

AI Workshop: Empowering NPOs to Deliver Impact With Data-Driven Decisions



PennState

April 11th, '23

Innovation Titan



NPO AI Readiness Workshop - Report

Executive Summary

Penn State University conducted the NPO (Non-Profit Organization) AI Readiness workshop in Pittsburgh on April 11th, 2023. Funded by the PIT-UN grant, the half-day event saw participation from seven high-impact NPOs working on areas such as tree conservation, public mobility, energy conservation, city planning, river conservation, and land use strategies.

Innovation Titan, a partner organization of Penn State Nittany AI, conducted the event. The team brought a decade of AI thought leadership and experience helping NPOs around the world embrace public interest technology and AI-driven solutions.

Planned in a workshop mode, the AI workshop was geared to educate NPOs on public interest technology such as data, analytics, and AI. The sessions demystified the foundational concepts and demonstrated the art of the possible by showcasing how non-profits worldwide leverage AI for social good.

AI Readiness assessment was conducted to help the NPOs reflect on their organization's preparedness with data maturity, analytical capability, and ability to adopt AI technologies. Actionable analytics frameworks were presented to help the NPOs ideate on impactful and practical initiatives they can implement to serve their organizational mission.

The sessions were designed to enable students to brainstorm alongside the NPOs, share their experiences from Nittany AI NPO internships, and identify ways to help NPOs embrace data-driven decisions. The workshop provided an exceptional opportunity for experiential learning by helping them solve real-world challenges with public-interest technology.

In the workshop, the NPOs identified a total of 21 high-impact ideas and expanded them by identifying their organizational impact. They expanded each idea into a brief project charter by detailing the potential, technology feasibility, and readiness to begin execution.

To help the NPOs implement the ideas, educational materials and useful resources from Penn State were shared. The common pitfalls to watch out for while implementing AI were shared by industry experts and the students based on their internship project experience. The NPOs expressed high interest in pursuing the project with the help of Nittany AI outreach initiatives such as the 'Advance' student internship projects and Nittany AI for Good Expo.

Workshop Objectives:

The workshop was conceived with a five-point objective:

1. Demystify public interest technology such as data, analytics, and AI for non-profit audiences and help them understand the building blocks of impactful solutions.
2. Demonstrate the art of the possible with AI by showcasing exceptional implementations of technology by non-profits worldwide.
3. Assess the data and AI readiness of NPOs through a structured survey. The questions were structured to promote dialogue and exchange of best practices amongst the NPOs.
4. Identify high-impact projects by each NPO in a workshop mode in partnership with students and industry experts.
5. Embed students as a part of the process to help them learn, share, and ideate along with non-profit leaders to provide an immersive learning experience.

Attendees:

The workshop saw participation from leaders from the following NPOs operating in the city of Pittsburgh:

- Tree Pittsburgh
- Green Building Alliance
- Grounded Strategies
- Allegheny County Conservation District
- City of Pittsburgh: Department of Mobility & Infrastructure
- Mobilify
- City of Pittsburgh: Planning

Approach:

The workshop was designed to bring in impactful public interest technology case studies, industry frameworks, insightful maturity surveys, and actionable resources throughout the 5-hour session. Here's a summary of the approach adopted:

a. Demystify Public Interest Technology

The session helped non-profit participants understand basic terminologies such as data, machine learning, artificial intelligence, data visualization, and decision intelligence with accessible explanations and insightful examples.

b. Demonstrate the Art of the Possible with AI

To inspire the NPOs, a curated set of case studies were selected and presented across a wide variety of areas relevant to the participating NPOs - protecting rain forests in Indonesia, using drones to measure the impact of forestation in Tanzania, bridging inequity in public transportation in Sierra Leone, and conserving energy in public buildings in the US.

c. Assess AI Readiness

A comprehensive quantitative survey was conducted on Mentimeter that polled NPOs on various areas such as data strategy, sourcing of data, analytical insights, and data literacy of end users. The results were used to illustrate how organizations mature with data and why they must plan this as a process instead of standalone projects.

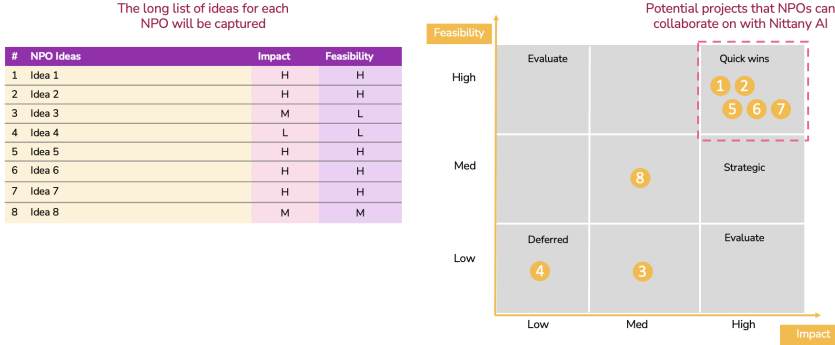
d. Identify High-Impact Projects

A proven industry framework to identify and prioritize projects was presented to the NPOs. Over breakout working sessions, NPOs brainstormed with industry experts and students to identify practical initiatives to solve their organizational challenges with AI.

e. Provide actionable resources for Implementation

To aid the NPOs with the implementation of the identified projects, educational materials, and ongoing support resources were provided through the Penn State network and Nittany AI outreach programs.

Innovation Titan Framework: How were each NPO's ideas prioritized?



(Picture: Preview of the framework leveraged)

Outcomes:

The half-day workshop helped identify 21 high-impact initiatives that leverage public interest technology, such as data, analytics, and AI. Every idea was detailed into a project brief to highlight the challenge addressed, target stakeholders, potential impact, the measure of success, and technology feasibility assessment.

Green Building Alliance - Project 1

Key Initiative & Project (Idea)	<p><i>What challenge does this idea address? Explain the idea in brief?</i></p> <ul style="list-style-type: none"> Key Initiative: 2030 District Project: Predicting impact on carbon emission reduction based on performing retrofits.
Measures of Success	<p><i>What are the criteria to evaluate the success of the project?</i></p> <ul style="list-style-type: none"> If the project is reducing energy usage or carbon emissions of buildings
Potential Impact	<p><i>A brief about the impact that would be created by this project</i></p> <ul style="list-style-type: none"> Existing Buildings 50% to 65% reduction by 2030; By 2040 reduced to zero New Buildings should be carbon neutral from initial design
Technology Feasibility Comments	<p><i>Your thoughts on the various technology to be used in the project</i></p> <ul style="list-style-type: none"> Data Gathering can be complicated and there is no clear source of data. Energy is affected by various factors, making the data needed unclear or changing.
Stakeholders	<p>Sustainability Consultants, Architects & Engineers</p>
Impact Classification (L/M/H)	<p>High</p>
Tech Feasibility Classification (L/M/H)	<p>Low</p>

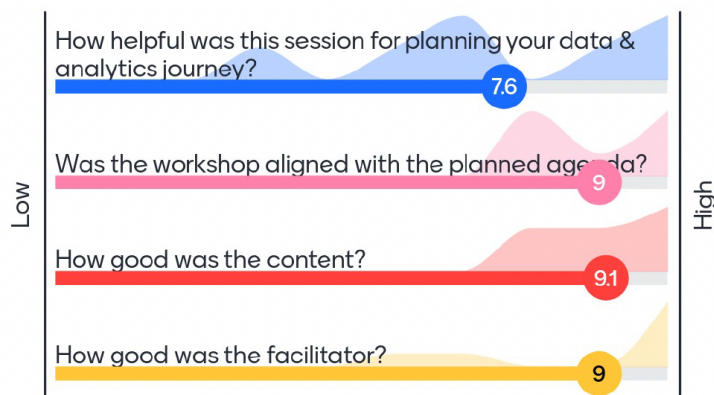


(Picture: Project brief template used to expand each identified idea)

To assess NPO attendees' experience and evaluate how the objectives were met, anonymous feedback was collected at the end of the workshop. The feedback demonstrated that the audience left the session inspired, and the event delivered way beyond the expectations.

(2/4) Thank you for participating in the workshop! Please share your feedback

Mentimeter



(Picture: Audience feedback collected on Mentimeter)

Select reactions from the attendees:

- “One challenge that we have is whether we have anyone on staff that has training or a thorough understanding of what AI has to offer. That is why this workshop was so important. It allowed me to bring back knowledge and understanding so we can best chart a path forward.” - **Kelsey Munsick, Community Tree Specialist, [Tree Pittsburgh](#)**.
- The workshop helped to better explain how machine learning models are built, as well as give concrete examples of how other nonprofits have used them to their advantage.” - **Paige Coloa, Director of strategy and analysis, [Green Building Alliance](#)**
- “Nonprofit organizations (NPOs) could view AI as being out of reach and become left behind as technology progresses. For this reason, it is crucial that NPOs understand how to leverage AI effectively and efficiently, to ensure the best use of finite resources. ACCD looks forward to working alongside

Penn State and the Nittany AI Alliance as we evaluate how this powerful technology could help us best serve local communities and promote our organization's mission." - **Kalin Drennen, resource conservationist for [Allegheny County Conservation District \(ACCD\)](#)**

- "I was really interested in seeing how AI could be used to make a difference. It is cool to be part of a project and see how new technology can play out in terms of helping people." - **Poorvika Vijayanand, Student, Penn State University**
- "I think it was a very useful exercise for both parties, for us and for them, to help them come up with ideas and some unique solutions. I think it inspired a lot of conversations that I don't think would have happened and a lot of different project ideas on ways they could use AI that they didn't realize could make their life a little easier." - **Thomas Foltz, Student, Penn State University**

Slide Deck Used In The Workshop



What's in it for you?



Art of the Possible with AI

Get inspired by AI's potential for NPOs & the challenges to avoid



4 Steps to a data-driven NPO

Find out what it takes to get there and how you can get started



Assess NPO's data readiness

Get a quick sense of the level of preparedness and potential gaps



Pick & plan high-impact projects

Identify high-potential projects that you can quickly implement



Workshop Schedule

<p>Session:</p> <ul style="list-style-type: none"> • Top misconceptions NPOs have about AI • Art of the Possible with data & analytics • Making sense of the key AI terminologies • Agenda overview 		<p>Session: The 4 steps to bring ideas to life</p> <p>Breakout:</p> <ul style="list-style-type: none"> • AI Readiness Survey & recommendations to level up • Identify feasibility of each idea identified 		<p>Session:</p> <ul style="list-style-type: none"> • Top execution issues to plan for – people, process, technology • Overview of Nittany AI Advance • SEPTA: Project overview 	
<p>Demystify basics and share Art of the Possible</p>		<p>Assess AI readiness and ways to level up</p>		<p>Journey from initiative to implementation</p>	
<p>Keynote (30 min)</p>	<p>Ideate (60 min)</p>	<p>Assess (45 min)</p>	<p>Prioritize (45 min)</p>	<p>Plan (30 min)</p>	<p>Next Steps (30 min)</p>
	<p>Brainstorm challenges to address with AI</p>		<p>Pick the best ideas on impact & feasibility</p>		<p>Nittany AI partnership avenues & wrap-up</p>
	<p>Session: How to pick high-impact ideas</p> <p>Breakout:</p> <ul style="list-style-type: none"> • Identify potential organizational issues • Capture likely outcomes and magnitude of impact 		<p>Session: Why AI initiatives fail to deliver</p> <p>Breakout:</p> <ul style="list-style-type: none"> • Map ideas on 2x2 framework • Prioritize short-term/long-term roadmap • Detail top ideas 		<p>Session:</p> <ul style="list-style-type: none"> • Share Penn State resources for NPOs data journey • AI Advance: Next Steps • Workshop recap and feedback



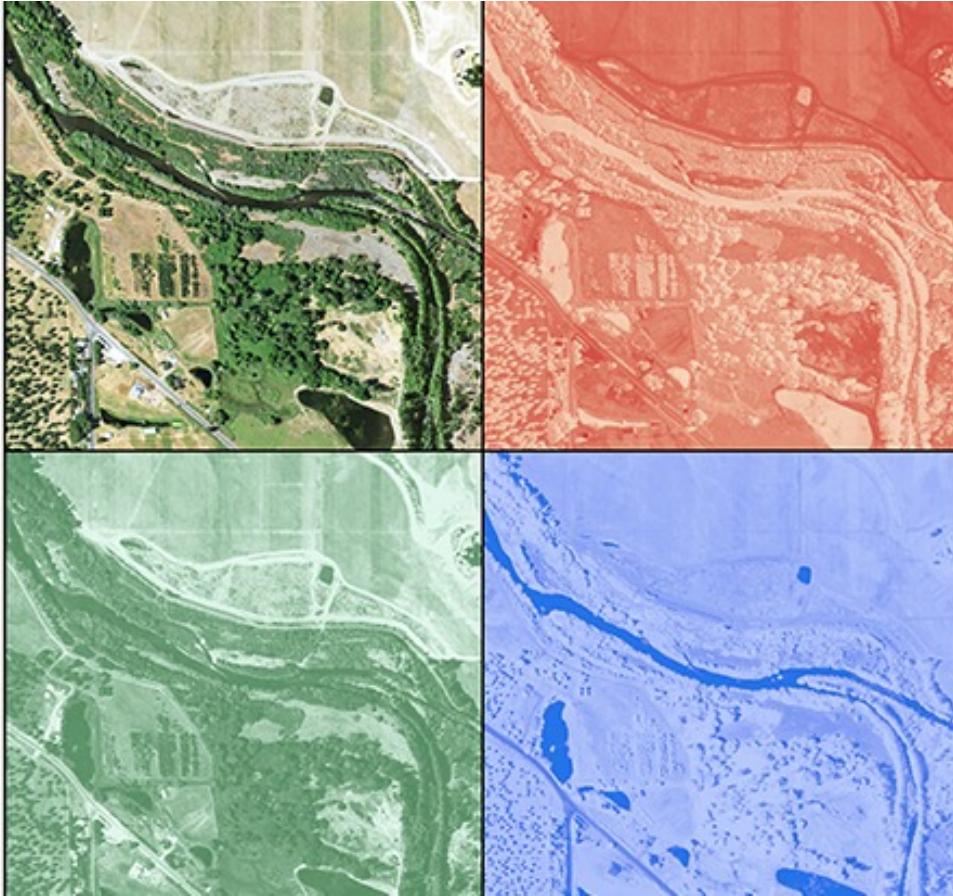


**Delivering
Impact With
Data-driven
Decisions**

The top challenges for Data & Analytics often reported by NPOs



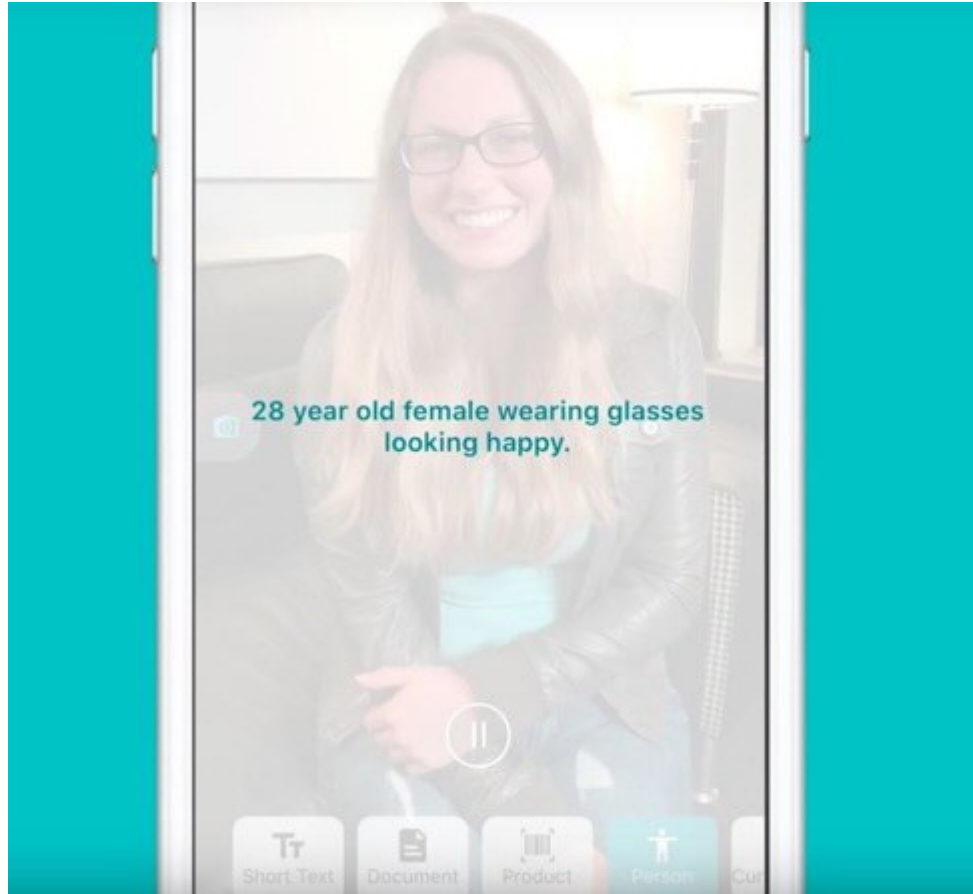
1. No (in-house) Data: Restoring gaps in watersheds using ML



(RBG coloration of the top-left image to find canopy height)

- The Freshwater Trust uses AI to fill data gaps in watersheds to improve water quality & fish habitat
- Planting native trees and shrubs along a river keeps its water cool & improves quality by avoiding runoff
- LiDAR, a remote sensing method helps assess tree heights in watersheds. When this data is not available, aerial imagery is a great substitute
- AI helps ascertain places where trees need to be planted apart from predicting canopy heights
- Example: In McKenzie river, 11.8 acres were planted benefiting two salmon species apart from rejuvenating the local communities.

2. No Budget: Solving problems with open-source and free AI



- AI can help visually impaired by providing navigation assistance using smart phones
- Microsoft launched “Seeing AI”, a free AI app, for the visually impaired in 70 countries
- The app narrates the world around the user by turning the visual world into an audible experience.



mb0392, 04/20/2018

Most useful app in my phone right now.

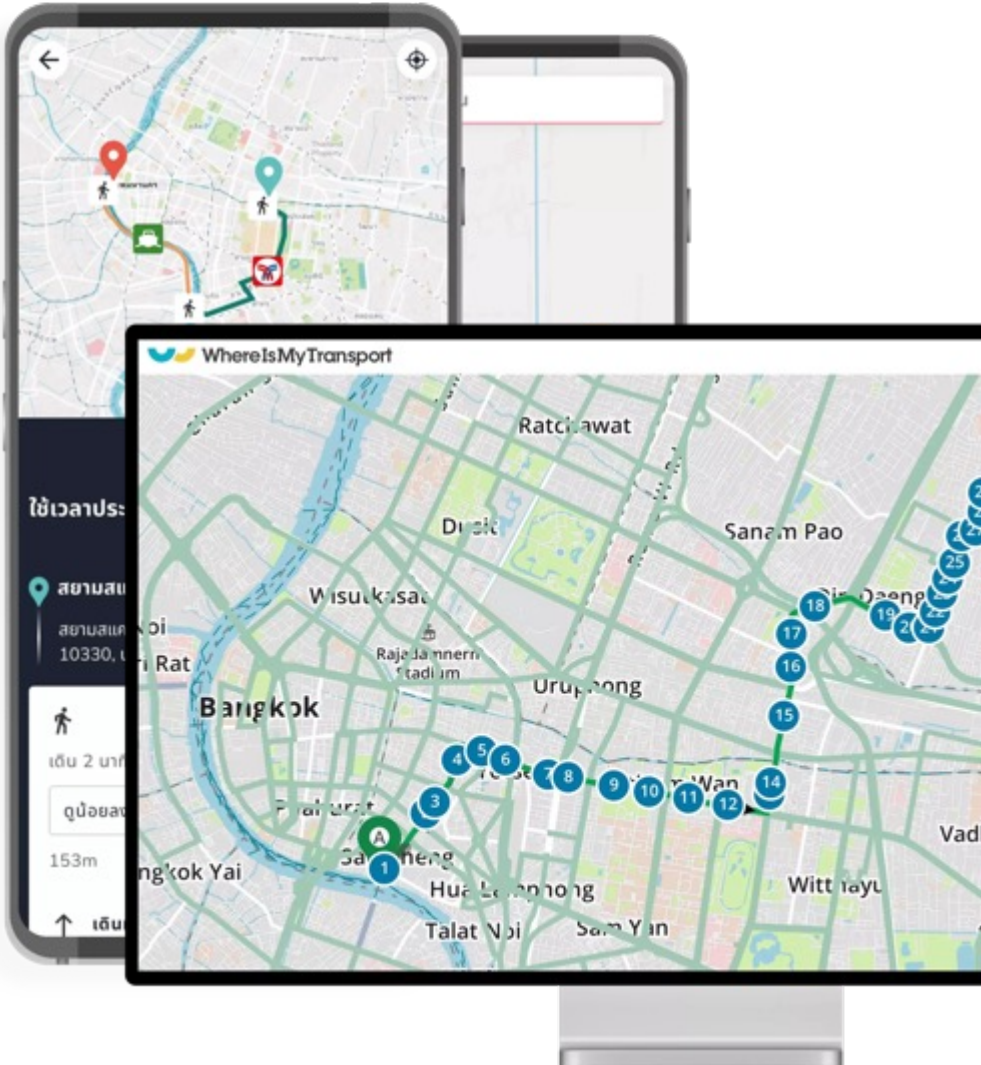
I would recommend this app to anyone who is completely blind, or low vision like me. The best parts of this app for me are it's ability to read short text on the fly, or capture entire documents in just a few seconds. This app rivals paid apps like DigitEyes and KNFBReader. I can't speak for KNFBReader as I don't own that app, but SeeingAI, in my experience, detects products just as good or even better than DigitEyes, as for it's recognition of text on paper or a computer screen, I've not had any complaints about it. Things that need improvement are the money reader, scene recognition, and color recognition. Those features are relatively new, so I expect them to improve with updates. The app gets a five star recommendation from me, for anyone with even a slight visual impairment.

3. No Tools: Detecting plant health using the mobile phone



- PlantVillage, an R&D unit at Penn State University created an app called 'Nuru' to assist farmers.
- It uses a phone camera to analyze pictures of diseased plants.
- It developed an ML model to identify and manage these diseases quickly by simply using its phone app
- Helps improve yield for a staple food that feeds over half a billion in Africa daily

4. No (in-house) Team: Sierra Leone Govt transforms public transit



- Sierra Leone govt and World bank wanted to improve transit network in Freetown (1 mn people)
- But no data was available. WhereIsMyTransport used novel data tools to gather data in 22 days
- 2500 miles of formal & informal public transport across ferries, taxis, and buses covered
- This data combined with free Open Street Map (OSM) road network data and public socioeconomic data (education, health, tourism..)
- This analytics helped identify 5 key transport corridors in the city and support a \$50 Mn program
- Established as a model approach for other countries



Making Sense of Data & Analytics

The lifecycle from **data** to **decisions**

Data

Data is a set of collected observations or measurements. It can be...

a) Quantitative - numbers



surveys



temperatures



measurements

b) Qualitative – unstructured formats



field notes



photographs



videos



documents



audio recordings



transcripts

The lifecycle from **data** to **decisions**

Data

Analytics

Analytics is the discovery of meaningful patterns in data to aid understanding and decisions



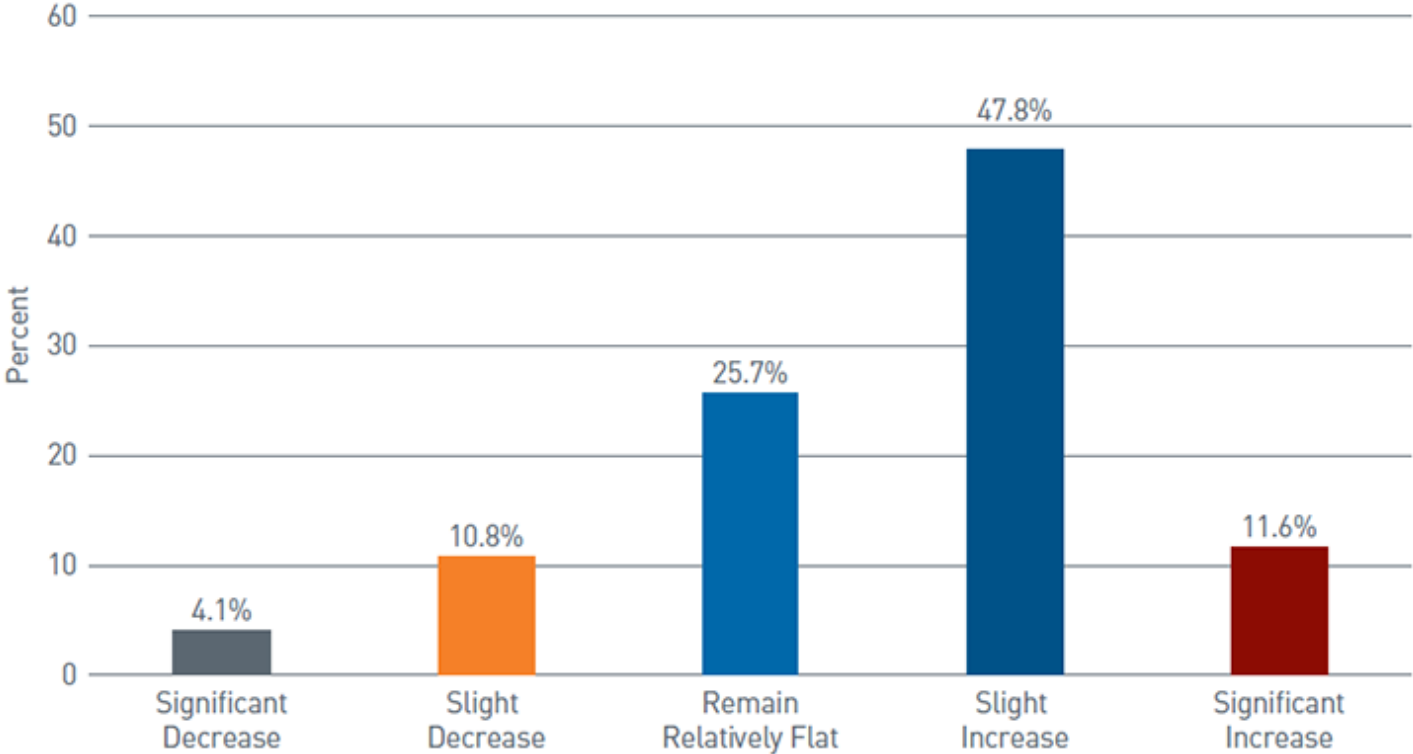
The lifecycle from data to decisions



Data

Analytics

Almost 60% of NPOs planned to increase their spending



Source: PNC; data as of 9/21/2021¹

Descriptive Analytics

The lifecycle from data to decisions

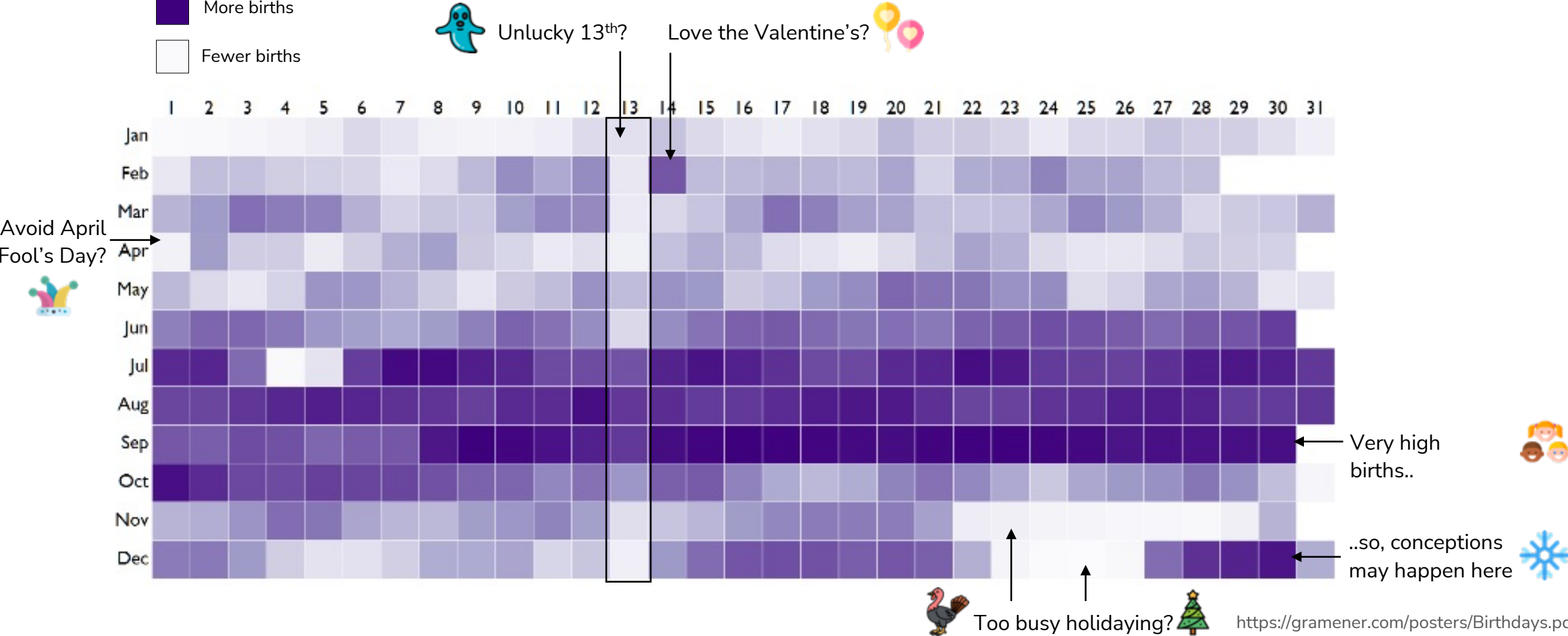


Data

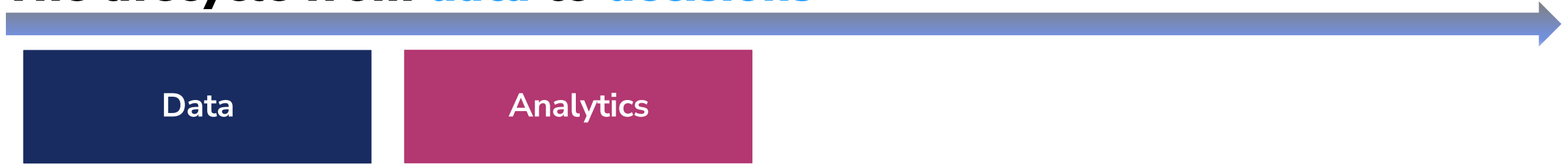
Analytics

Diagnostic Analytics

More births
Fewer births



The lifecycle from data to decisions

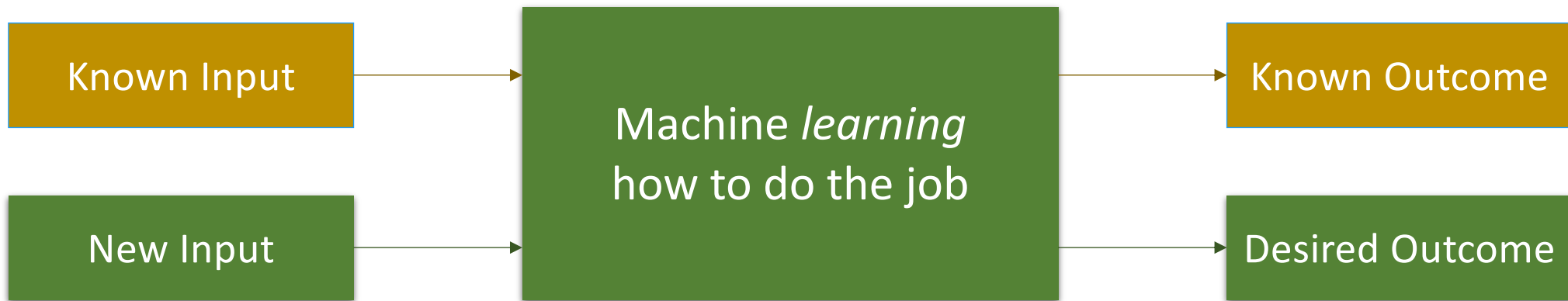


Predictive Analytics

“Programs that solve the problem”

vs

“Programs that **learn** to solve the problem”



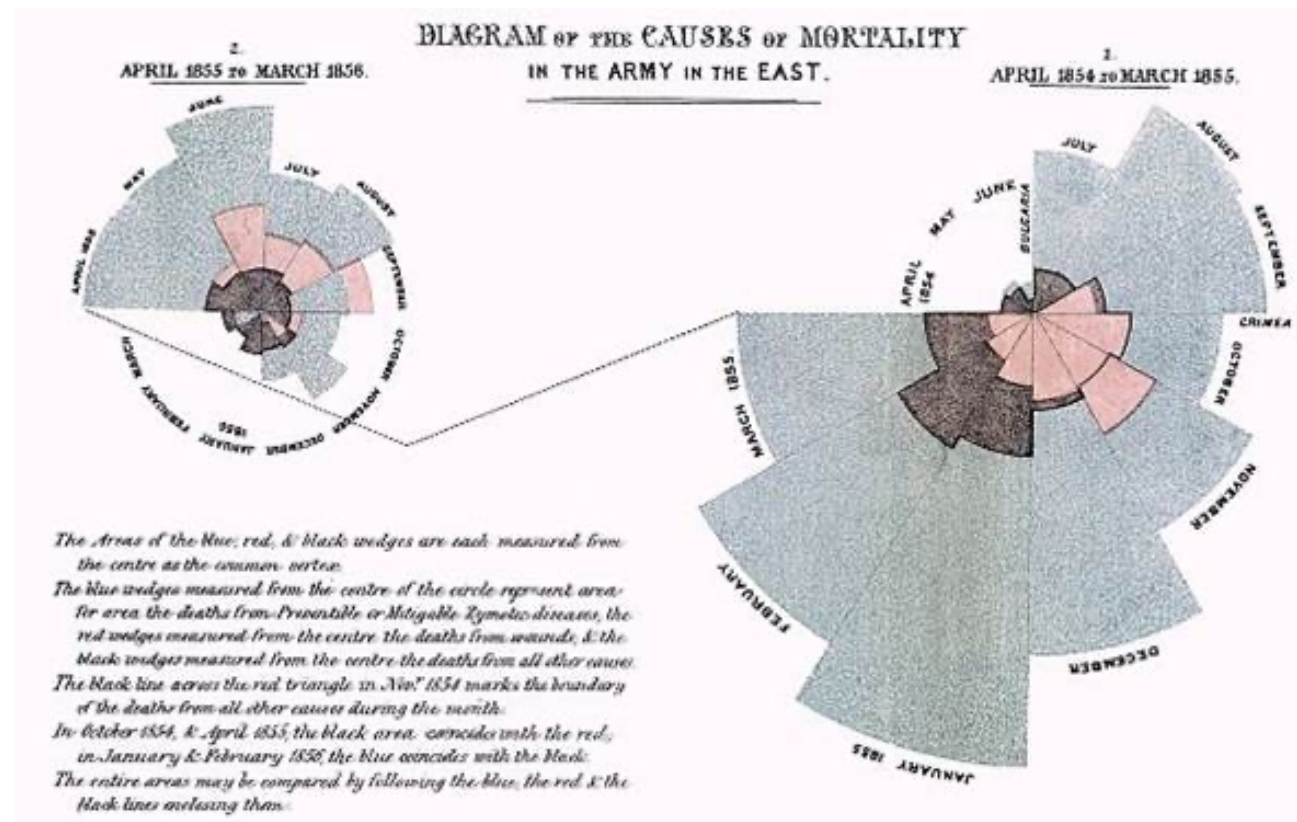
The lifecycle from data to decisions

Data

Analytics

Visualization

Data visualization is the representation of data through use of common graphics, such as charts, plots, infographics, and animations.¹



The lifecycle from **data** to **decisions**



Decision intelligence enables the translation of analytics **insights** from **data** into actionable **decisions** to solve **organizational problems**.

The lifecycle from data to decisions

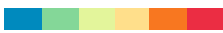


Input
Satellite Imagery (50 cm resolution)



Output
Gridded Maps (50m * 50m)



High Density of Wild Mosquitoes  Low Density of Wild Mosquitoes



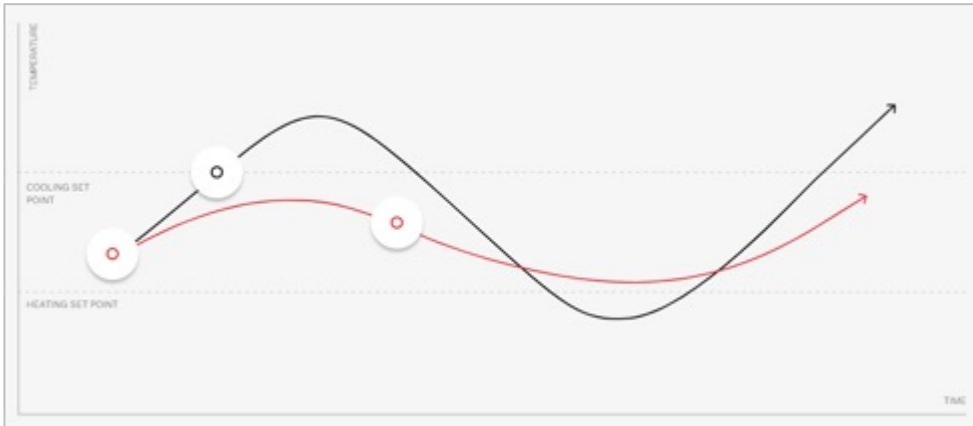
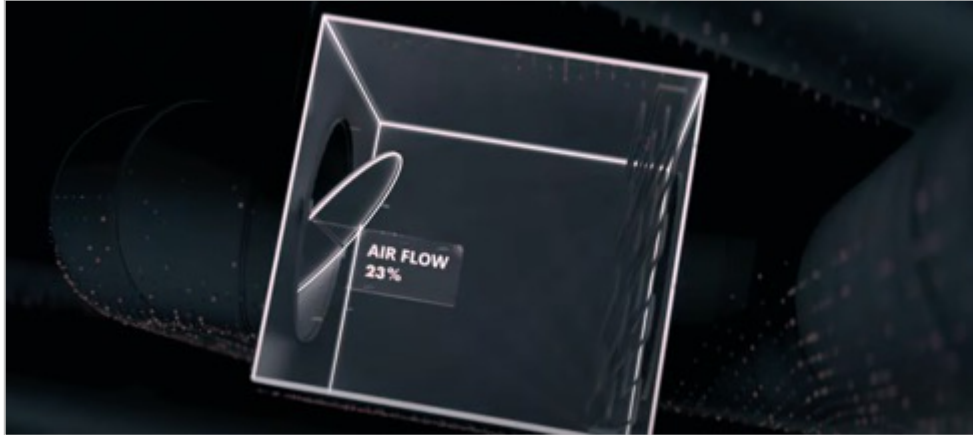
NPOs: Art of the Possible with AI

Protecting rainforests with bioacoustics and big data



- Every two seconds, an area of rainforest the size of a football field is destroyed.
- Using audio data from mobile technology in treetops, known as 'guardians', Rainforest Connection is listening in to the forest
- It has over 107 million minutes of audio collected
- AI can now detect 3200+ species in real time, apart from sounds of guns, chainsaws and trucks
- Models predict logging activities even before they happen and alerts local rangers
- This model has achieved 80% confidence interval, this advance warning helps take actions faster.

Optimizing building energy consumption with AI



- Buildings take up ~40% of US energy consumption. HVAC systems use 45% of which 30% is wasted
- BrainBox AI uses AI to optimize buildings' heating and cooling needs.
- Connects to HVACs and utilizes existing sensors and data, along with third-party resources such as weather forecasts and occupancy information
- For example, east-facing offices may require more cooling in earlier parts of the day as the sun rises.
- Impact: Reduction in energy consumption by 25%. Lower carbon footprint by 40%. [video](#)

Detecting weeds using aerial imagery and AI



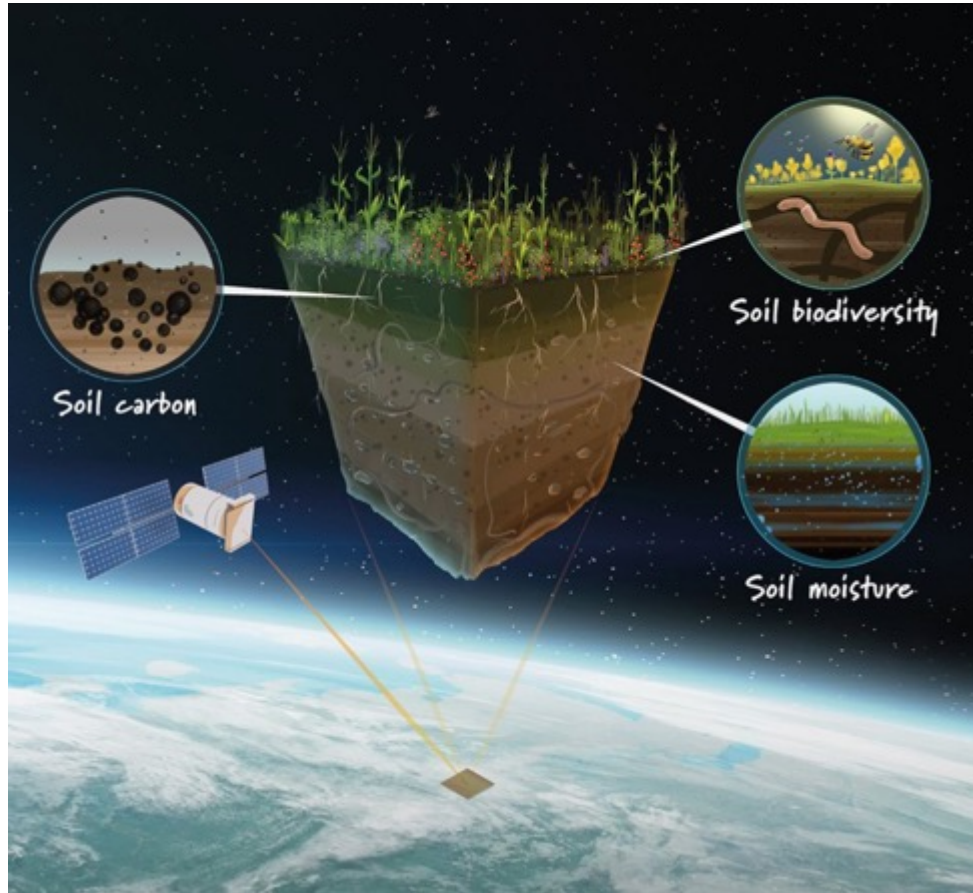
- Weeds decrease harvest yields and reduce farmer's income
- Picterra uses AI models to automatically detect weeds using drone imagery
- It used to take 3 hours to manually identify weeds from images of a 40-acre field.
- The model saved 66% effort, with high future scalability. The model achieved high accuracy in detecting weeds.

Measuring impact of forestation with drones and AI



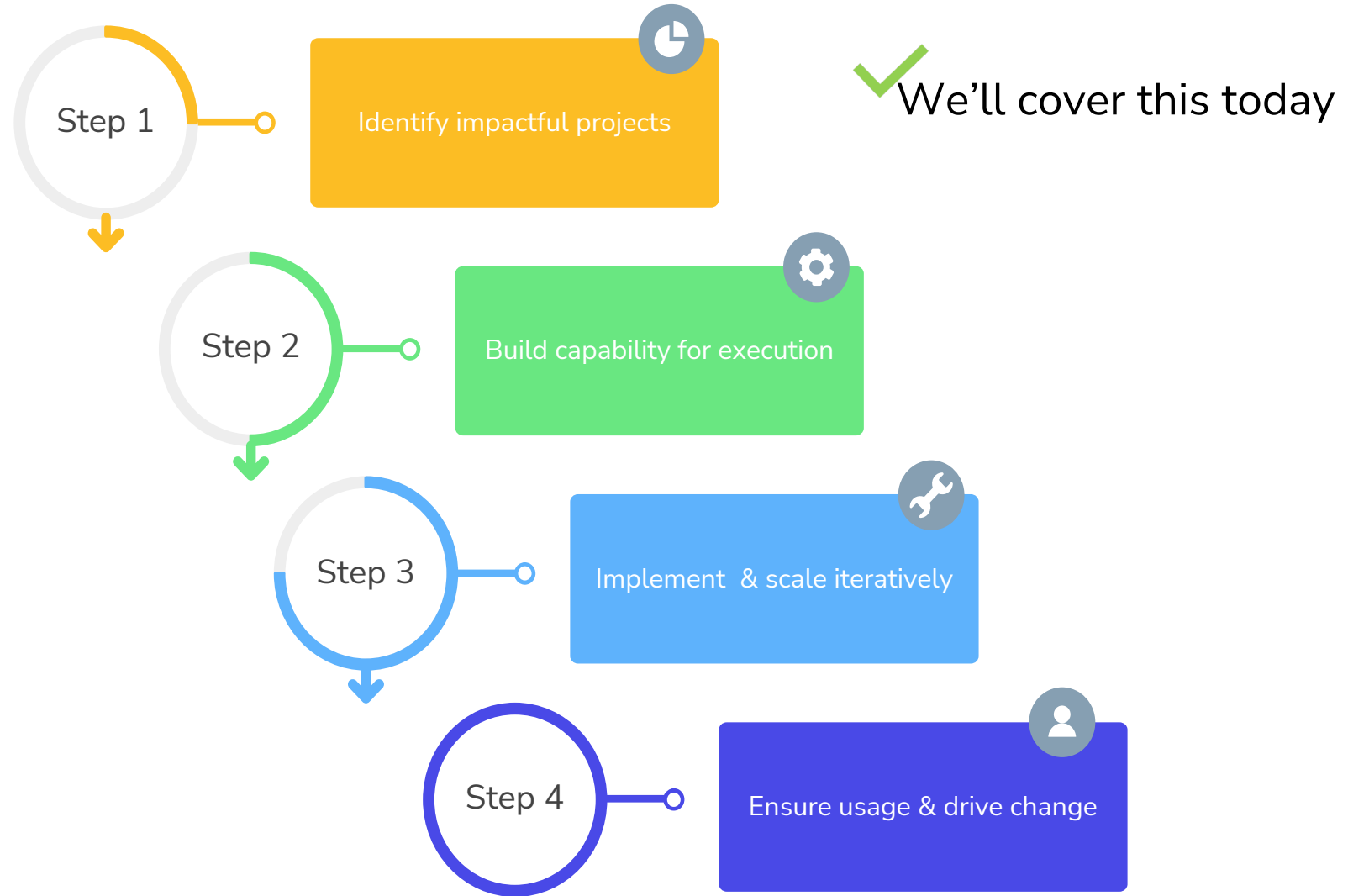
- Justdiggitt is a non-profit organization on a mission to regreen Africa in the next 10 years
- One technique used in 'Treecovery' which involves regrowing living tree stumps, by selecting, pruning and protecting them.
- Lynxx developed a new computer vision model to detect trees and their sizes in drone images.
- Impact: Fast and accurate insight into number of trees and its development over time. It helps track projects for efficiently and show positive impact to donors and farmers involved.
- In the Dodoma region of Tanzania, 9.1 million trees have been regenerated

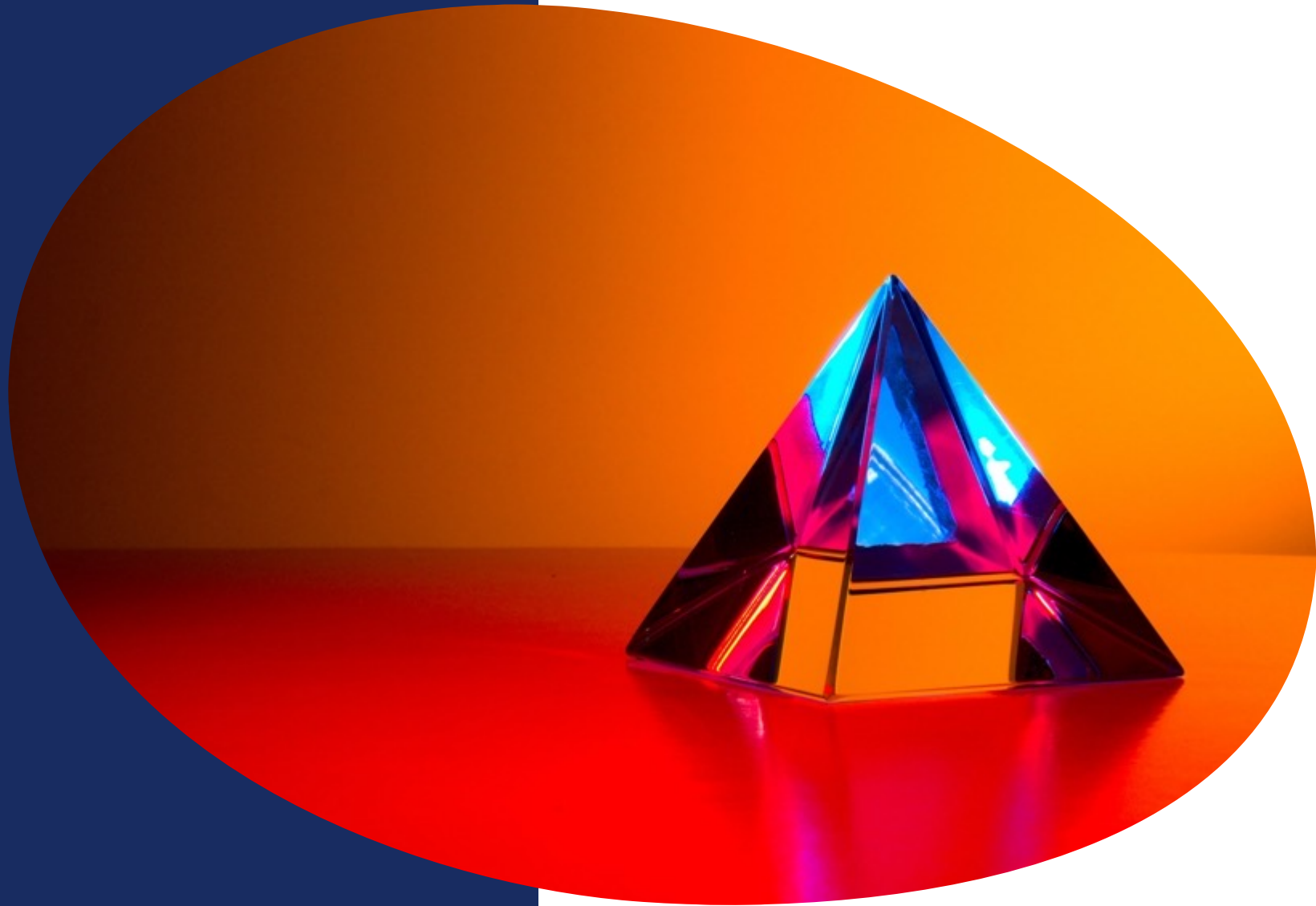
Improving soil quality and yield with 3D soil maps



- To remain competent, AgriLife needed to increase their production yield as if they had acquired extra land.
- To achieve this, they needed a clear understanding in real-time of what was going on in their soils.
- Smart Cloud Farming used high-definition satellite imagery with soil sensor data to model the surface up to 30 cm depth. Mapped soil organic carbon, soil biodiversity and soil moisture with AI to analyze.
- Used less pesticides. Rearranged crop distribution with a tailored fertilizer plan
- Increased yield by 8%. Avoided non fertile parcels of land for farming, thereby saving resources.

The 4 steps to help you become data-driven





Data Readiness Assessment

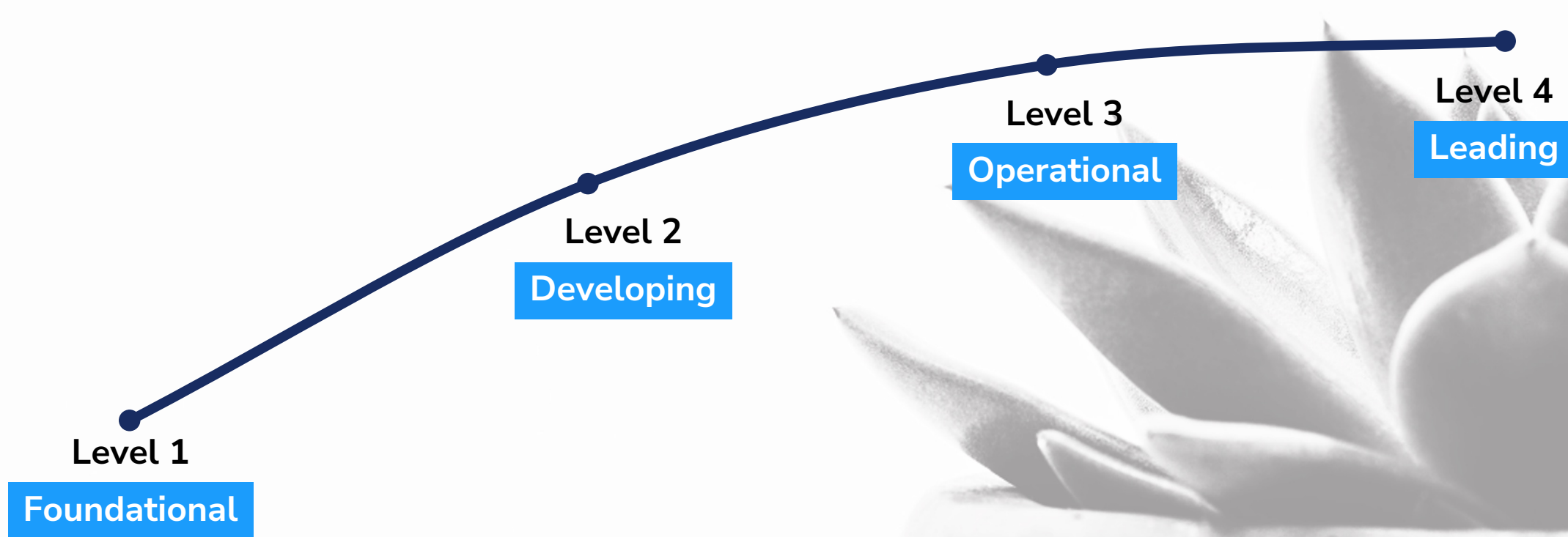
Data Readiness Poll

(Please respond using your mobile)

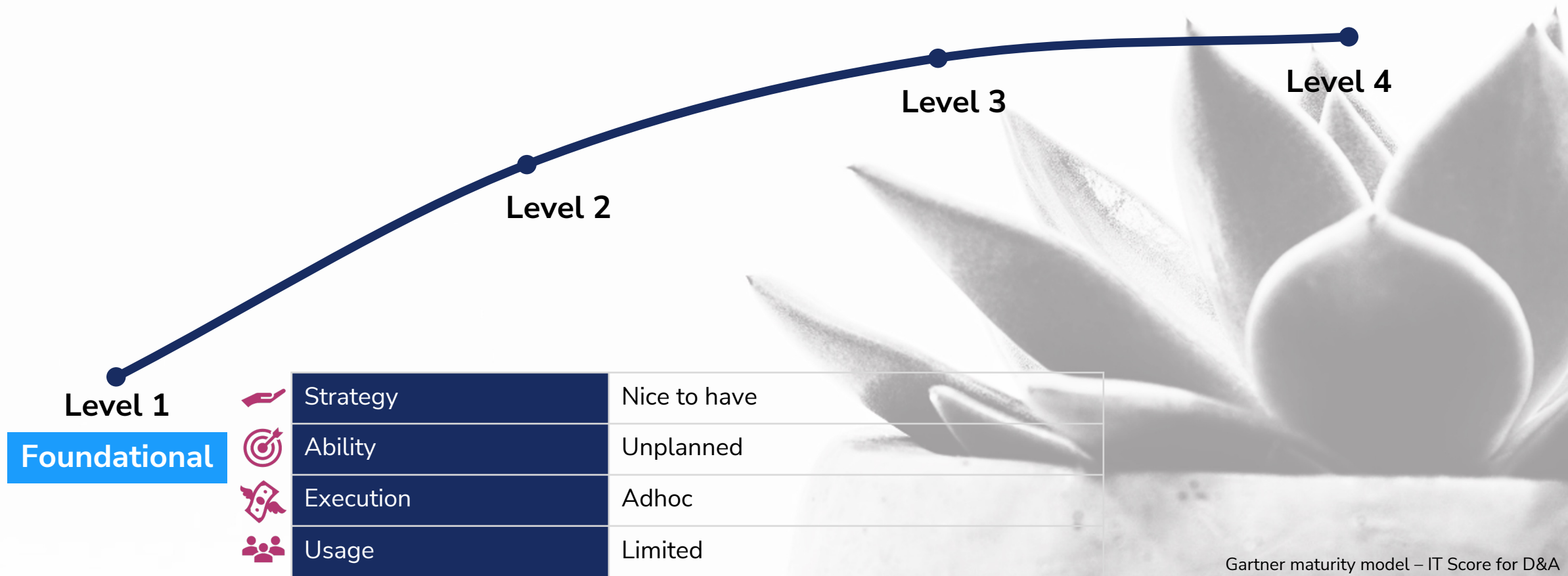
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Non Profit Organizations mature in their **data journey** through 4 levels

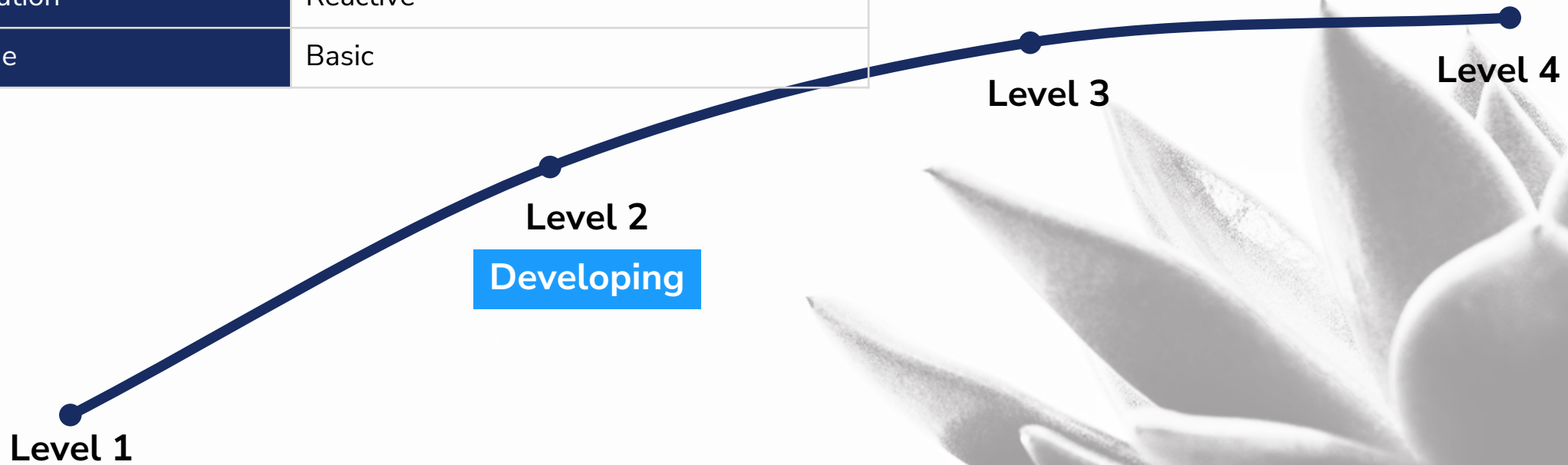


Non Profit Organizations mature in their **data journey** through 4 levels



Non Profit Organizations mature in their **data journey** through 4 levels





 Strategy	Opportunistic
 Ability	Informal
 Execution	Reactive
 Usage	Basic

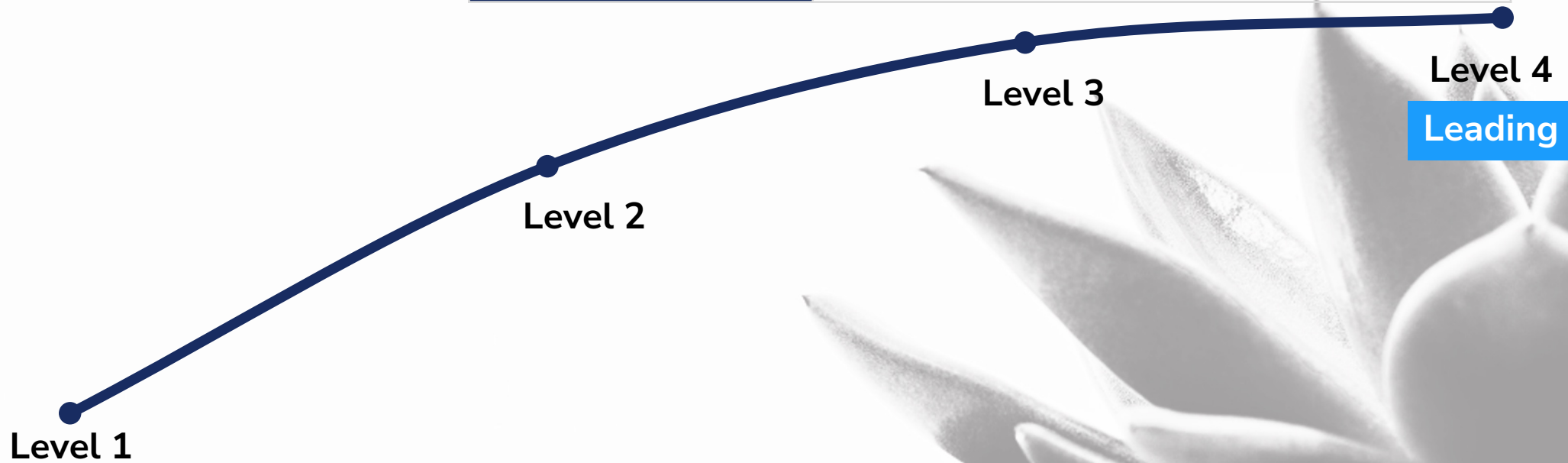


Non Profit Organizations mature in their **data journey** through 4 levels



Non Profit Organizations mature in their **data journey** through 4 levels

	Strategy	Central
	Ability	Differentiating
	Execution	Scalable
	Usage	Habitual

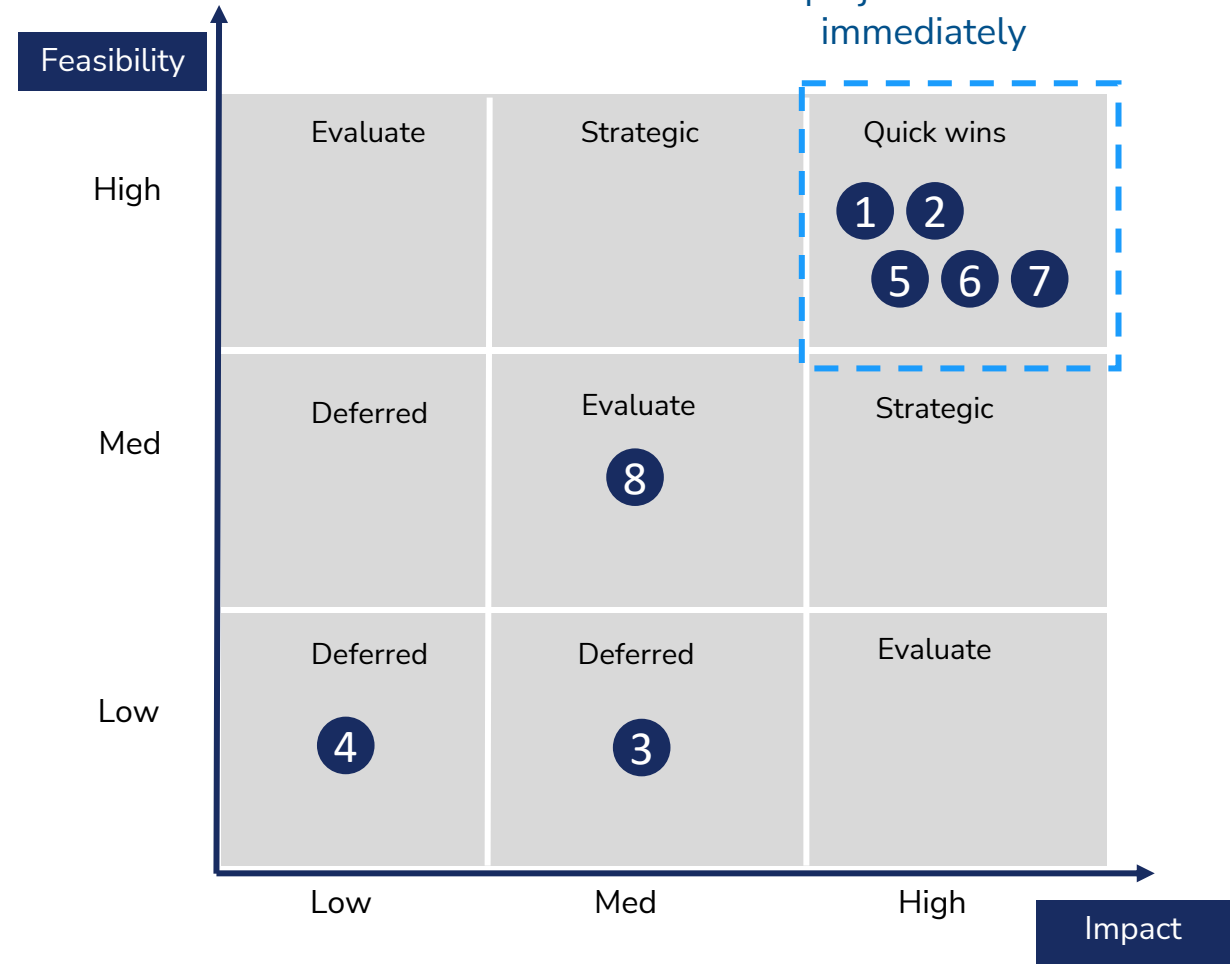


Here's how we will prioritize the high-potential ideas

The long list of NPO ideas

#	NPO Ideas	Impact	Feasibility
1	Idea 1	H	H
2	Idea 2	H	H
3	Idea 3	M	L
4	Idea 4	L	L
5	Idea 5	H	H
6	Idea 6	H	H
7	Idea 7	H	H
8	Idea 8	M	M

Potential projects to take forward immediately



Implementation challenges to watch out for



- Attempting a big-bang transformation
- Getting carried away by “shiny new things”
- Poor integration with user workflows
- Resistance from organizational culture

Thank You!

