



THE
Cacophony
PROJECT

Moore's Law – twice as good or half the price every
18 months

Open source – collective speed intelligence

What is your Cacophony Index?



Very inexpensive environment monitoring tool

Runs on any Android phone

Collects sound in 3 minute periods around dawn and dusk and on the hour every hour

Automatically uploads to the cloud (wifi or cell phone – free spark data)

Solar powered – only does dawn and dusk if power limited (power monitored remotely)

Next work – walk by blue tooth data pick up for remote areas

Why lots of subjective monitoring is important

Need to know what is happening to trends over time in different areas.

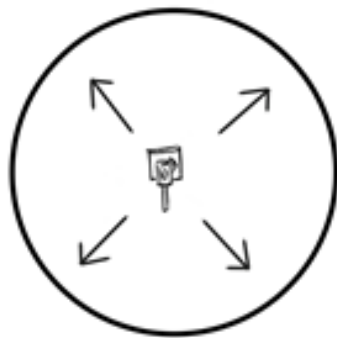
Currently don't know for sure if bird numbers are get better or worse

Don't know at what rate they are changing in different areas

Don't know what is actually making the biggest difference

The data can be reanalysed at any time in the future – eg run a tui filter to work out trends in Tui numbers

Modern I.T



100 x Arena



20 x Lifeline
(solar)



4 x Types
of Predators



10 x
the catchrate

80,000
Times Better

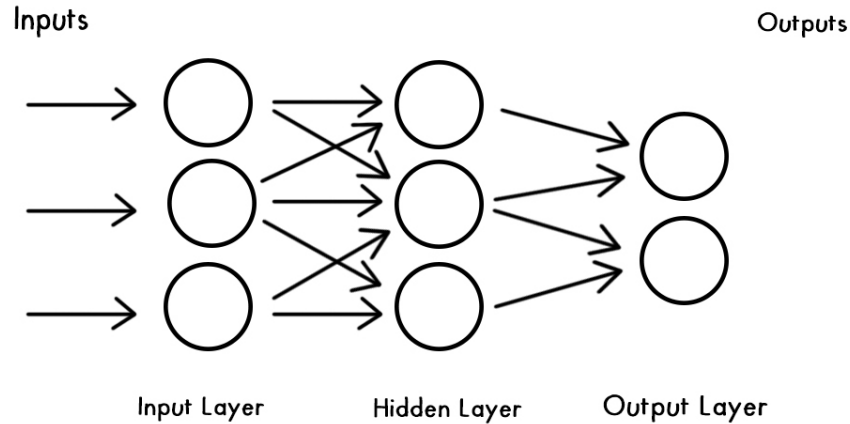
Optimal camera for predator control



Video tool optimised
for New Zealand
predators

Predator recognition 100%

Artificial Intelligence - machine learning...



Device effectiveness

Complete guess						
Some data						
Strong data						
Animal traps	Possum	Rat	Stoat	Rabbit	Hedgehog	Mouse
Good Nature	< 5-30%	< 15%	< 10%			
Timms (or other head-in-hole, over-centre-trigger traps, e.g., Trapinators)	< 5-30%	< 15%				
Leg hold	< 65%					
Doc 200		< 30%	55%			0%
Poison station	?	?	?	?	?	?
Live capture		?			100%	
Spitfire	30%	<30%	55%			
Animal tracking tools	Possum	Rat	Stoat	Rabbit	Hedgehog	Mouse
Tracking tunnel		<30%	55%			
Motion sensor cameras	95%	95%	75%			
Chew cards	50%	30%	10%			
Real time motion camera	100%?	100%?	100%?			

Digital lures – social sounds

Cover much larger area

Species specific

Longer lasting (not eaten by non targets)

Even more effective in reinvasion or low numbers

May only need to attract and kill half population (males/females)

Evolve faster than predators



Digital lures summary

P = Theoretically possible,,					
E = some evidence it works (literature and or our testing)					
V = looks very useful and promising					
	Possum	Rat	Stoat	Rabbit	Cat
Listen to hear if they are out there	P	P	P		
Sound call to get a response to confirm if they are there.	V				
Digital sound to draw into the trap area (caught on video)	E	P	P		E
Digital image to draw into trap area (video records them)	E			E	
Sound/image to hold the pest for long enough for AI identification	E				
Sound/image hold the pest in area enough for a identification and kill	P				
Sound that can be used as a deterrent	V				

Cacophonometer

X = Done			
s=started working on			
	V1 working	Field testing	Consumer product
Recording the environment			
Record sound	X	s	
Record video	X	s	
Motion sensor initiates video	X	s	
Infra red light active video	X	s	
Video optimized for NZ pests (rats stoats possums)	X	s	
Heat camera - no need for extra light	X	s	
Ap on phone to set recording times	X	s	
Power system			
Solar powered	X	s	
Power management system	s		
Additional battery	X	s	
Communication system			
Upload data to cloud (wifi and cell)	X	s	
Mesh network for devices talking to each other			
Satelite data upload			

Cacophonometer

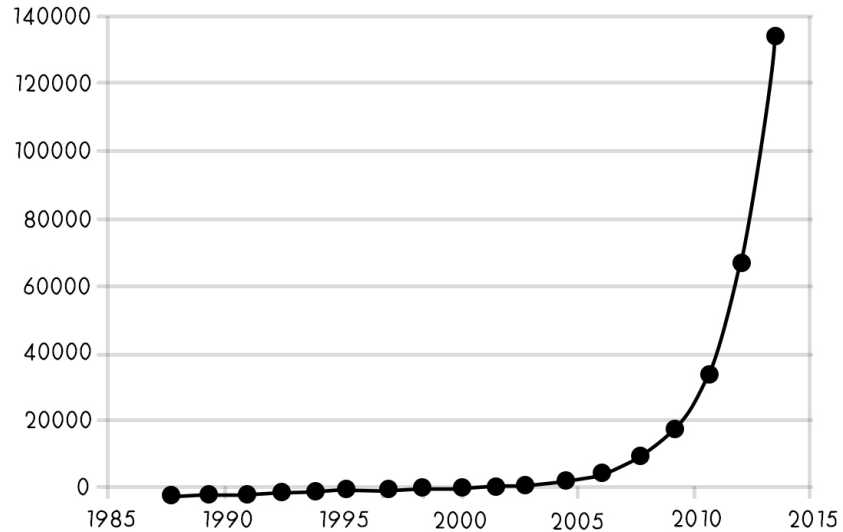
Data management		
Cloud storage system	X	
Data query interface	X	
Manual data upload	s	
Data base indexing	X	
Digital lures		
Speaker to play sounds	X	s
Screen to play images	X	s
First experiments with sound and audio lures	X	s
Adaptive sound and audio lures		
Mechanical design for in field	X	
Analysis		
Machine learning on phone to determine animal types		
Active listening for pests		
Cacophony index calculation		
Machine learning on cloud - pest identification	X	
Device for eliminating pests		
Poison squirting		



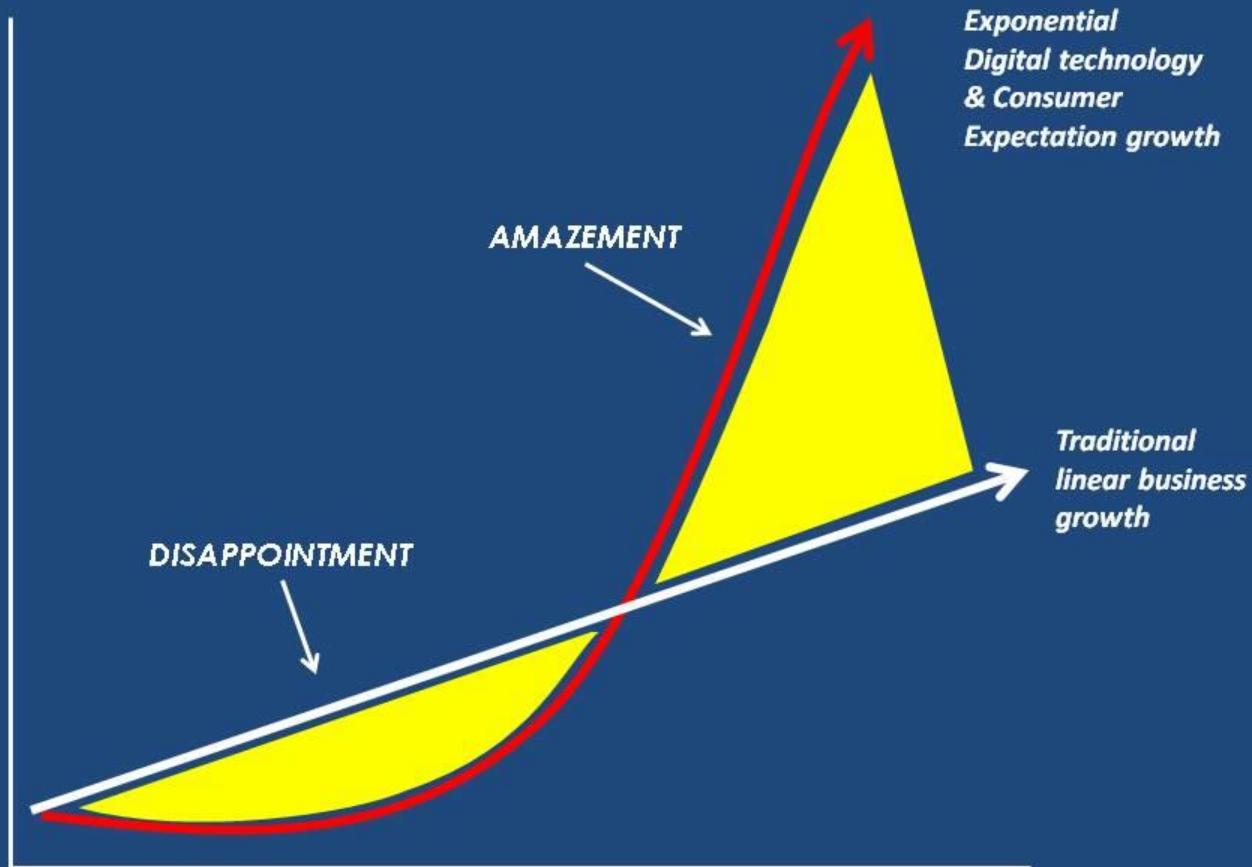
List of project for next phase

- Device that can monitor 100% of predators with AI
- Get real data for effectiveness of existing traps and monitoring
- Rapidly test lots of digital lures (sound and light)
- Identify at a distance predators in area
- 100% kill method – paint ball, spay, aerosol, infrasound, poison dart

Moore's Law - Impossible becomes normal



LINEAR VS EXPONENTIAL GROWTH



Open Source is a beautiful thing

Cameron Ryan-Pears - Main engineer for project

Dave Lane - Open source design and Drupal CMS integration

Tim Hunt - Ap development

Brent Martin - Machine learning (University of Canterbury)

Tim Sjoberg (ZIP) - animal behaviour

Elaine Murphy (DOC/Lincoln) - animal behaviour

Matt Kavermann - Digital lures

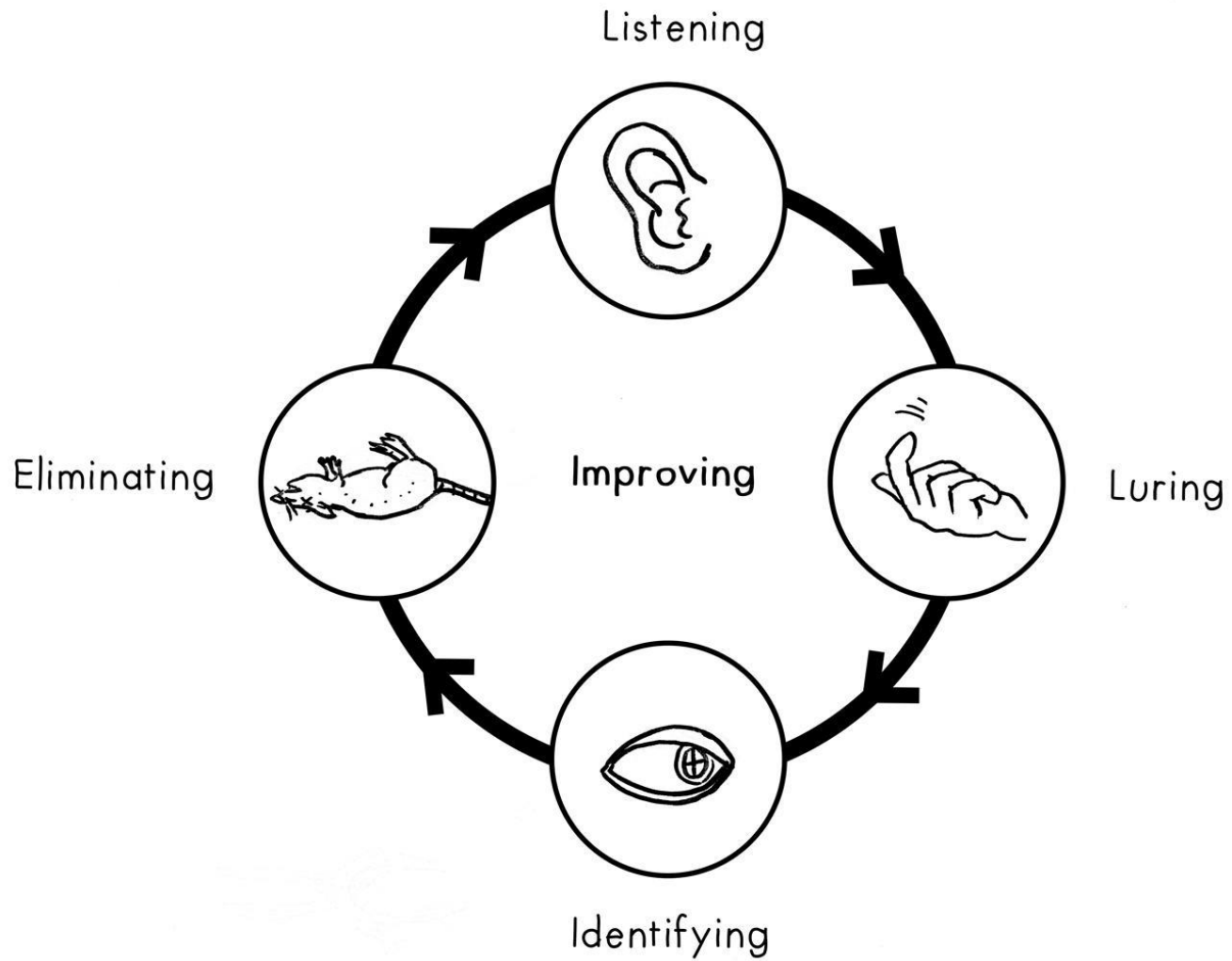
Jessica Lyons - Social media

Michael Busby - Website design and development

Max Johns - Content

Gray Rathgen - Designer

Roger McKenzie - Technical advice



Technology stack

For our Cacophonometers, we are using the following technology stack:

Android (4.0 or better) OS

Android SDK and developer tools

Commodity hardware including Raspberry Pi

For server components:

Linux Server (virtual instances) - Ubuntu 14.04 LTS

Node.JS (and various related javascript plugins for creating RESTful web services)

PostgreSQL

Amazon S3 for sound data storage