



Why are we studying these?

- Research & development and market research are two functions that play a vital role in **supporting** New Product Development
- Without **R&D**, New Product Development could not happen
- Without **market research**, we would not know what products to develop



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What is R&D?

- Definition:
 - “to **develop** new knowledge and **apply** scientific or engineering knowledge to connect the knowledge in one field to that in others” (Roussel et al. (1991)) [1]
- Research or Development
 - **Research** – discovery of new knowledge and scientific research
 - **Development** – new product development for commercial gain
- The activities of R&D can be placed along a line of **product tangibility**

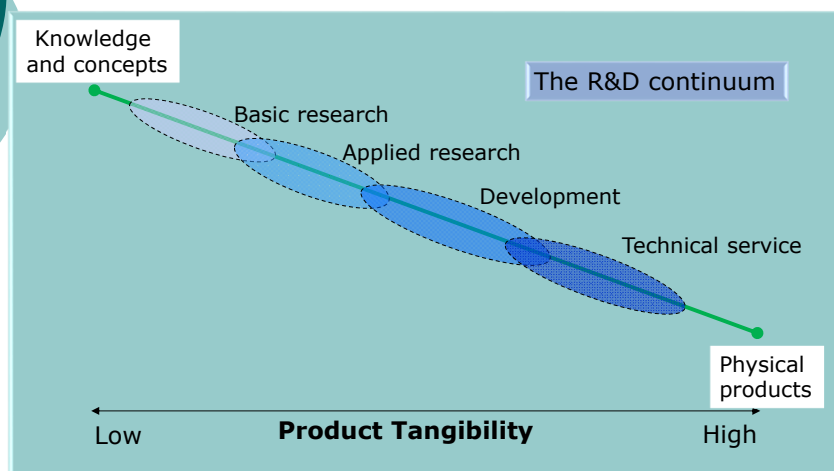


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The R&D continuum



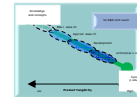
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The R&D continuum

- It is sometimes difficult to determine when **research ends** and **development begins**
- It is clearer to see industrial R&D as a **continuum** with **scientific knowledge** and concepts at one end and **physical products** at the other
- Many **major companies** use this structure to manage their R&D
 - e.g. Siemens, Nokia, BMW and Shell
- The four areas of this continuum will be described later in this lecture



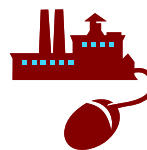
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The main activities of R&D

- The main activities of **industrial** R&D can include [3]:
 1. Discovering and developing **new technologies**
 2. Improving understanding of the technology in **existing products**
 3. Improving and strengthening understanding of technologies used in **manufacturing**
 4. **Understanding research** results from universities and other research institutions



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Operational activities of R&D

- There are **several stages** of activity that enable fundamental **research** to become **products** that could lead to commercial **gain**
- These stages can be seen **before** the introduction phase in the Extended Product Lifecycle in the next slide
- The slide shows all of the stages of the typical **product lifecycle**, plus additions that are focused on **R&D activities**

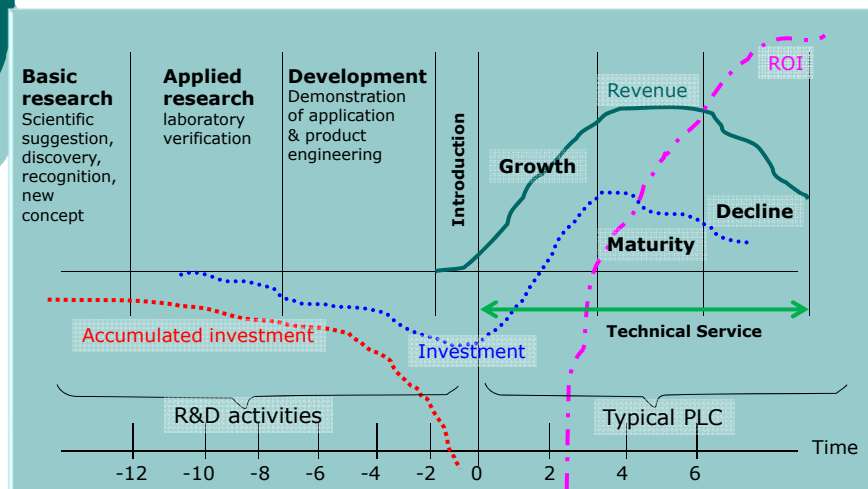


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The extended Product Life Cycle (PLC)



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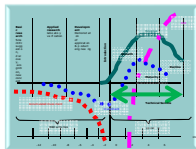
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Extended Product Life Cycle (PLC)

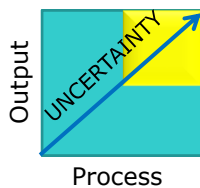
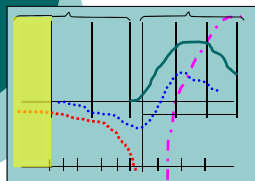
- Shows the series of activities **before** the first stage **introduction**
 - For some products, most notably aircraft or pharmaceuticals, the **lead-time** before launch can be **10** or even **15 years**
- Shows the extended product life cycle with some of the **key R&D** activities incorporated.
 - Mapped on top are the **investment** and **expenditure** curves showing the scale of **upfront money** required in some industries



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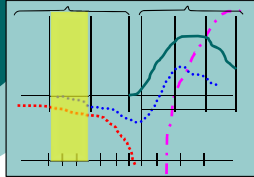
Extended Product Life Cycle - basic research

- Basic research "involves work of a **general nature** intended to apply to a **broad range** of uses or to **new knowledge** about an area" [5]
- Also referred to as **fundamental** research or '**blue sky**' research
- Usually in **universities** or labs in large organisations
- Quadrant 1 of **Pearson's uncertainty map** - "Exploratory Research", i.e. high risk
- Some findings will be researched **further** to identify new product technologies
 - e.g. scientific discoveries - such as antibiotics in 1940's



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Extended Product Life Cycle - applied research



- Applied Research “involves the use of **existing** scientific principles for the solution of a **particular problem**” [6]
- Also referred to as the **application of science**
- Many **new products** emerge from this
- May lead to **new technologies** and the development of **patents**
- Usually in **universities** or labs in large organisations

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Extended Product Life Cycle - applied research

- This is in **Quadrant 3** of the uncertainty map
 - “Applications Engineering” - high/low risk
- e.g. the development of the Dyson **vacuum cleaner** involved applying the science of **centrifugal forces** first explained by Newton. Centrifugal forces spin dirt out of the air stream in three stages (or cyclones) with air speeds of up to 178 miles an hour

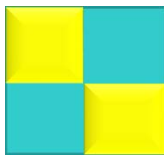
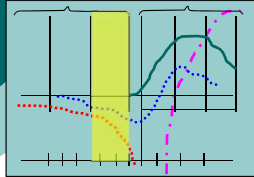


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Extended Product Life Cycle - development



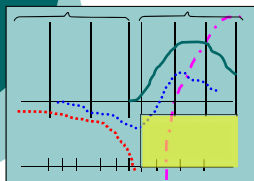
- Development “involves the use of **known** scientific principles, but the activities centre on **products**” [6]
- Usually involves overcoming a **technical problem** associated with a **new product**
- Possibly research into **improving** an **existing** product’s performance
- This is in quadrants 2 or 3 of the uncertainty map “Development Engineering/Applications Engineering”
 - There is some overlap in the risk for these activities
- e.g. **modifications** to **prototypes** that can lead to commercial products or **improvements** to **existing** commercial products

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Extended Product Life Cycle - technical services



- Technical Service “focuses on providing a service to existing products” [7]
- Often involves **cost** and **performance** improvements to existing products, processes or systems
- Also includes **design changes** to reduce manufacturing costs
- This is in quadrant 4 of the uncertainty map- “Combining Market Opportunities with Technical Applications”

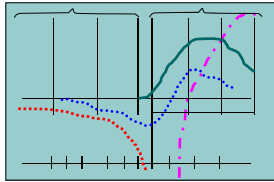
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Extended Product Life Cycle – introduction to market

- Development then **stops** on the specific product and release as introduction to the market takes place
- In parallel, further R&D will take place to identify **new** technologies, **update** and improve the products - and thus the cycle continues
- This is especially the case for the “Technical Service” aspect of R&D where current products are updated



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The strategic role of R&D

- Previous lectures have highlighted that the importance of **innovation** includes
 - obtaining **competitive** advantage
 - becoming the **market** leader
 - attracting and retaining **employees** etc.
- We have also looked at the impact of **corporate strategy** on the organisation’s choice of **product strategy**
 - i.e. is it in line with the organisation’s mission statement or strategy to become a market leader, challenger or follower?



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