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mtc Manufacturing Technology Centre

INSPIRING

Great British Manufacturing

Webinar:

Getting the Mind Set Right to Embrace Technology: Using a Road Map

9th February 2020

Your presenters

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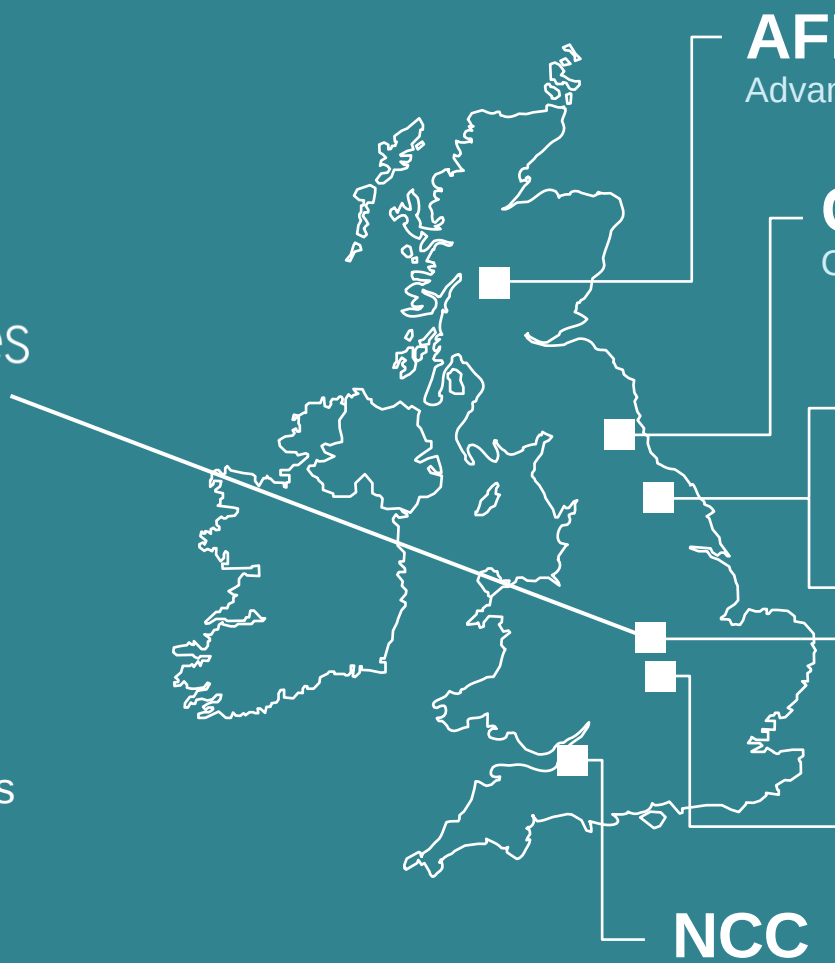
Getting the Mind Set Right to Embrace Technology: Using a Road Map

- **Introduction to webinar**
  - Aims and Objectives
  - MTC introduction
- **The imperative for change**
  - Strategic, business performance and cost benefits
  - Q&A
- **Technology Road Mapping in action**
  - The process
  - A case study
  - Q&A
- **Webinar programme**
- **Short video – ‘Manufacturing Support Services’**
- **MTC offer**

HIGH VALUE MANUFACTURING CATAPULT

mtc | Manufacturing Support Services

- 800 employees
- Assist with improving quality, cost and delivery performance
- We identify new technologies and de-risk investments
- We provide expert technical capabilities and advice using our extensive engineering team and cutting edge workshop



AFRC
Advanced Forming Research Centre

CPI
Centre for Process Innovation

NAMRC
Nuclear Advanced Manufacturing Research Centre

AMRC
Advanced Manufacturing Research Centre

MTC
Manufacturing Technology Centre

WMG
Warwick Manufacturing Group

NCC
The National Composites Centre

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CATAPULT High Value Manufacturing

Imperative for change

Paul Duffy

9th February 2020

The Imperative for Change

Introduction

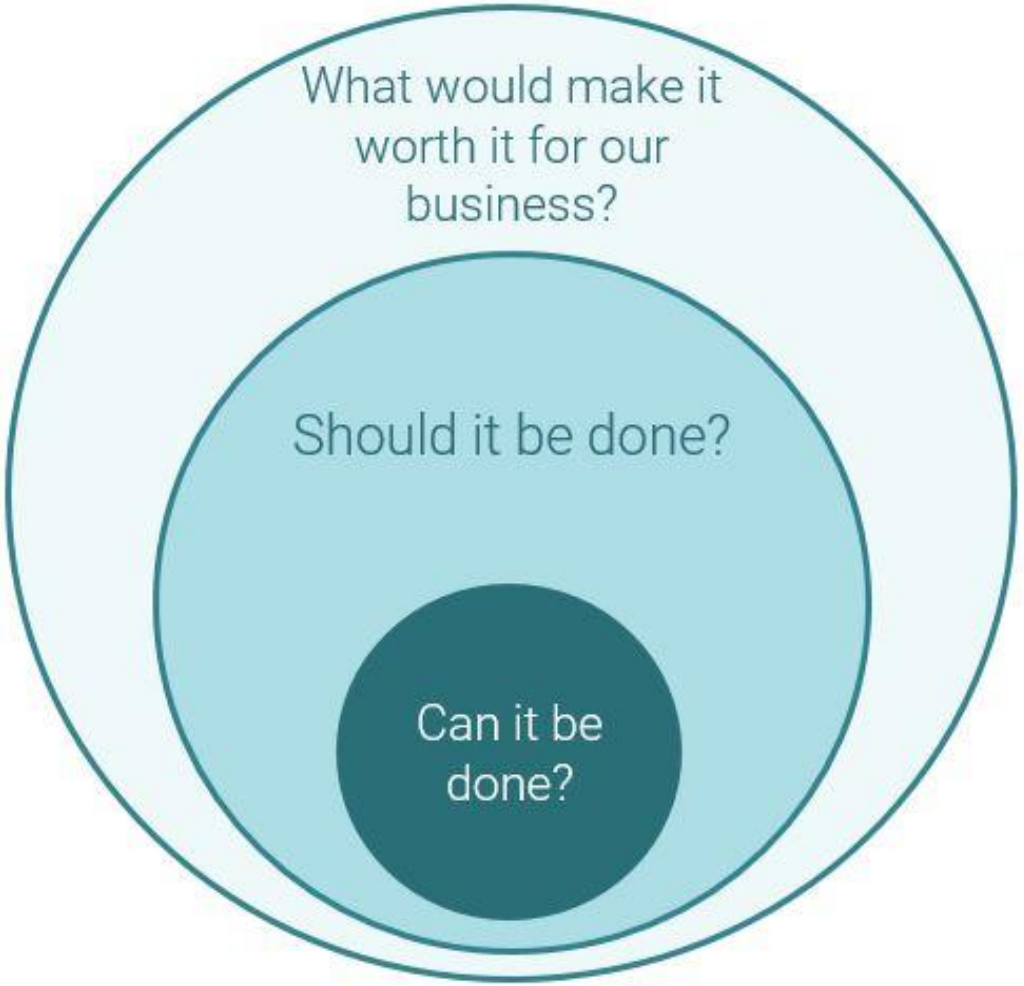
- The adoption of automation or new technology, provides opportunities to ***improve productivity, reduce manufacturing costs and increase competitiveness.***

- Realistic business case may be needed to secure investment
  - Longer term view of the benefits may be required for leading edge and complex technologies.

Source: MTC Change Handbook

The Imperative for Change

New & Disruptive Technologies



The Imperative for Change

New & Disruptive Technologies

- Developing an effective business case for *disruptive technology* will involve considering costs and benefits in very different ways to traditional manufacturing. According to the *Made Smarter Review* (2017):
- "*Technologies such as additive manufacturing can fundamentally change the supply chain, and mean that competitive advantages afforded by high volumes and low labour costs are replaced by advantages like proximity to market and the opportunities to make products unique to each customer.*"

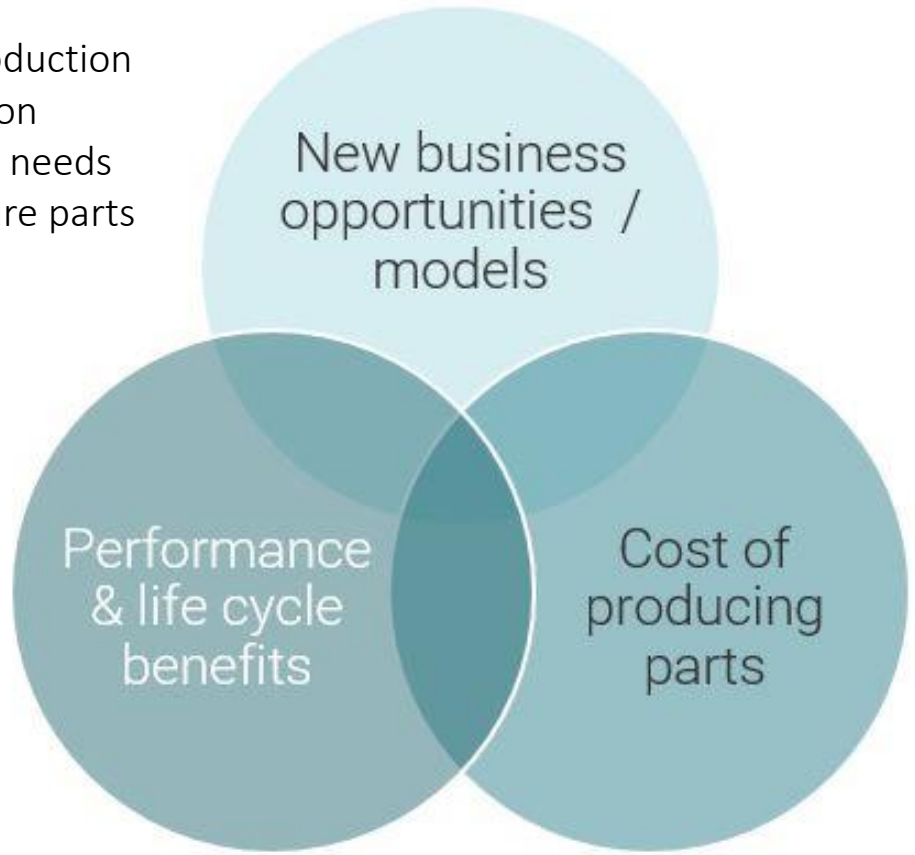
The **Made Smarter Review** (2017) can be accessed at: https://www.gov.uk/government/publications/made-smarter-review

The Imperative for Change

New & Disruptive Technologies

Strategic benefits:

- Decentralised production
- Mass customisation
- Meet just-in-time needs
- Cost-effective spare parts



Performance benefits:

- Consolidated parts into one part
- Design freedom for product performance – complexity
- Light-weighting
- Optimised materials for function and durability

Cost savings:

- Simplified production process
- Increased capacity for new product lines

Leaner manufacturing:

- Less wastage of material
- Flexible product volumes
- Reduced lead time and inventory

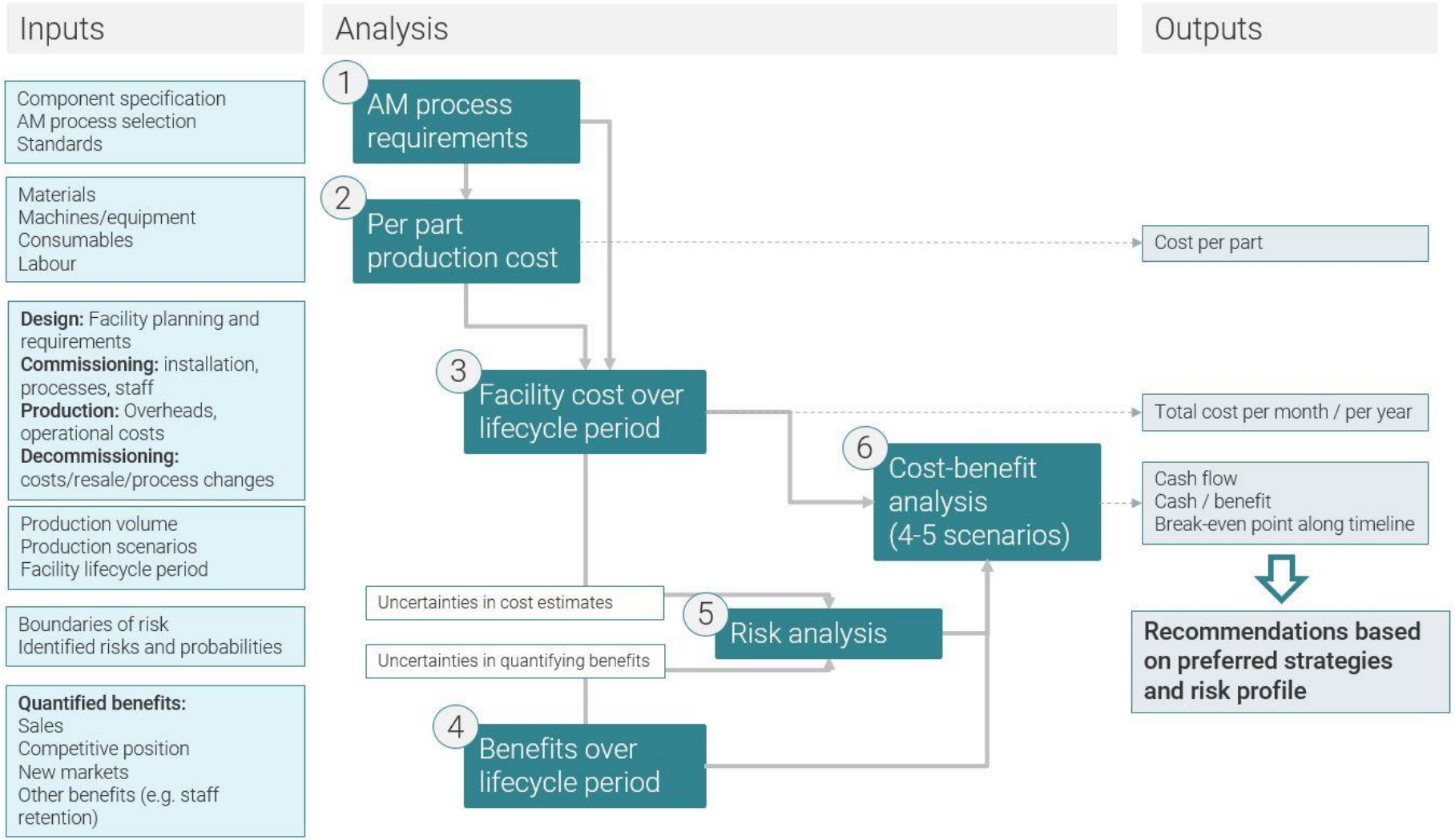
The Imperative for Change

Understanding Benefits and Limitations - example

	Advantages	Limitations
Customer	Increased geometric design freedom • Light weighting for lifetime cost reductions • Additional functionality • Improved performance Increased material design freedom • Improved performance and durability Customisation and personalization	Part types • Available materials • Size of part to be manufactured • Cost for high production volumes Part consistency • Qualification for safety-critical applications
Manufacturing business	Part consolidation • Reduction in manufacture and assembly costs Possibility of remanufacturing obsolete parts • No need for expensive re-tooling • On-demand part volumes Decentralized manufacturing Faster iteration of 'design to part' cycle Efficient use of materials (less waste)	High cost of machines and materials Limited mass production capabilities • Time consuming • Labour intensive Post-processing requirements • Cost / time • Equipment and AM-specific skills

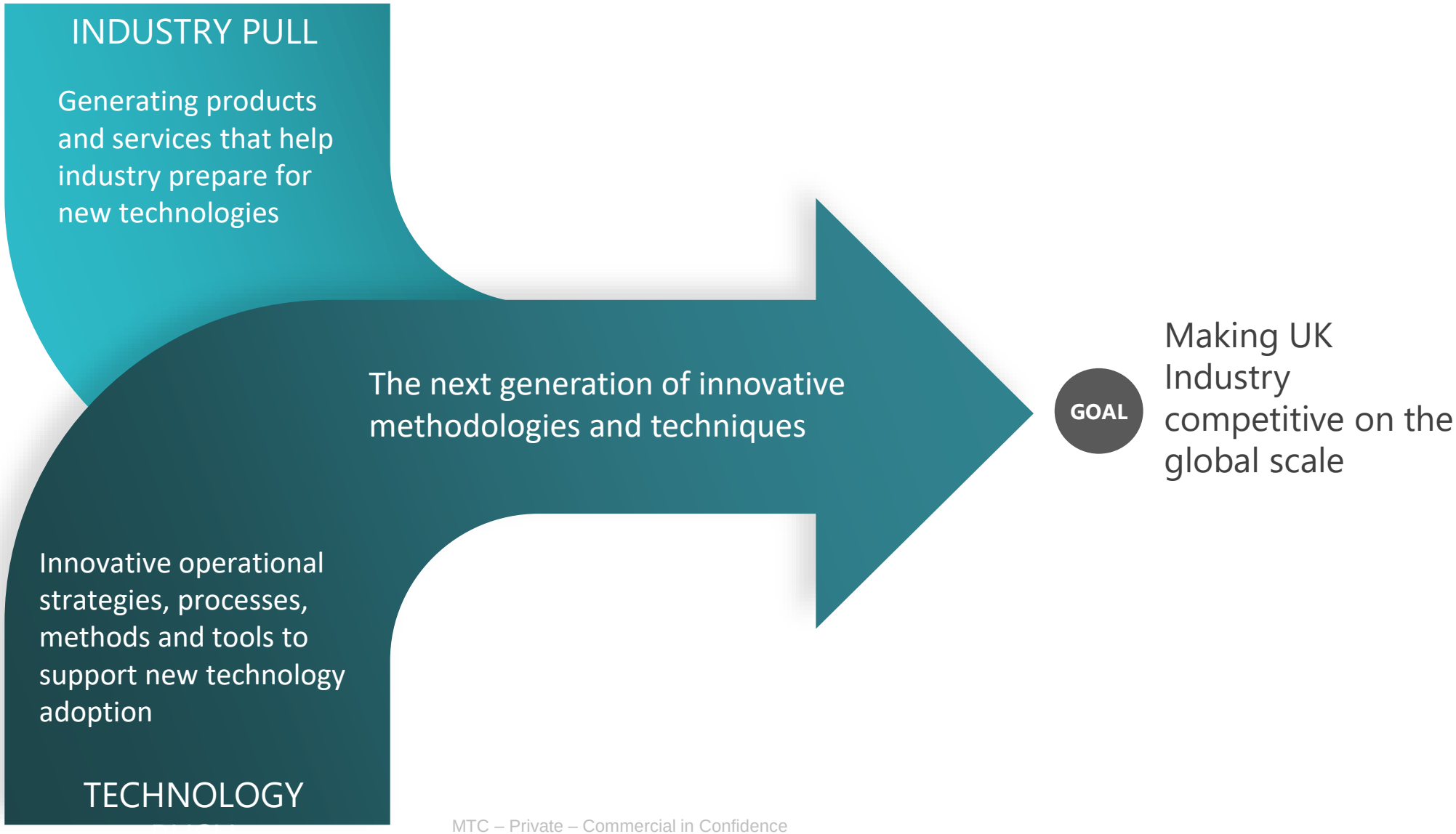
The Imperative for Change

Business Case Development



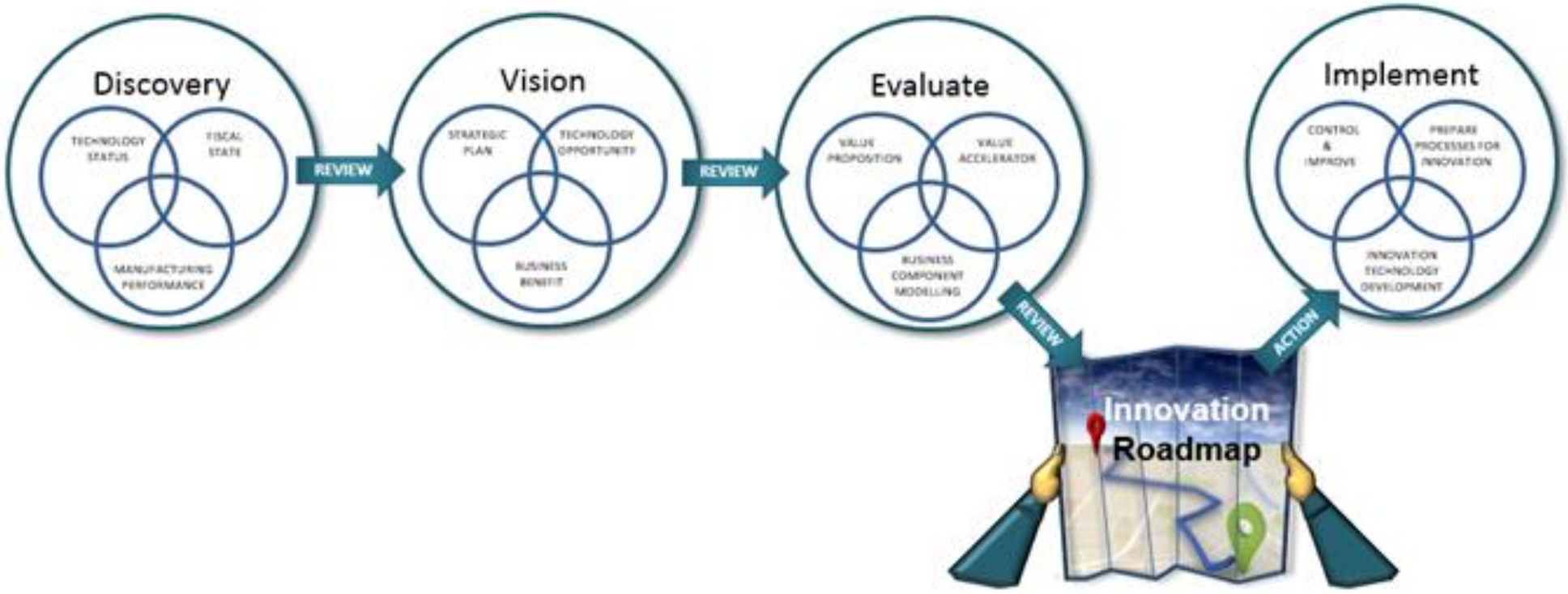
The Imperative for Change

The MTC's Role



The Imperative for Change

Context of Road mapping

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Q&A

Technology Road Mapping in Action

Richard Blain

9th February 2020

Technology Road Mapping in Action

Introduction

All companies need to plan out their investment to reach a business goal

- Fabrication in the construction industry -> shortage of skilled welder / fabricators
- High volume castings -> throughput in the de-flash area
- High value castings -> lead times, cost of scrap, health and safety in fettling area
- Electro mechanical assemblies for aerospace industry -> just won a large order
- Aluminium assemblies for defence sector -> increasing volumes, opportunity for investment
- Machine shop for aerospace sector -> lights out, additive*
- Rubber compression moulded parts -> reshoring of flash removal
- Equipment manufacturer, start up -> show a route to scale before selling the business
- Renewable power generation, start-up -> means to test a wave energy harvesting device
- Actuator manufacturer -> rationalise historic product lines

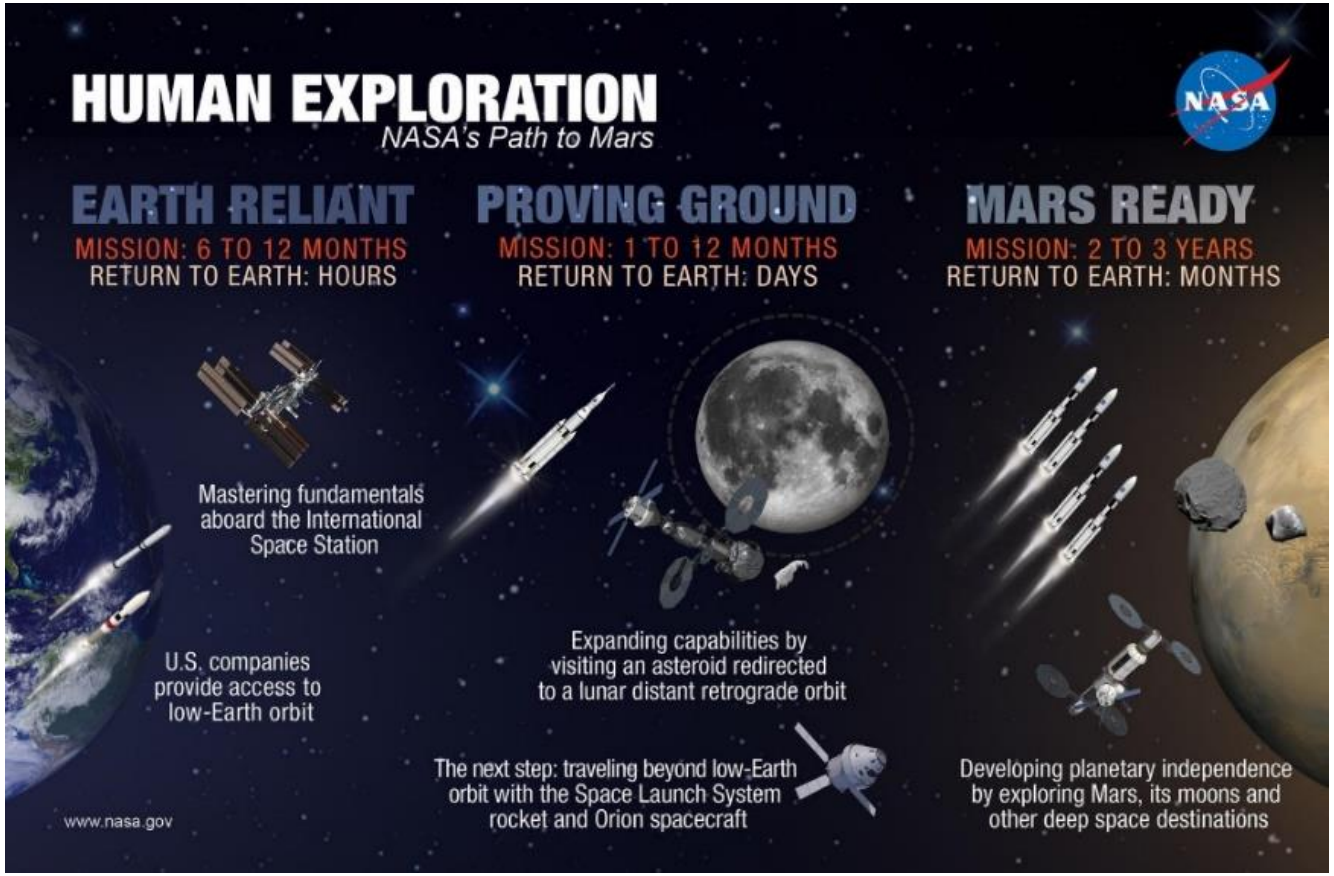
Use cases for technology roadmaps (images from Google)

Technology Road Mapping in Action

What is a roadmap?

Roadmaps are a simple way of planning and communicating

- Visual representation
- Starting point and a goal
- Themes or milestones
- A time axis
- Various levels of detail



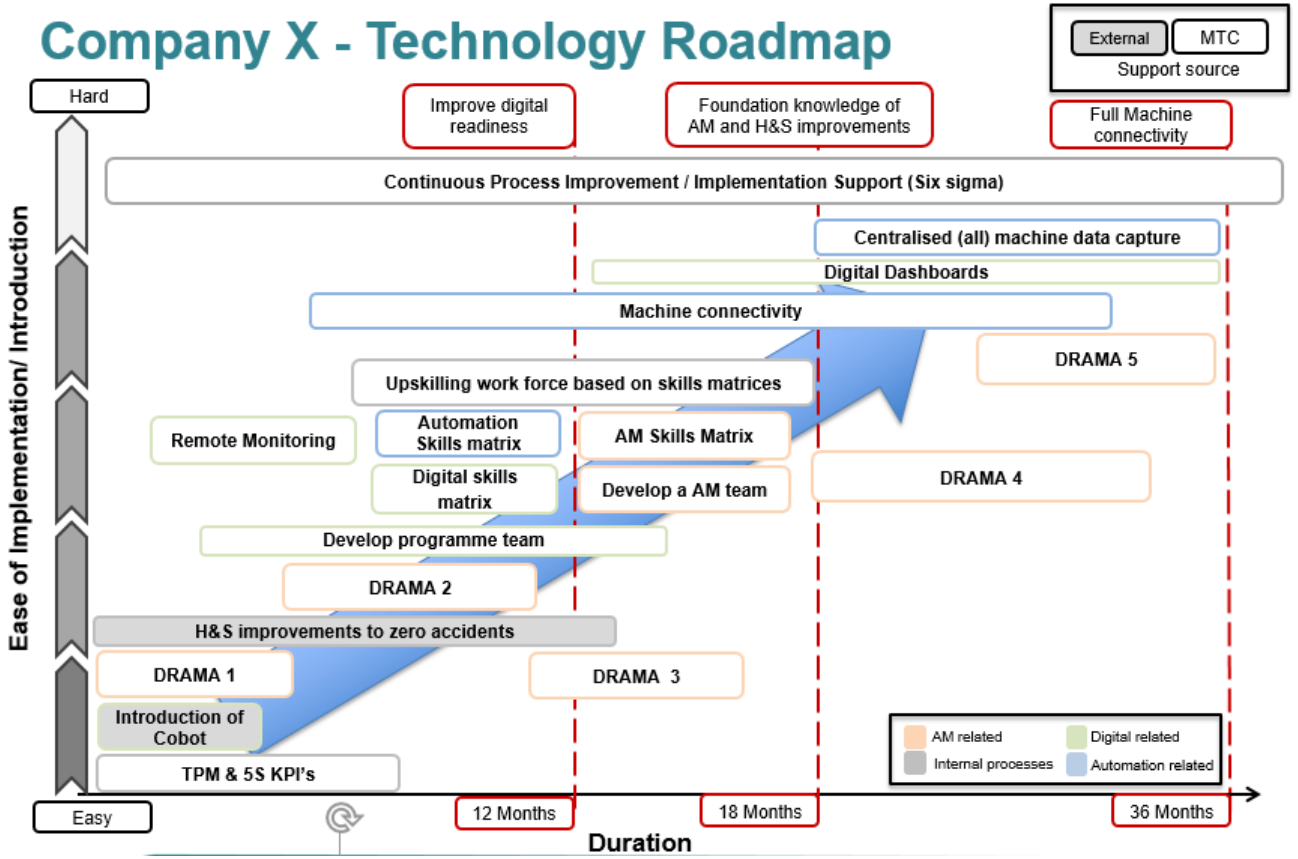
Example roadmap: NASA: development of technology needed to visit Mars

Technology Road Mapping in Action

Roadmaps for Manufacturers

Manufacturers should use them to identify relevant technologies and sequence into a progression of projects

- The goal is a future factory
- Series of connected projects, each enabling the next
- Not just technology
- Milestones
- Themes



Example roadmap from a machine shop in the aerospace industry

Technology Road Mapping in Action

Why should you invest the time to make one?

Quickly reduce the number of options so you know where to focus and in what order

Technology Road Mapping in Action

The Method

The first stages are data gathering. These are needed to select relevant technologies.

The Method

with an example

Technology Road Mapping in Action

Step 1: Company Background

Step 1 Company → Step 2 Business Drivers → Step 3 Current State → Step 4 Future Vision → Step 5 Opportunities → Step 6 Roadmap → Step 7 Implement

The industry size and company are important

Typical external domestic welded / fabricated steelwork

Type of business = welding/fabrication
Size of company = 30 people
Products = architectural fabrications
Sector = construction
Customers = large OEMs
Timeframe = 3 years
Business health = excellent
Available capital = medium

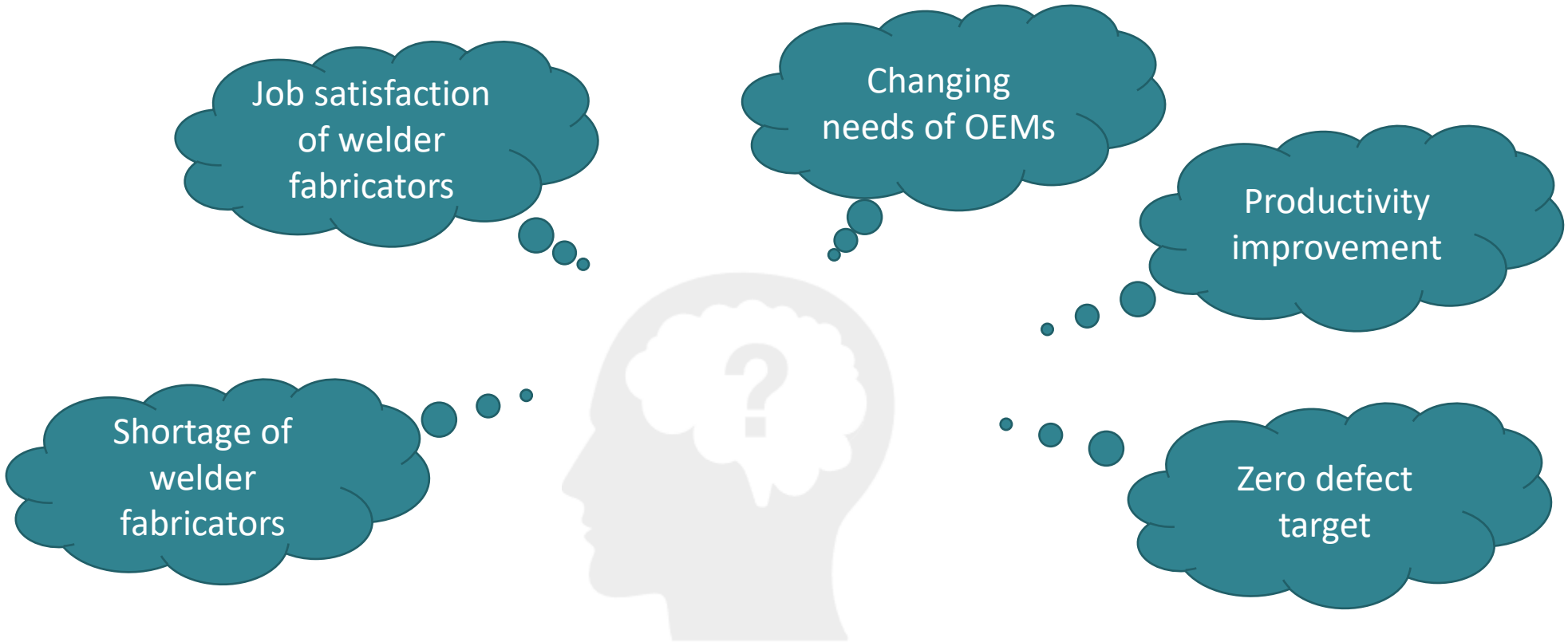
Typical internal prison welded / fabricated steelwork

Technology Road Mapping in Action

Step 2: Business Drivers

Step 1 Company → Step 2 Business Drivers → Step 3 Current State → Step 4 Future Vision → Step 5 Opportunities → Step 6 Roadmap → Step 7 Implement

Each company faces a unique set of business drivers and challenges



Technology Road Mapping in Action

Step 3: Current State

Step 1 Company → Step 2 Business Drivers → **Step 3 Current State** → Step 4 Future Vision → Step 5 Opportunities → Step 6 Roadmap → Step 7 Implement

Go look see to understand the starting point

Workflow

- Design draws components and fabricators build fixtures / tack weld

Pains

- Small parts get left until last
- Unpleasant environment

Constraints

- Small batches, no runners
- Spread out over several buildings

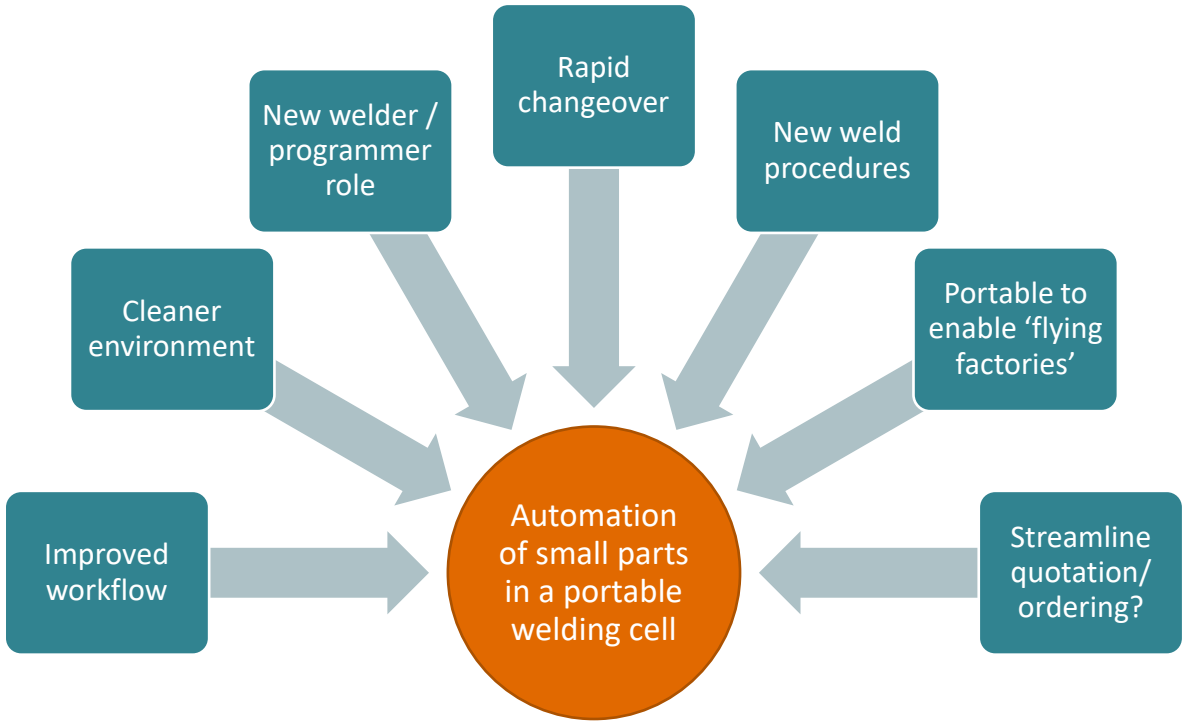
Typical welding / fabrication workshop (image from Google)

Technology Road Mapping in Action

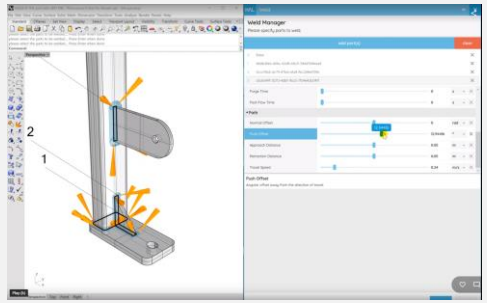
Step 4: Future Vision

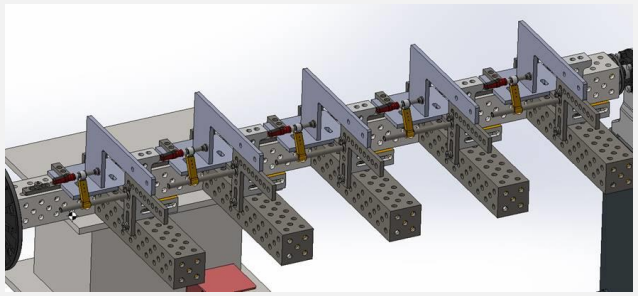
Step 1 Company → Step 2 Business Drivers → Step 3 Current State → **Step 4 Future Vision** → Step 5 Opportunities → Step 6 Roadmap → Step 7 Implement

Sketch out a vision of the future factory

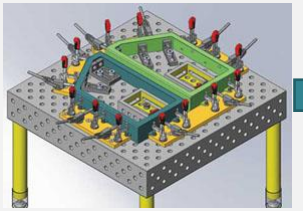


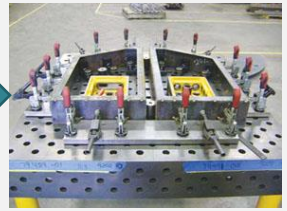
A new workflow for small parts





1. Design both part and tooling in CAD





2. Send tooling design, parts and robot program to shop floor

Technology Road Mapping in Action

Step 5: Identify Technologies

Step 1 Company → Step 2 Business Drivers → Step 3 Current State → Step 4 Future Vision → **Step 5 Opportunities** → Step 6 Roadmap → Step 7 Implement

Select the relevant technologies that can help achieve this future

Technology suppliers
Other industries
Bigger players
Academia
New ideas
MTC Technology Roadmaps
Best practice

Filter

Include everything

- Technology + working methods
- Technology push + pull

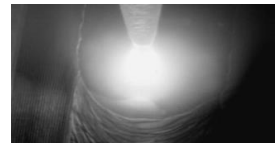
Reconfigurable tooling

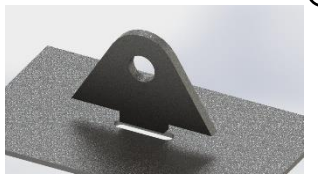
OLP / Simulation

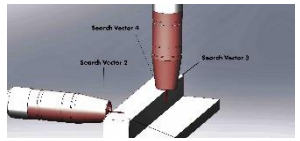

New weld process

Fume extraction

Robot welding cell


Camera systems


Self locating parts


Seam finding / tracking

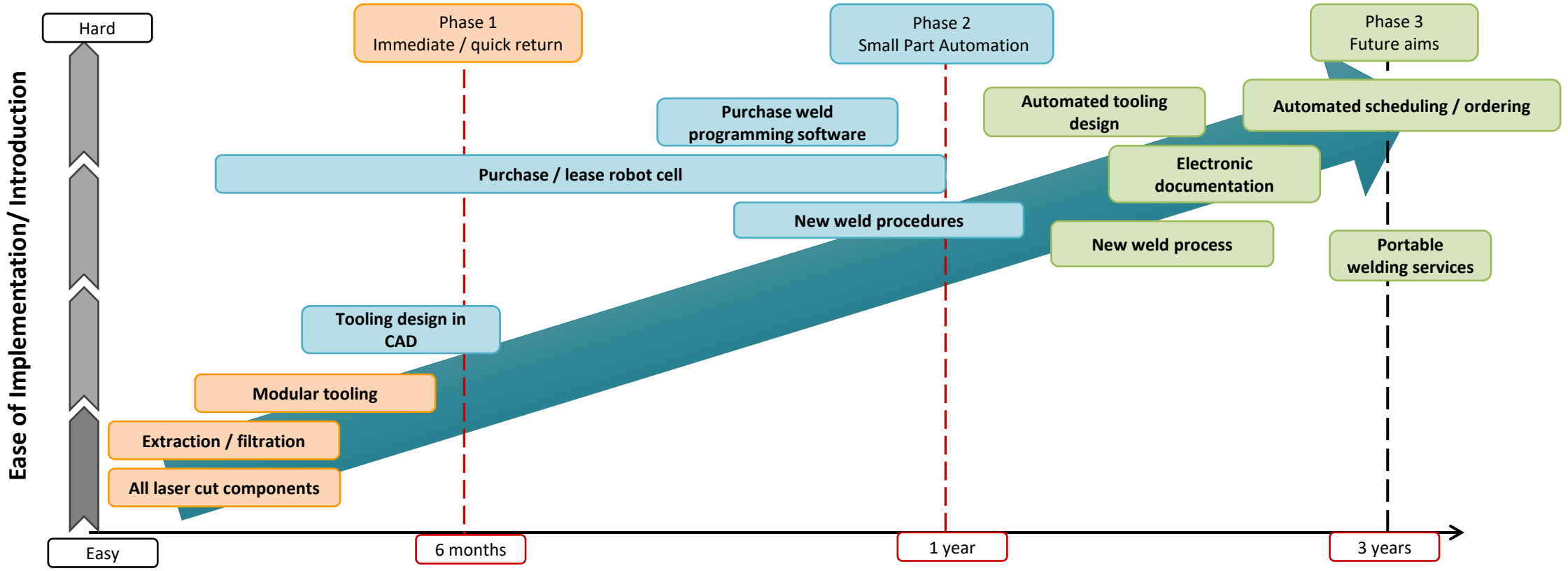
Wire Arc Additive

Technology Road Mapping in Action

Step 6: Sequence on a Technology Roadmap

Step 1 Company → Step 2 Business Drivers → Step 3 Current State → Step 4 Future Vision → Step 5 Opportunities → **Step 6 Roadmap** → Step 7 Implement

Organise in a sequence, add a timeline and some milestones

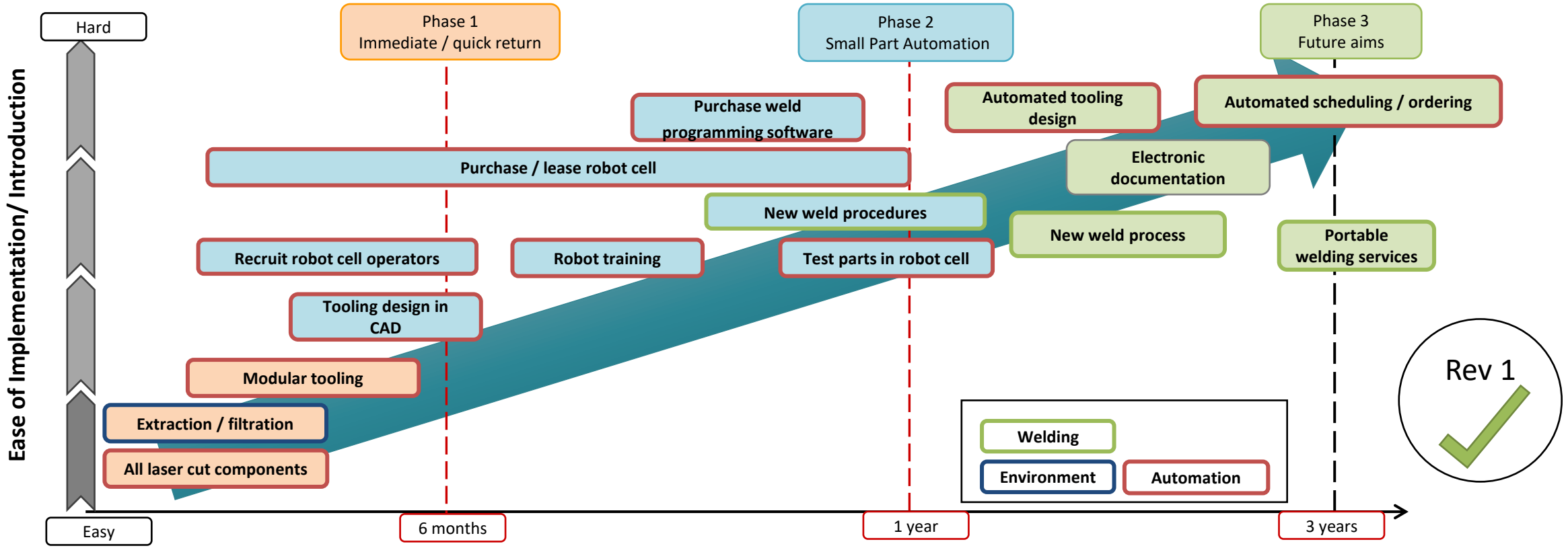


Technology Road Mapping in Action

Step 7: Add Implantation Steps

Step 1 Company Background → Step 2 Business Drivers → Step 3 Current State → Step 4 Future Vision → Step 5 Opportunities → Step 6 Roadmap → Step 7 Implement

Add preparation activities and identify themes to complete Rev 1

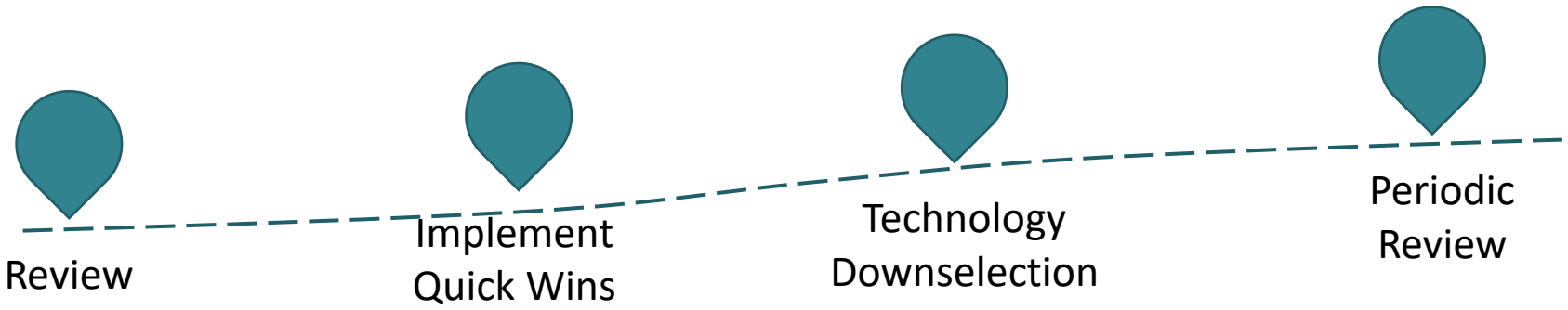


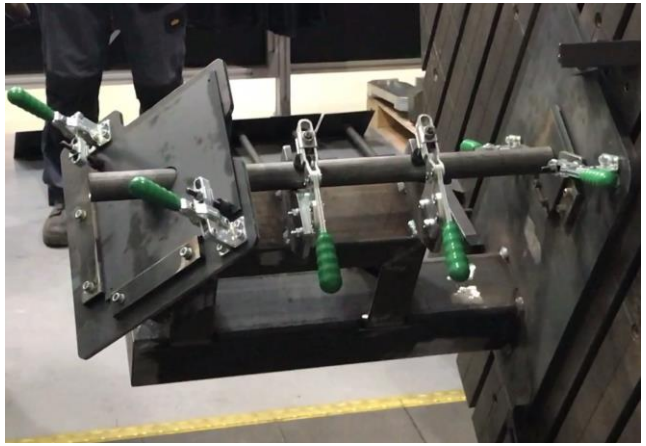
Technology Road Mapping in Action

Next Steps

Review the roadmap overall then develop each opportunity in turn

- Review and sense check (that was just the first draft)
- Implement the quick wins
- Downselection (arrange trials/demos, write specification, vendor selection)
- Review every year (we expect the roadmap to evolve)





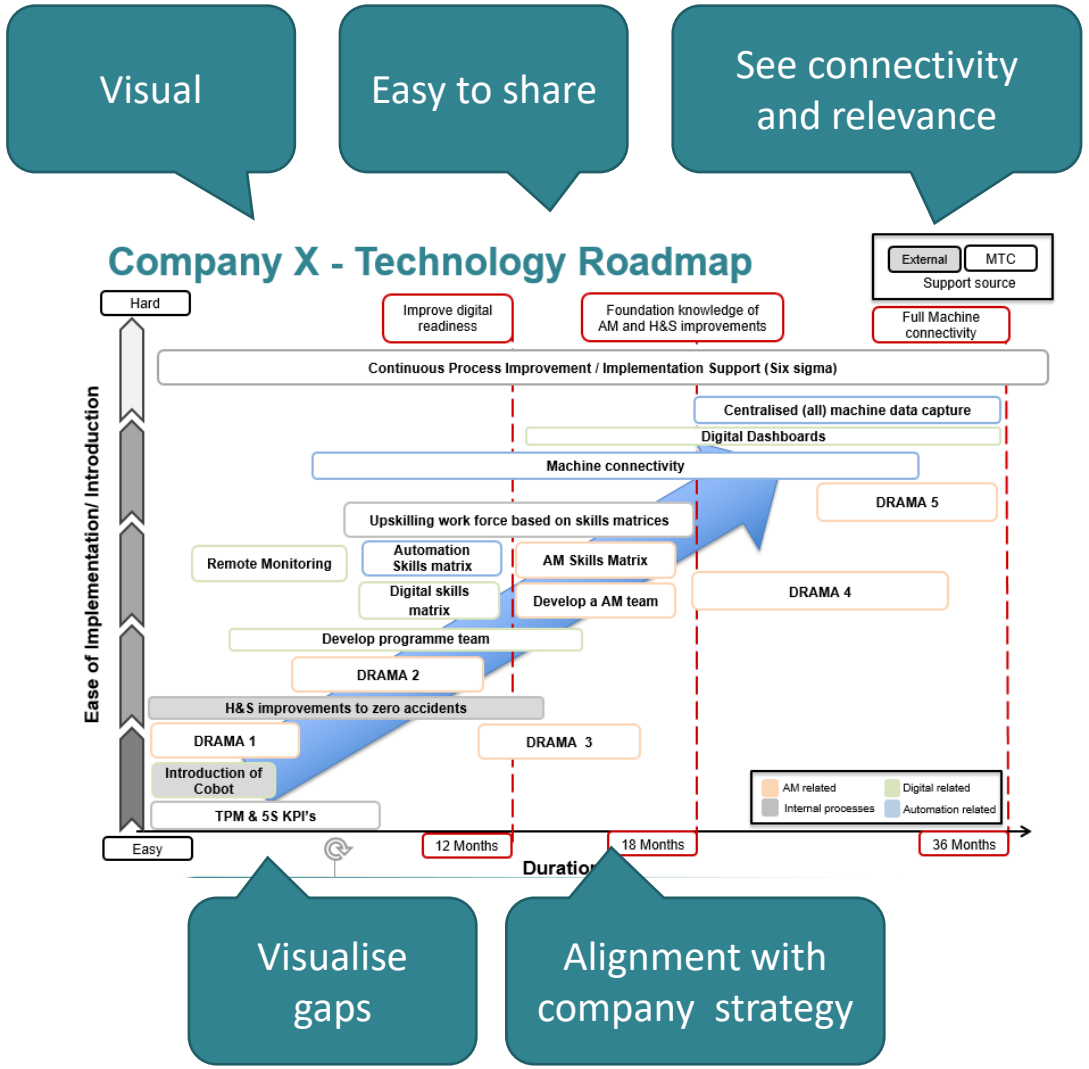
'Pendent' test part demonstration

Small automated welding test cell

Technology Road Mapping in Action

Summary

- There is an imperative to invest in technology
- Roadmaps are how we plan out investment
- Powerful tool when seeking investment
- Ensure that you start in the right place (not in the middle)
- They are relatively quick to make

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2 day Technology Road Map

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