

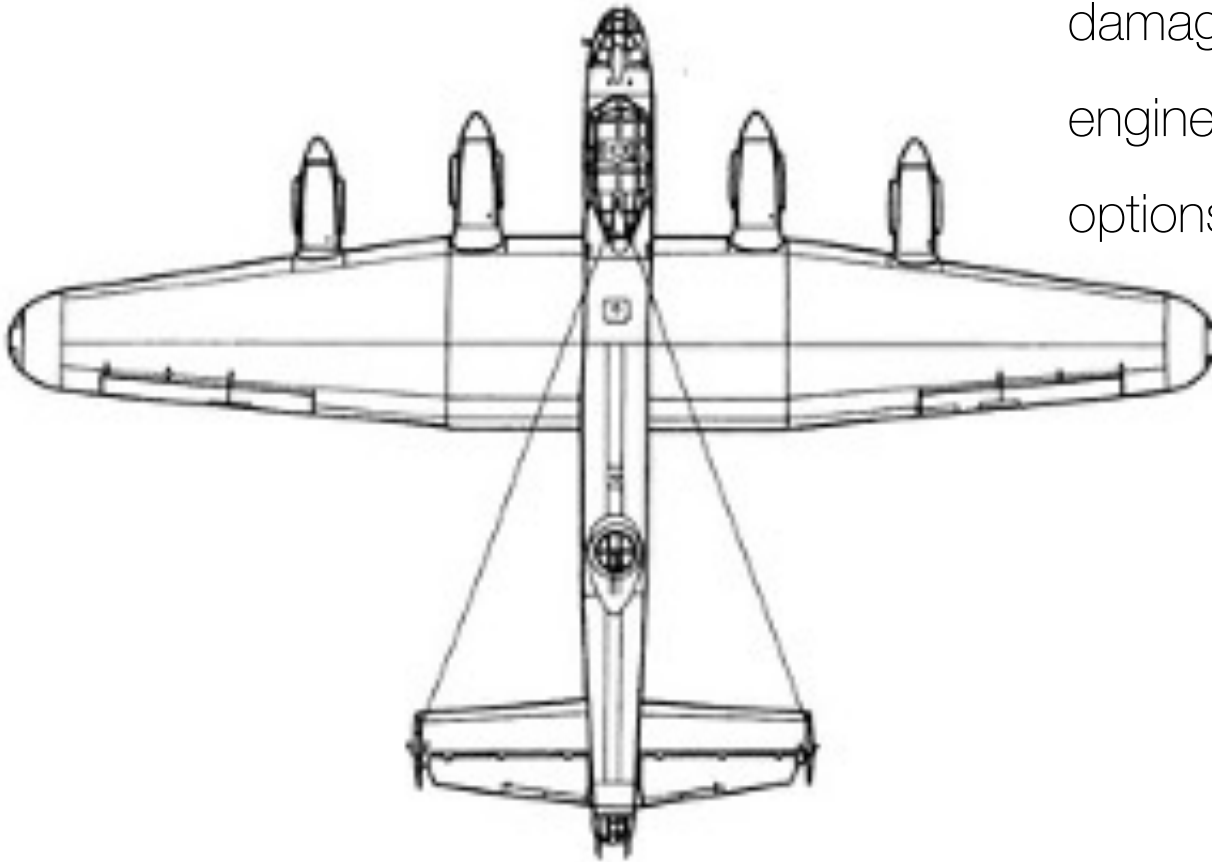
Managing Research & Development

- Alan Mumby
- Session IV

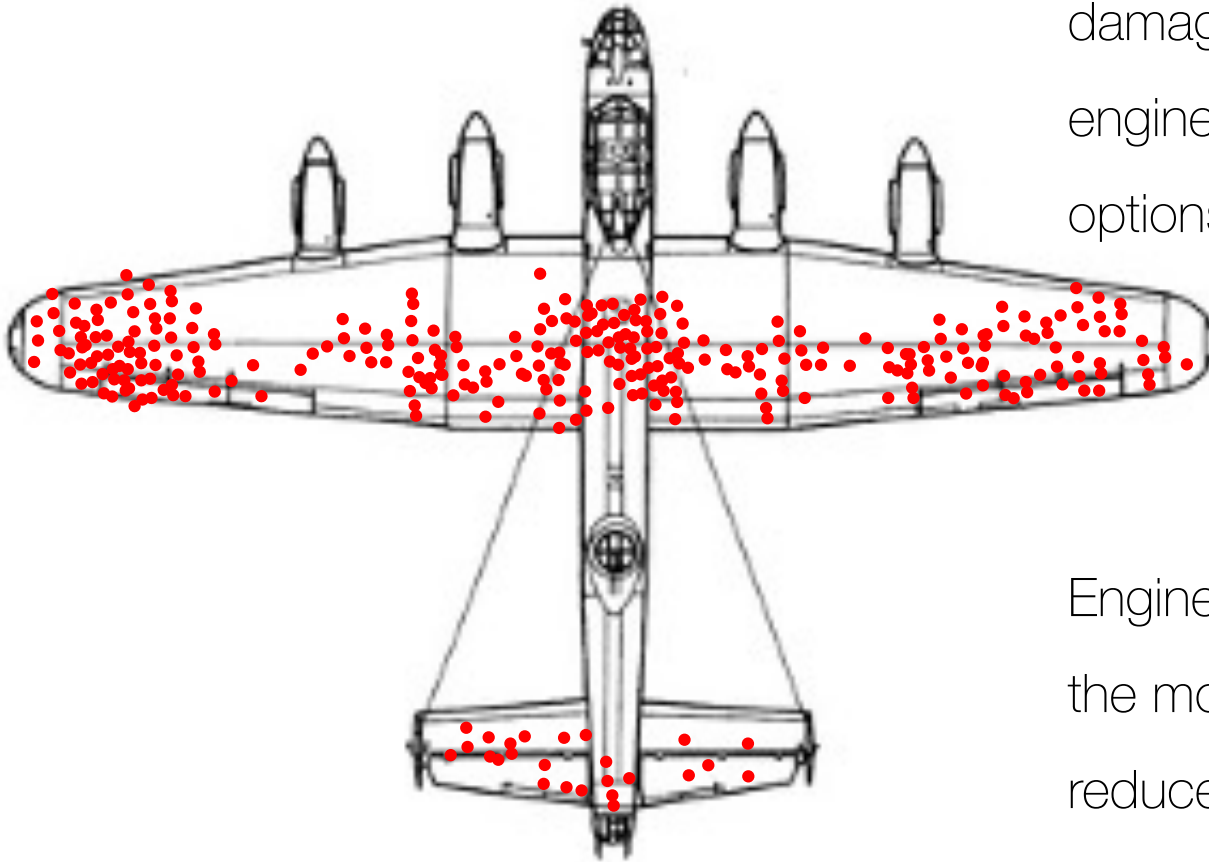
July 2022

new product development

During World War II, aircraft would come back from their missions with a lot of anti-aircraft artillery damage. The ground crew and maintenance engineers analysed the patterns and considered the options.

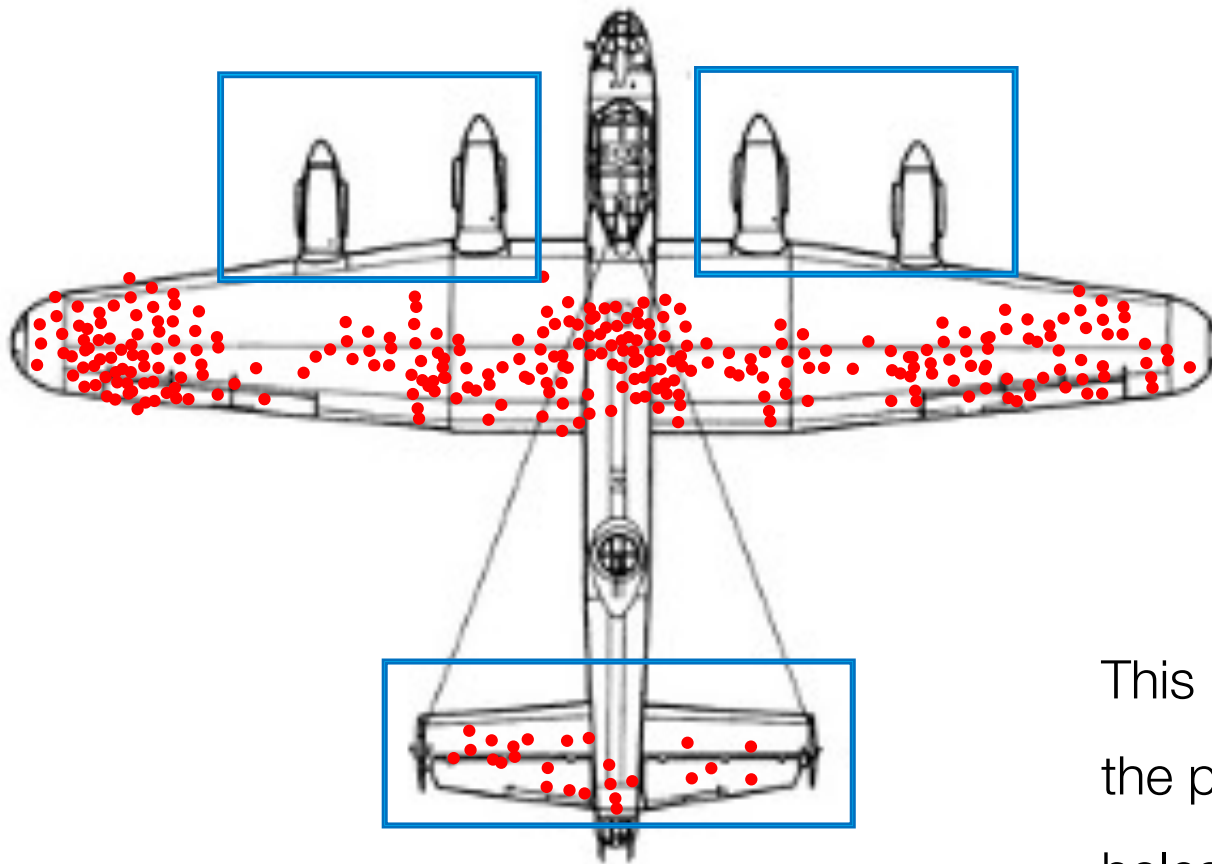


During World War II, aircraft would come back from their missions with a lot of anti-aircraft artillery damage. The ground crew and maintenance engineers analysed the patterns and considered the options.



Engineers looked to see how they could strengthen the most commonly damaged areas of the wings to reduce the number of aircraft that were shot down.

A mathematician, Abraham Wald, pointed out that perhaps there was another way to look at the data.



Perhaps the reason certain areas of the fuselage weren't covered in bullet holes, was that aircraft that were shot and seriously damaged in those damaged in those areas didn't actually return to the airbase.

This insight led to the armour being re-enforced on the parts of the plane where there were fewer bullet holes.

The story behind the data is arguably more important than the data itself.

Or more precisely, the reason behind why we are missing certain pieces of data may be more meaningful than the data we have.





Generating new ideas



Product Development

The development of an innovation inevitably starts when an idea emerges.

But, how do you come up with an idea? Even more difficult, how do you keep coming up with ideas?

Companies that are successful innovators tend to utilise multiple sources of information and ideas, including:

- In-house research and development, including basic research.
- Links to customers or other potential users of innovations.
- Links to an external network of firms that may include competitors, complementors, and suppliers.
- Links to other external sources of scientific and technical information, such as universities and government laboratories.

Encourage risk-taking, development of internal skills and managing change are all necessary factors in developing R&D within an innovation and NPD culture.

Maybe a bit of planning, organising and coordinating....

More leadership; inspiring, motivating and encouraging

R&D is the purposeful and systematic use of scientific knowledge to improve man's lot even though some of its manifestations do not meet with universal approval.

Twiss (1992)

Defining technology as "...the application of knowledge to achieve a practical result."

Roussel (1991)

To develop new knowledge and apply scientific or engineering knowledge to connect the knowledge in one field to that in others.

Roussel (1991)

R&D will take us on a journey from fuzzy ideas, discoveries and blue sky research to new products

- previous knowledge and concepts
- physical products

Defining R&D

Product Development

previous
knowledge
and
concepts

research and development continuum

Trott, Paul.

basic research

applied research

development

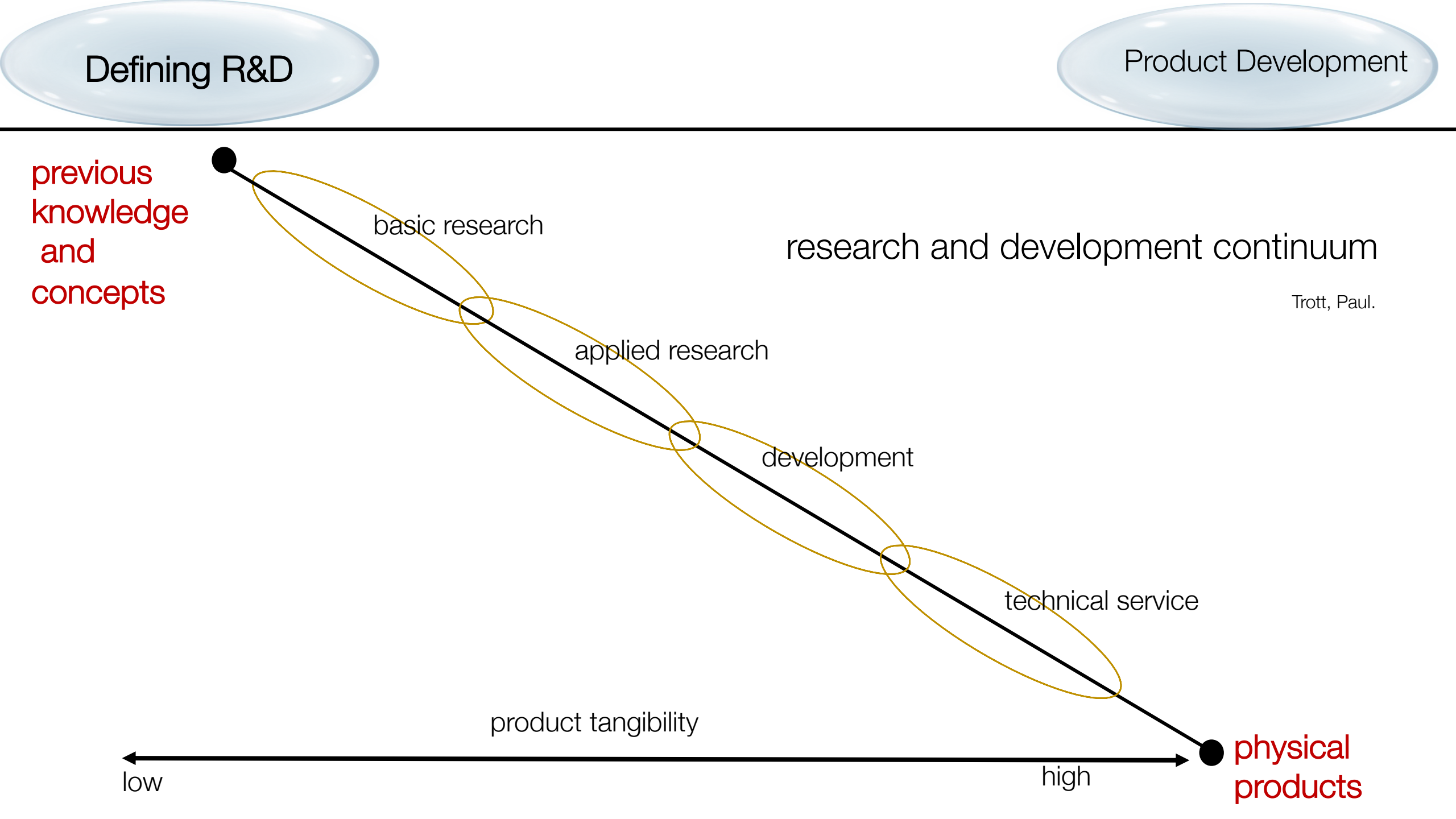
technical service

product tangibility

low

high

physical
products

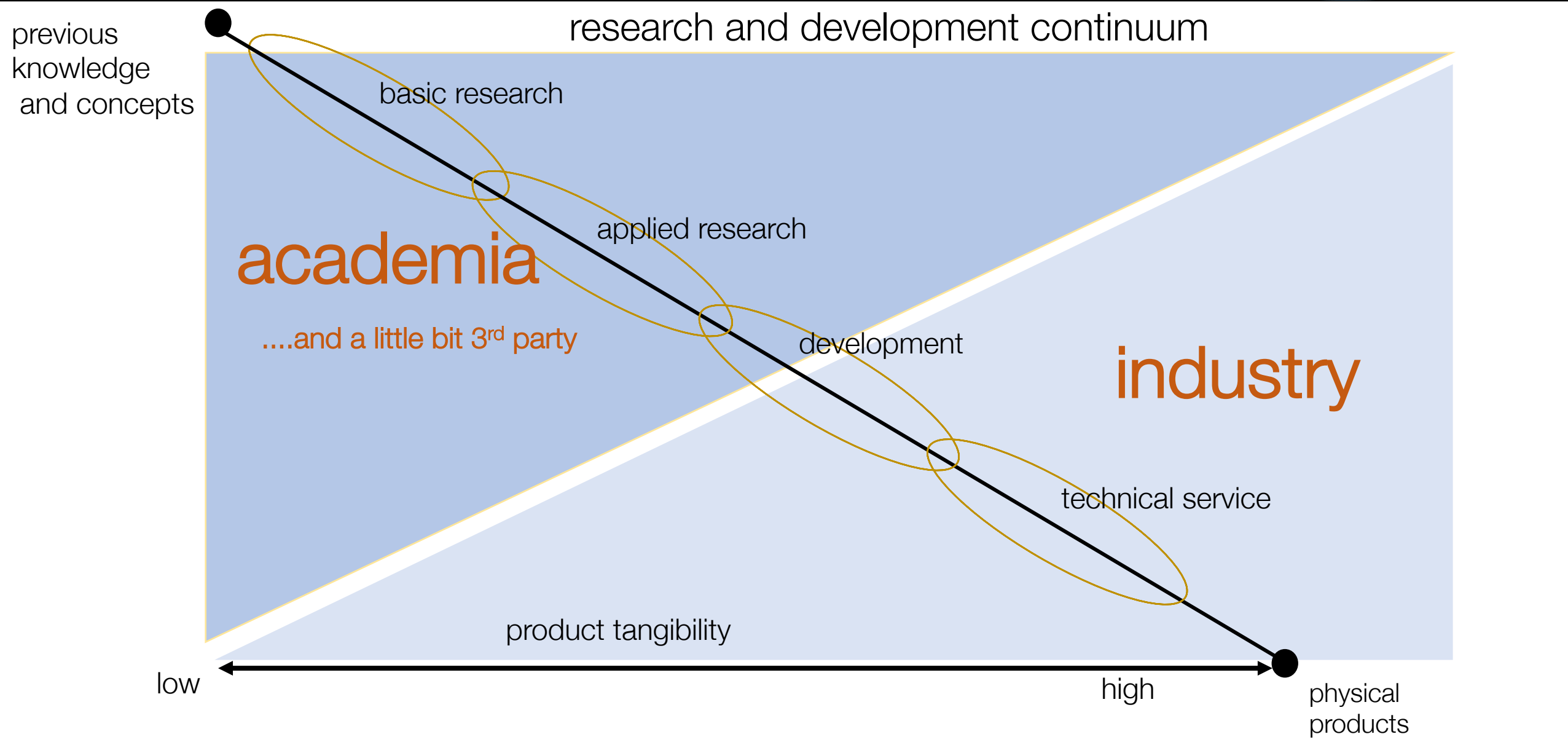


Who's doing the research and development

university
industry /end user
3rd Party provider } R&D

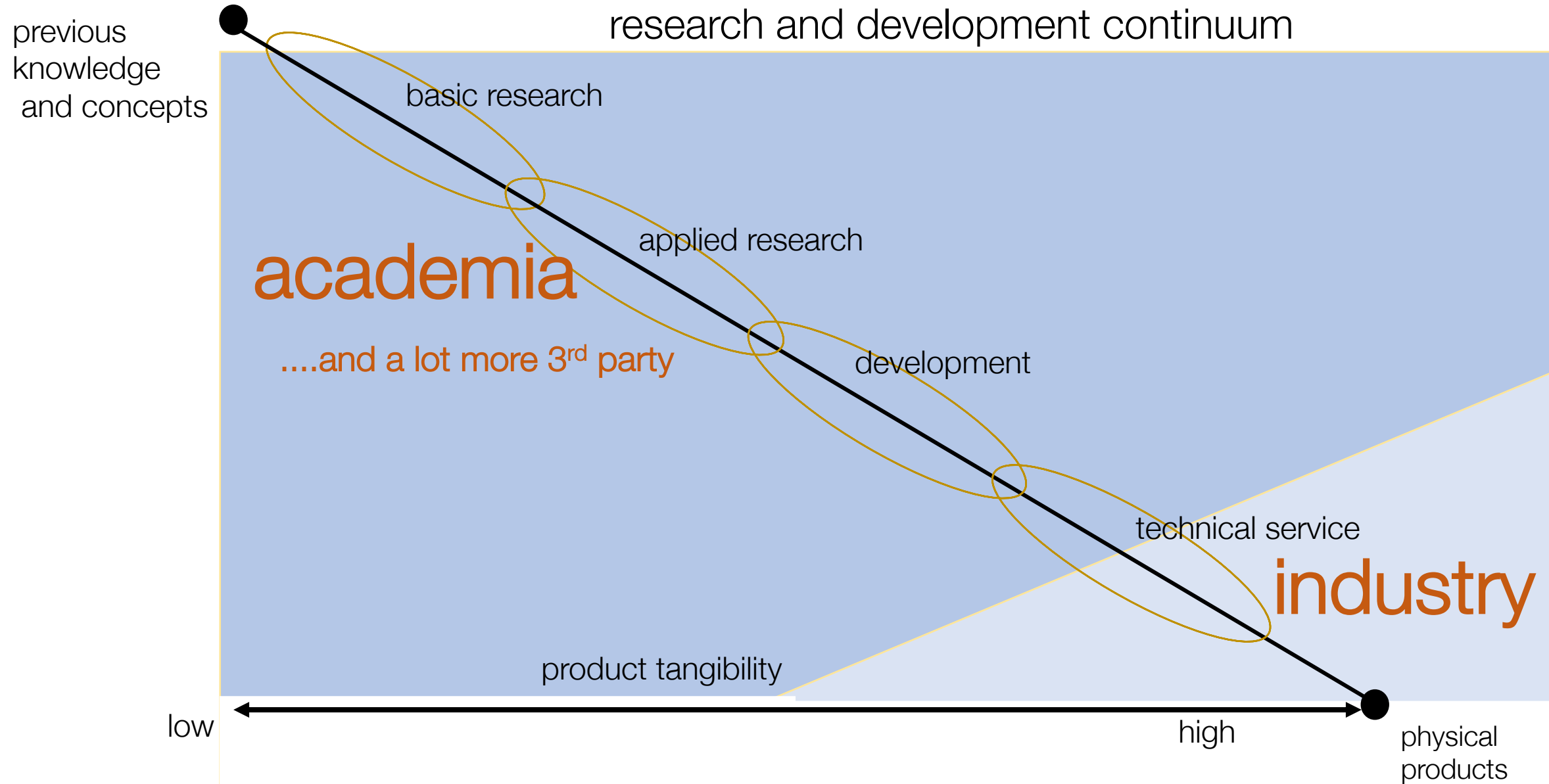
Managing our R&D

Product Development



Managing our R&D

Product Development



R&Ds Links to Company Strategy

Creating plans for the future is considered to be as much an art as a science.

Predicting the future is extremely difficult and there are many factors to consider:

- economic,
- social,
- political,
- technological,
- natural disasters, etc.

Predicting the future?

“...prediction is very difficult, especially about the future”.

Niels Bohr

Management of company R&D

R&D managers need to have a view of the future and however imprecise, this will need to include:

- market forecasts;
- comparative technological cost-effectiveness;
- risk; and
- capability analysis.

Market Sector forecasts

These are, primarily, concerned with changes in technology that will occur in the future.

Not to be considered in isolation, other factors, such as economic, social and political factors, also have to be considered.

- Who will be our competitors in 5 or 10 years' time?
- What technologies do we need to understand to avoid technological surprises?
- What will be the new competitive technologies and businesses?

Comparative technological cost-effectiveness

“It is argued that technologies have life cycles

- and that, after a period, further research produces negligible benefit.

When this stage is reached, a new branch of technology is likely to offer far more promising rewards.

“This may require a significant shift in resources.” **and focus**

Managing the R&D portfolio ...or Spreading the Risk

All companies have differing attitudes to the idea of commercial risk within R&D and tend to spread risk across portfolio of projects that will include

- some exploratory high-risk projects (radical)
- and some developmental low-risk ones. (probably more incremental or easier management)

Planning cannot remove risk, but it can help to ensure that decisions are reached using a process of rational analysis.

Capability analysis

It is fairly obvious to state, but companies have to consider their own strengths and weaknesses. This analysis should help them ensure that they have the necessary capabilities for the future.

- Internal audits
- Independent evaluators

Integration of R&D

The management of research and development needs to be fully integrated with the strategic management process of the business.

....but how many businesses fail to integrate the management of research and technology fully into the overall business strategy process

(Adler et al., 1992).

The strategic role of R&D as viewed by the business

Trott, Paul.

R&D and its links to business

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graph TD; A([R&D and its links to business]) --> B[1. R&D for existing businesses<br/>ensures ability to compete<br/>and exploit all the opportunities<br/>available to it]; A --> C[2. Drive new businesses<br/>Business opportunities<br/>will continually arise.<br/>R&D will ensure its<br/>exploitation]; A --> D[3. Exploratory research<br/>Developing understanding<br/>of technology that<br/>business<br/>is using now .....or in the<br/>future];
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1. R&D for existing
businesses
ensures ability to compete
and exploit all the
opportunities
available to it

2. Drive new businesses
Business opportunities
will continually arise.
R&D will ensure its
exploitation

3. Exploratory research
Developing understanding
of technology that
business
is using now or in the
future

1. R&D for existing businesses ensures ability to compete and exploit all the opportunities available to it.

Defend, support and expand existing business

Maintaining the status quo

The defence of existing businesses essentially means maintaining a business's current position, that is keeping up with the competition and ensuring that products do not become outdated and ensuring that existing products can compete.

2. Drive new businesses
Business opportunities
will continually arise.
R&D will ensure its
exploitation

Driving new businesses

Either through identification of market opportunities or development of technology, new business opportunities will be presented continually to managers.

Sometimes, the best decision is to continue with current activities. However, there will be times when a business takes the decision to start a new business.

3. Exploratory research
Developing understanding
of technology that
business is using now
.....or in the future.

Broaden and deepen technological capability

The third area is more medium- to long-term strategy. It involves the continual accumulation of knowledge, not only in highly specialised areas where the company is currently operating, but also in areas that may prove to be of importance to the business in the future.

From an R&D perspective, the company's technology base can be categorised as follows:

- core technologies;
- complementary technologies;
- peripheral technologies;
- emerging technologies.

The core technology usually is central to all or most of the company's products.

Expertise in this area also may dominate the R&D department as well as strategic thinking.

For example, in the photocopying industry, photographic technologies are core.

Complementary technologies are additional technologies that are essential in product development.

For example, microprocessors have become essential in many products and industries.

So, for the photocopying industry, there are several complementary technologies, including microprocessor technology and paper-handling technology.

Peripheral technology is defined as technology that is not necessarily incorporated into the product but whose application contributes to the business. Computer software often falls into this category.

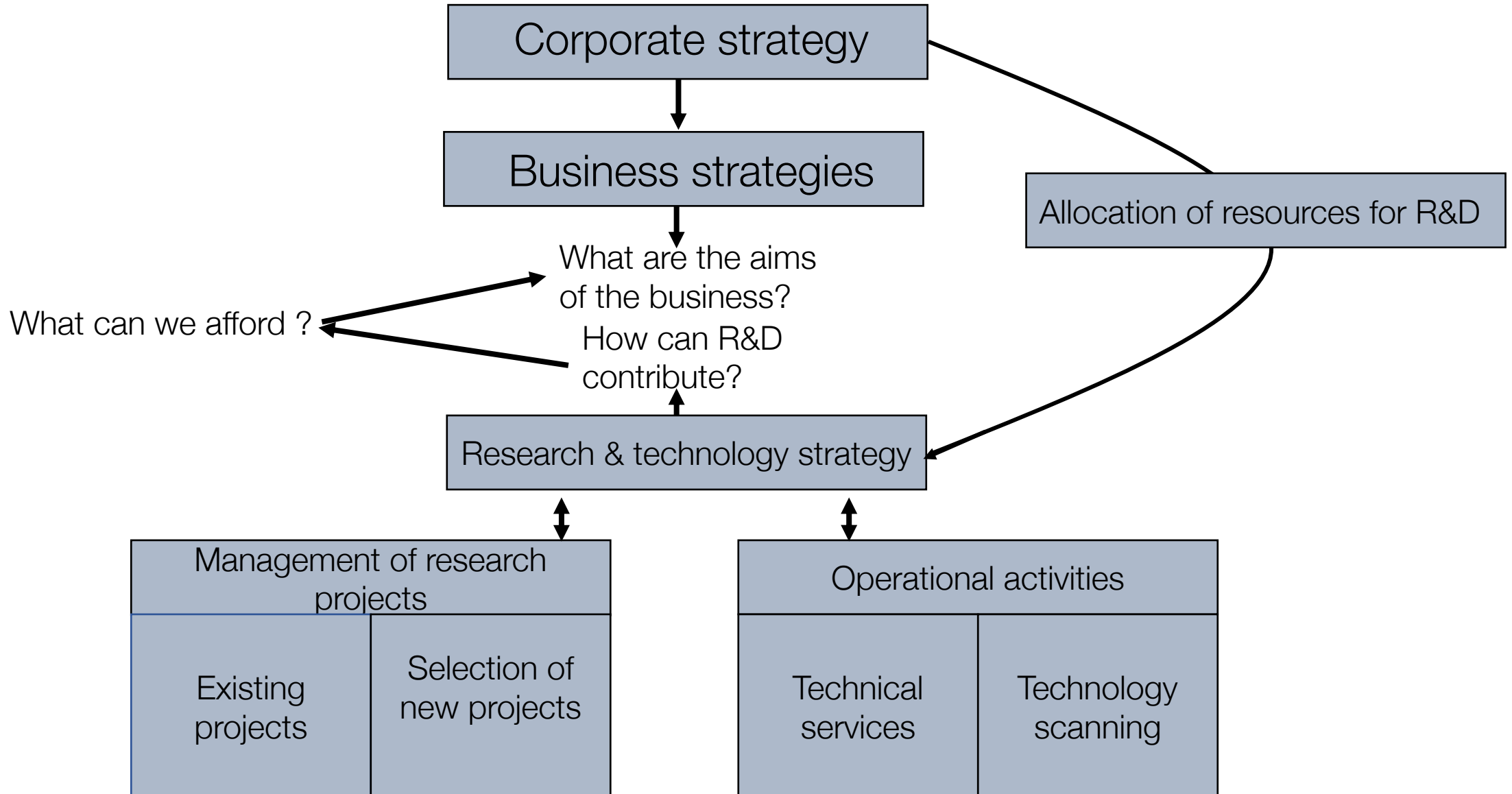
The photocopying industry increasingly uses software to add features and benefits to its products, such as security.

These are new to the company but may have a long-term significance for its products. In the photocopying industry, telecommunications technologies are being incorporated as standard features of the product.

So what is - or what could effect the industry and market sector in which we have photocopying machines?

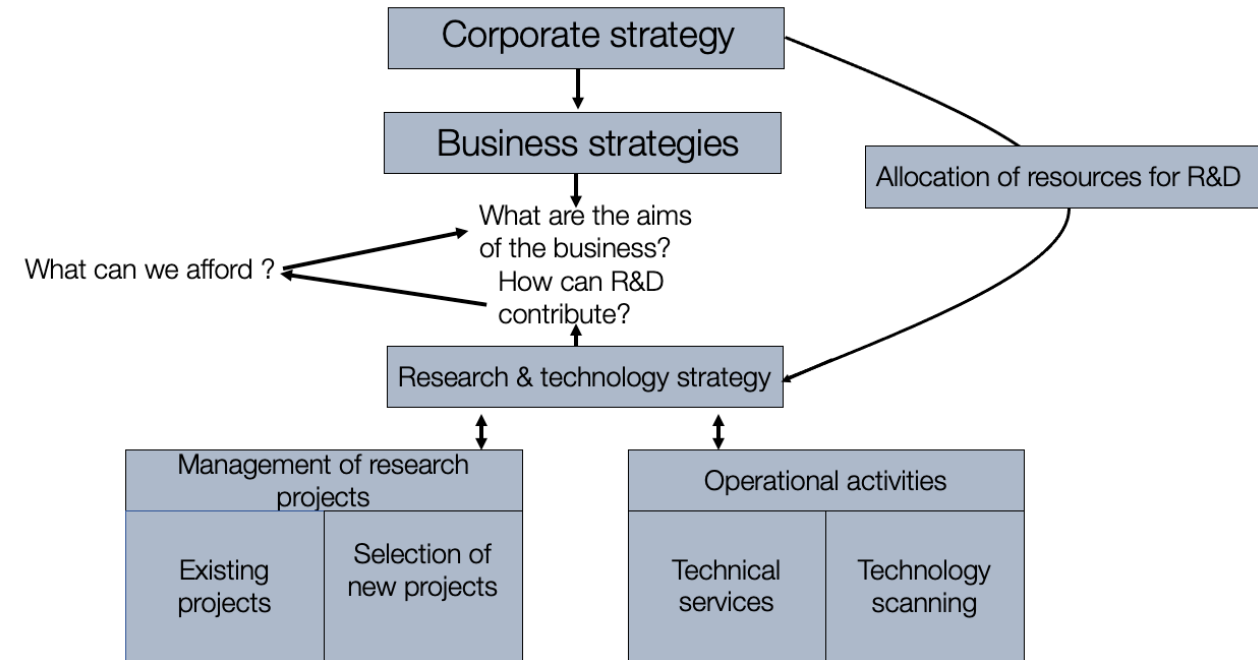
The R&D strategic
decision-making
process

Product Development



It starts with the company producing a statement of their objectives and how they are to be achieved. Essentially, a number of questions need to be considered:

- What are the needs of the business?
- What might the company do?
- What could the company do?
- What should the company do?



This process is neither a bottom-up nor a top-down process. What is required is continual dialogue between senior management and R&D management.

DEGREE OF INNOVATION	EXPLANATION	INVESTMENT (PERCENTAGE)
Incremental Innovation	• Improvements to existing products, services and processes, such as line extensions • New products or services that address the same existing market. • Easy to develop, based on customer needs. • Growth is only possible through taking a greater market share	70
Breakthrough Innovation	• New products or services with unique features that provide real benefit to customers. • Difficult to develop, as they require deeper customer insight. • Generate growth through adjacent markets. • May take time to generate sales.	20
Radical Innovation	• Develops products, services for markets that don't exist at this time • New business models that transforms markets. • Rare and difficult to develop	10

The Golden Ratio

R&D costs

An important factor influencing research and development costs is how much time you take for the project's completion. A shorter time frame tends to increase research and development cost because you require more resources and false starts resulting in wasted effort are more likely.

A light blue oval bubble with a slight gradient and shadow, containing the text "R&D Spend".

R&D Spend

A light blue oval bubble with a slight gradient and shadow, containing the text "Product Development".

Product Development

How important is R&D to our companies...?

R&D Spend

Product Development

Organisations that spend large amounts of money on R&D, such as Volkswagen, IBM, Sony, all would say there's a good return on the invest in R&D

	Company	R&D spend (£M) (approx.)	R&D % of Sales (approx.)	Industry
1	VW	11.7	6	Engineering & vehicles
5	BMW	4.8	6.3	Engineering & vehicles
8	Siemens	4.5	6	Engineering
9	GlaxoSmith Kline	4.1	13	Pharmaceuticals
19	AstraZeneca	3.2	17	Pharmaceuticals
15	FIAT	3.3	4	Engineering & vehicles

2019 Taken from Europe's top 20 leading firms in terms of R&D expenditure.

1. consider how R&D is managed within your company
in particular how does the company manage the R&D budget
2. research and analyse methods that could be used for
managing an R&D budget



Managing New Product Development

An Introduction to Assessment A

July 2022



Brief

Dates & Times

Teams

Module Learning Outcome: Demonstrate a systematic understanding of the key elements that contribute to the successful gathering of market knowledge for new product development.

Scenario

i. Background

You are NPD Manager of a Carmarthen-based SME which currently specialises in the manufacture of electronic breathalyser systems. The market for these devices is predominantly to police and security forces.

* NB See the website of Lion Laboratories for an exemplar product, for example the Lion Alcometer 500.

Scenario

ii. A new product development project

Through a Knowledge Transfer Partnership with a local university, the Company has identified the possible commercial opportunities that may exist if the chemical alcohol detector system (which is at the heart of their breathalyser products) was adapted to cover the detection of other organic materials, including those generated in the breath as a result of various virus infections.

Scenario

ii. NPD project...cont'd

In light of the current Coronavirus pandemic, the Company can see great potential in developing a device that could meet both clinical and personal requirements. As the NPD Manager you're approaching the development of this potential CDS (Chemical Detector System) in an 'Open Innovation' manner – and presently have a series of small concurrent R&D projects being undertaken both in-house and in conjunction with your local university.

Scenario

iii. Sources of marketing knowledge

As this product will take the Company away from its normal market sector, you're concern is the lack of market intelligence that you know will be essential in the development of this product.

The Task:

Sourcing Marketing Knowledge for the
development of a CDS (Chemical Detector System)

1. Determine what marketing knowledge is likely to be required for the development of this new product.

The Task:

Sourcing Marketing Knowledge for the
development of a CDS (Chemical Detector System)

Present your findings from your sources of marketing knowledge, and apply this
practice to the business in order to ascertain –

2. what business are we in?
3. what business(es) could we be in?

The Task:

Sourcing Marketing Knowledge for the
development of a CDS (Chemical Detector System)

4. You will also include your interpretation of marketing sensing capabilities and market understanding and develop the definition(s) of value for at least one customer value proposition scenario.

The Deliverables – a Group Presentation:

The presentation should be made using Keynote or PowerPoint and should last for 30 minute minutes. You should prepare for a 5-minute question period after your presentation is complete.

Dates & Deadlines:

Your 'hand in' date: 12 noon Wednesday 10th August 2022

Your Presentation day: Friday, 12th August 2022 (or there about)

TEAMS

Managing New Product Development

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