To be able to constantly adapt we must live in an uncomfortable state of chronic uncertainty. We grow accustomed to 'knowing' and with each passing year spent in such circumstances – where the overwhelming emphasis is on 'the answer' – we become less and less able to 'not know', which is the fundamental condition of the creative process.

We have become experts and conditioned to finding familiar answers to problems without truly embarking on a process of discovery – looking for something that no-one is aware of – and taking the time and effort to fully 'name the problem'. To be effective explorers, we must have the courage to accept that our 'maps' are quite likely wrong. This requires participants to be curious, give up what they know and move onto something new, use available information differently, and collect information from different signals around us.

The design thinking process is challenging and requires the fortitude to robustly test deep set biases and familiar ways of thinking prevalent among individuals and organisations involved in the process – if facilitated well.

Shifting mindsets to enable new thinking to flourish

Given our exposure to design thinking lead approaches, and no doubt other types of solution-focused models that will inevitably follow, why do we not see step change occurring within New Zealand's agricultural sectors that are so often talked about?

Despite the protestations of individuals and industry sectors about the need to break out of the commodity cycle and aim further up the value chain, this is very difficult to achieve. This is particularly so when an industry has grown accustomed to operating within a relatively stable and low-risk commodity market sustained by an elaborate ecosystem to support this. However, this situation makes us highly vulnerable to disruption should a major disturbance or event take place within the primary industry, or some significant transformation occurs in the consumer purchasing behaviours of agri-food and fibre products.

So when a disruption does happen that challenges the way we operate, we often seem reluctant or even powerless to act until someone else delivers a tidy package containing a familiar type of solution or template that is consistent with what we expect to see and aligns with our mental models without fully exploring the extent of the problem and/or seeking alternative broader scale solutions.

So why is it that some individuals perform better and demonstrate greater resilience during times of crisis than others?

In looking at the art and science of survival Laurence Gonzales wrote that psychologists who study survivors conclude that the most successful are open to the changing nature of their environment – they are curious to know what's happening. He notes that as the environment changes what is needed is versatility – the ability to perceive what is really happening and adapt to it. In such circumstances training and prediction may not be your best friend.[3]

Developing an acute awareness of the environment, being able to collect information and analyse this effectively, and then having the conviction to adapt to changing circumstances seem to be common attributes of survivors. While this represents the harsher end of the spectrum in managing crisis situations, it does provide useful insights into some of the behavioural traits of individuals faced with acute adversity.

Operating within the relative comfort of our commodity market we can expect to see the types of outcomes that match our mental model in the production, processing and marketing of our commodity products. But this does not necessarily provide us with a

[3] Laurence Gonzales: *Deep Survival: Who Lives, Who Dies and Why* [2004]

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heightened awareness of external factors that could impact on our existing business models, or equip individuals with the skills and confidence to become more adept and adaptive in operating in uncertain environments.

The weight of expectation to maintain the status quo – the foundation of our very success within the agricultural industry – is heavy. Often heralded changes we hear about are more in the realm of marginal improvements and sustaining what they are doing already. But does this potentially impact on our ability to deeply consider, discuss and explore radically different perspectives that challenge the status quo, and slow down the uptake of ideas and new technologies?

The agricultural industry has largely been immune to the digital and technology transformation seen in other industries, such as in the medical care, manufacturing and service sectors. But this is quickly changing and we can expect to see greater levels of technology developments on-farm and at various stages along the supply chain through to the marketplace in future.

The opportunity

Having taken the time to research the topic for my Fellowship, and the many tangents this took me down, I believe a radically different approach is required in building the capability of individuals and innovative organisations to become more adept in sensing and capturing opportunities within the marketplace. This approach includes:

1. Embracing risk

Seeing the innovation ecosystem culture prevalent in the San Francisco Bay Area that has a high tolerance for risk and doesn't fear failure is in stark contrast to the risk aversion we see within New Zealand's agricultural sectors, which are often constrained by low margins with limited scope to invest in research and product development. But without taking on risks and experiencing this directly, we are less inclined to want to continually test out new ideas and innovations in developing new products and services.

We need to develop a culture that encourages and resources individuals and innovative businesses to want to embrace risk without fear of failure in testing out new ideas. Industry and government-funded research programmes have a critical role to play in developing greater tolerance of risk in the way they invest in and sustain these projects, particularly in areas targeted at building a competitive advantage for New Zealand's primary products.

2. Providing space to 'breathe'

While technology and a constantly expanding range of tools have improved the ways we produce and process agricultural products, they have also filled out the edges of our personal and working lives, impacting on our ability to freely explore new ideas and areas of development or alternative streams of logic.

Greater opportunities should be given to highly motivated and talented individuals to 'breathe' – to devote more time and energy to exploring and widening their scope of their awareness in pursuit of new ideas and innovations within the agricultural sectors and the marketplace, or possibly a new industry.

By supporting and resourcing individuals and innovative business enterprises to independently expand their capabilities by immersing themselves in particular areas of interest in a new and developing area, this would better enable them to become more adept at sensing shifts and picking up signs of change in the marketplace and in the adaption and application of new technologies.

3. Creating safe environments

Greater effort should be made in providing a secure environment for individuals and organisations to openly debate, discuss and test new ideas and concepts. This is often difficult where individuals are seen to be swimming against the tide of prevailing views and practices.

It is far too easy to challenge, or at the extremes alienate, individuals for expressing views that don't necessarily align with mainstream thinking and established business practices.

This has been made worse at times where views and opinions are openly criticised through the anonymity that social media provides.

4. Seeking more 'mavericks'

There are limitations with our existing businesses and industries being able to continually adapt and innovate, made more difficult by internal cultures and steadfast systems established over a long period of time. This has been made worse by the preoccupation of micro-managing risk across all aspects of business endeavour, thus stifling interest in testing and exploring new and leading edge ideas.

In accepting the confines of our own business models and the cultures that are within them, greater consideration should be given to encouraging more 'mavericks' and new players into the industry to challenge the status quo and disrupt our traditional ways of thinking and patterns of behaviour.

5. Becoming match fit to keep pace with technology change

The speed of uptake in the application and/or adaptation of technologies on-farm and along the supply chain will inevitably be determined by highly motivated and forward-thinking individuals and entrepreneurial organisations best able to use, adapt and exploit the opportunities presented by new and emerging technologies.

The pace of change in the development of new and emerging technologies in the agri-food and fibre industries is accelerating at a faster rate than we have ever seen before. Unless we learn to become more adept and adaptive in response to fast-moving technology-driven change more rapidly than our existing competitors and/or within a new product category, then we run the risk of following the same trajectory as the New Zealand strong wool industry that was unable to respond quickly enough to synthetic fabrics when circumstances demanded it.

Conclusion

New and emerging technologies and their associated business models have the potential to massively disrupt our traditional farming methods and heavily influence consumer purchasing behaviours in the future.

Significant advancements are already being made in the development of plant-based meat and milk alternatives, big data, artificial intelligence and blockchain technology, to name a few. We are also witnessing the technical boundaries of research endeavour being extended further in the development of areas such as new sensory technology, lab cultured food proteins, nanotechnology and (with some certainty) other new technologies.

The race is on, and if we don't learn to become more adept at identifying and exploiting new technologies and rapidly changing consumer preferences, then we risk falling behind current and new competitors in the market who potentially have greater capability to take advantage of the opportunities presented by them than we do.

Instead it will be how we use, adapt and exploit new and emerging technologies more quickly and effectively than our competitors will be where the opportunities are for New Zealand's agricultural sectors. However, this must be more than simply seeing new technologies as a way of sustaining our existing business models and practices.

Critical to this will be our ability to quickly build the capabilities of highly motivated and talented individuals and entrepreneurial organisations to sense, seek out and exploit opportunities in establishing a competitive advantage for New Zealand agri-food and fibre products within an increasingly dynamic market environment.

Undoubtedly this will represent a significant challenge for individuals and organisations involved within our industry, but as the great Winston Churchill said:

'This is no time for ease and comfort. It is time to dare and endure.'

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