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EBU5608 Product Development and Management

Topic 1 –

a) Introduction to the Module
b) Overview of Product Development

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Housekeeping

- Attend sessions and join **on time**!
- Sessions will not be recorded (in case they are delivered online)
- If you **do not understand** a point, write down your question and post it on www.menti.com or raise a hand in the classroom
- Your lecturer will answer your questions before the end of the class

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Agenda

- What is the module about:
  - Module emphasis
  - Module objectives
  - Teaching schedule
  - Delivery model
  - QMPlus
  - Module textbooks
  - Assessments
    - Coursework
    - Exam
  - Module Reps
- **Topic 1 – Overview of Product Development**
  - What is New Product Development (NPD)?
  - Product failure
  - Characteristics of successful product development
  - A generic product development process
  - Key departments and teams in product development

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Module Emphasis

- The emphasis of the module will be on
  - Understanding what lies behind the **product development process,**
  - Understanding the fundamental **business concepts** and **business environment**,
  - Investigating the stages in the introduction of a **new product** in a large **established** company,
  - Managing **intellectual property**, **product development projects** and **economics**, product **quality and improvement**, **risks,** and **marketing strategy**
  - Concept of **innovation** and **entrepreneurship** - setting up of a **new small** company (start-up) within the context of new product development

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Module Objectives

- **The module aims to give each of you**:
  - The ability to define the concept of **innovation** within the context of new product development
  - The ability to explain the functions of a **large company** in terms of the **development** of a new product
  - The ability to grasp basic **management** skills, including planning, organization, coordination, and adaptability
  - The ability to explain how the development of a product **differs** when it is developed by a **start-up** company
  - The ability to consider different **risks** and a successful **legal strategy** to develop, launch and distribute your product

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Teaching Schedule

	Week 4 (w/c 11th March)
Topic 1	Module Overview; Introduction to Product Development
Topic 2	Digital Transformation and Digital Products
Topic 3	Business Environment and Economic Environment
Topic 4	Innovation
Topic 5	Opportunity Identification
	Tutorial 1 - Exercise
	Week 5 (w/c 18th March)
Topic 6	Product Plannning
Topic 7	Identify Customer Needs
Topic 8	Concept Development
Topic 9	System Level Design
Topic 10	Detail Design and Prototypes
	Tutorial 2 - Coursework session
	Coursework's Report submission deadline: 29th of April

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Teaching Schedule

	Week 13 (w/c 13th May)
Topic 11	Design for Manufacturing
Topic 12	Production Ramp-up and Robust Design
Topic 13	Managing Intellectual Property
Topic 14	Introduction to Management
Topic 15	Managing Product Development Projects
	Tutorial 3 – Exercise **Coursework's Poster submission deadline: 13th of May**
	Week 14 (w/c 20th May)
Topic 16	Quality Management and Continuous Improvement
Topic 17	Marketing Strategy for New Products
Topic 18	Start-ups and Entrepreneurship
Topic 19	Cybersecurity and Managing Risks
Topic 20	Revision
	Tutorial 4 - Exam preparation

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2 Lecturers

Module Organiser

Nickos Paltalidis

Co-Lecturer

Michaela MacDonald

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4 Lecture Groups

Lecture Group	Lecturer
IoT_G1 (classes 11-13)	Nickos
IoT_G2 (classes 14-16)	Nickos
EIE (classes 17-20)	Michaela
IST (classes 21-24)	Michaela

- Same teaching material and tutorial exercises
- Same coursework assignment
- Same exam paper
- Different timeslots for live sessions for each lecture group
- Common *Student forum* on **QMPlus**

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Teaching Arrangements

- **Lectures**
  - **90 minutes** lectures (in person or online)
- **Tutorials**
  - **45 minutes** each session (in person or online)

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Preparing for this module

Lecture

- Read the lecture notes **before** you attend the lectures!
- **During** the lecture, make notes – don't just highlight. Ask questions.
- **After** each lecture, study the lecture notes and use the recommended textbooks to enhance your understanding of the week's topic. Lecture notes include information about recommended and further reading. Read the assigned materials *thoroughly*.

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Get ready for tutorials

Tutorial

- Prepare **before** you attend the tutorial. Read the relevant materials (e.g., a case study, article).
- **During** the tutorial, take part in the activities. Often, there are no 'right' answers. Use your judgement about which answer is most appropriate. You will learn and build upon your skills through participation. **After** the tutorial, finalise your answers and compare with the sample answers - they will be available on QMPlus at the end of the week.

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QMplus

- This is the **official way** module-related materials and information will be distributed (http://qmplus.qmul.ac.uk)
  - *Check **QMPlus** regularly*
- **Lecture notes, tutorial exercises and other study materials** are available on the **QMPlus EBU5608** module page.
- **Coursework Instructions** will be available soon on the **QMPlus EBU5608** module page.

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Module Textbook

Core Textbook

- ***Product Design and Development***, *Karl T Ulrich and Steven D Eppinger, 7th Edition, 2020, McGraw-Hill.*

Further Reading

- ***The Business Environment, A Global Perspective,*** *Thompson, E., Worthington, I., Britton, C. (2023) 9th Edition, Pearson, ISBN 1292417846.*
- ***Management***, *S. P. Robbins and M.A. Coulter, 13th Edition, 2016, Pearson.*
- ***Digital Product Management***, *Kevin J. Brennan, Sallie Godwin and Filip Hendrickx, 2022, BCS, The Chartered Institute for IT.*

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Glossaries

- **Business Glossary** - you will find it to QMPlus.
- **Online sources**:
  - Oxford Dictionary of Business & Management
    www.oxfordreference.com
  - Online dictionaries/glossaries, e.g.
    www.investopedia.com

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Assessments

- Will be based on
  - Coursework – worth **30%** of your marks
  - Exam – worth **70%** of your marks
- To pass this module, you must get **at least 40 marks** (QMUL scale) for the whole module (coursework + Exam)

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Coursework

- Looking at a potential **new digital product/service**
- **Submission deadlines:**
  - **Product idea**: ***Monday 1st of April 2024***
  - **Report**: ***Monday 29th April 2024***
  - **Poster**: ***Monday 13th of May 2024***

Group-based coursework, therefore your group should have regular meetings. ALL the members should meet every week to work on the coursework's tasks and to review the team's progress.

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Create a Group

- Create one coursework group of **5 members** (all the members should be students of the same major/lecture group) and choose your group leader.
- Visit the file **EBU5608 Groups 2024** available on QM Plus to select a coursework group number from your major/lecture group.
- Each student must visit the **EBU5608 Coursework Group Sign-Up sheet** on QM Plus and to register into to their group by **Friday 15th March 2024**

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Exam

- 2.5 hours
- **Answer ALL 3 questions**
- **70%** of overall mark

- Further instructions will be given during the revision session at the end of the semester
- **Past papers** will be added to the QMPlus EBU5608 web page later in the semester. (Note: This module has been adapted from previous modules, such as EBU5607 so does not have past exam papers per se)

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For Questions

- **During the lectures**, if you do not understand a point, write down your question and post it on www.**menti**.com or **raise your hand**. Your lecturer will answer your questions before the end of the class.

- Any questions about the topics, groups, coursework, exam:
  - Talk to your lecture during the **Office Hours**:

Teaching Week/Date	Office Hours	Location
Week 3 – 13th March	13:50 – 14:35	IS (International School) Building, 105-3
Week 4 – 20th March		
Week 12 – 15th May		
Week 13 – 22nd May		

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For Questions

- Post on QM Plus '**Student Forum**'. Questions are likely to be asked by **several** students. All students will be able to see questions and responses.
- **Do NOT email your lecturer - direct emails to lecture will be ignored**

- For any other questions related only to your personal matters or about your coursework marks, please email Dr Nickos Paltalidis (n.paltalidis@qmul.ac.uk) from your QMUL student email accounts (**@qmul.ac.uk**).

2 Module Representative for each lecture group

The main responsible are:

- Give an overall feedbacks collected from students about the lectures to lecturer at the end of teaching week
- Provide quick feedback to lecturers during each teaching week and aim at quicker respond to students
- Finish the tasks assigned by the lecturer
- Assist lecturers to prepare the content of revision lecture
- Attend to meetings

If you are interested to be a Module Rep, please email Dr Nickos Paltalidis (n.paltalidis@qmul.ac.uk) by the **15th of March 2024**

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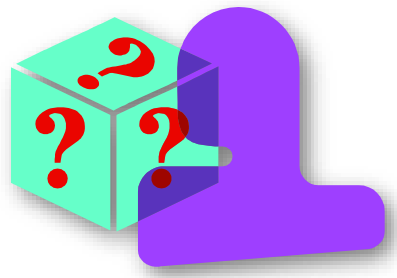
Questions?



Go to www.menti.com to post your questions

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Topic 1 – Overview of Product Development

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Agenda

- What is a new product?
- What is New Product Development (NPD)?
- Product failure
- Characteristics of successful product development
- A generic product development process
- Key departments and teams in product development

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What is a Product?

- A product can be a **service,** or an **item** offered **for sale**.
- It can be **physical** or in **virtual** or **cyber** form.
- *the **problem-solving** services or **core benefits** that consumers are really buying when they obtain a product"*
- Every product is made at a **cost,** and each is sold at a **price**.
- The price that can be charged depends on the **market**, the **quality**, the **marketing** and the **segment** that is targeted.

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New Products and Innovation

- Innovation means to **renew**, to **make new** or to **alter,** new way of doing things
- An innovation is a successful implementation of a **new** or significantly **improved product** (good or service), or **process**, a **new marketing method**, or a **new organisational method** in business practices, workplace organisation or external relations.
- A creative process in which **two or more existing things are combined** in some novel way to produce unique new thing.
- Innovation is where an **idea becomes reality**
- Innovation is the practical application of **new inventions** into marketable products and services

More details in Topic 4

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Six Types of New Products

Booz Allen and Hamilton (1982) identified six types of new products

1. New to the world
2. New product lines
3. Additions to existing product lines
4. Improvements and revisions to existing products
5. Re-positionings
6. Cost reductions

More details in Topic 17

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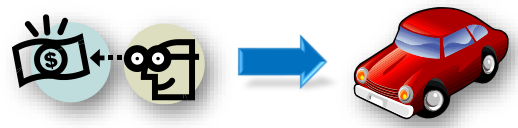
New Product Development (NPD)

What is New Product Development (NPD)?

- "For many people, **new products** are the **outputs** of the **innovation** process, where the new product development (NPD) process is a **subprocess** of innovation"
- "**Managing innovation** concerns the conditions that have to be in place to ensure that the organisation as a whole is given the opportunity to **develop new products**"
- "the actual development of new products is the process of transforming **business opportunities** into **tangible products**"



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New Product Development – the main inputs to planning

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Product Failure

- Identification of **appropriate projects** to be developed into products is vital
- Many studies have been carried out and the rate of **failure** given ranges from 10-90% of new products.
- Acceptance that some ideas are **not commercially viable** or **organisationally appropriate** is very important to ensure that **unnecessary investment** is avoided
- However, even after rigorous continual **assessment**, some products that are launched to the market still **fail**

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Reasons for a product failure

- Many reasons are given for product failure
  - The product **offers** nothing new or no improved performance
  - Inadequate **budget** to develop ideas or market the product
  - Poor **market** research, positioning, misunderstanding of customers needs
  - Lack of top **management** support

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Reasons for a product failure (2)

- Did not involve **customer**
- Exceptional factors such as **government** decision
- **Market** too small, either forecasting error with sales or insufficient demand
- Poor **match** with company's capabilities, company has insufficient experience of the technology or market
- Inadequate support from a **channel**
- **Late** to market

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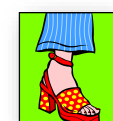
Reasons for a product failure (3)

- Competitive response was strong and **competitors** were able to move quickly to face the challenge of the new product
- Internal **organisational** problems, often associated with poor communication
- Poor return on **investment** forcing company to abandon project
- Unexpected **changes** in consumer tastes/fashion



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Avoiding failure

- An analysis of the common failure modes reveals the **root causes** of failure
- **Process improvements** and a **structured approach** can address these common failure themes. For example:
  - Better **requirements** capture and management
  - Better **planning** (including getting to the market on time and first, if market leader)
  - Better **analysis** and screening
  - Organisation-wide **process** framework
  - Better **execution**
- This means we need a **structured** development process

Characteristics of successful product development

- To assess whether or not a product development has been a success, the **characteristics** on the next few slides are evaluated at the end of each project
- This is usually done at the post project 'wrap-up' meeting
- This helps the management of a '**for-profit**' organisation to make decisions on the **next project**
- The answers to these questions, whether the project was a **success** or **failure**, can give fundamental information to organisations to help make decisions on NPD in the future

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Characteristics of a successful product development

- **Product Quality**
- **Product Cost**
- **Development Time**
- **Development Cost**
- **Development Capability**





Characteristics of a successful product development [6]

Characteristic	Questions asked	Description
Product quality 	How **good** is the product resulting from the development effort? Does it satisfy customer **needs**? Is it **robust** and **reliable**?	Product quality affects **market share** and the **price** that customers are willing to pay

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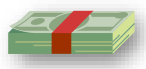
Characteristics of a successful product development

Characteristic	Questions asked	Description
Product cost 	What is the **manufacturing** cost of the product?	This cost includes spending on **capital equipment** and **tooling** as well as the **incremental** cost of producing each unit of the product Product cost determines how much **profit** the firm makes for a particular sales **volume** and a particular sales **price**

Characteristics of a successful product development

Characteristic	Questions asked	Description
Development time 	How **quickly** did the team complete the product development effort?	Development time determines how **responsive** the firm can be to **competitive** forces and to **technological** developments, as well as how quickly the firm receives the economic returns from the team's efforts **Can be used to plan future development times/schedules**

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Characteristics of a successful product development

Characteristic	Questions asked	Description
Development cost 	How **much** did the firm have to spend to develop the product?	Development cost is usually a significant fraction of the **investment** required to achieve the **profits** **Can be used to plan future budget and resources**

Characteristics of a successful product development

Characteristic	Questions asked	Description
Development capability 	Are the team and the firm better able to develop **future products** as a result of their **experience** with a product development project?	**Development capability** is an asset the firm can use to develop products more **effectively** and **economically** in the future **Potentially, development time and cost of the next project is reduced as the team is now more experienced**

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Characteristics of a successful product development

- **Positive** answers to these questions, will show that the project was **successful**
- Often the **success factors** of this project will be considered and replicated in **future projects** to give continual success in product development
- Failures can also be learned from – mistakes can be avoided to **reduce the chance** of future product failure
- Of course, ***every project is different***
  - other elements, e.g. external and internal factors, will have to be considered

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Product Development Process

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Product Development Process

- A product development process can be **defined** as:
  - "a **sequence** of steps or **activities** which an enterprise employs to conceive, design, and commercialise a product"
- The **way** the product development process is designed and implemented **differs** between organisations
- Some organisations may **not** have a **structured** or **recorded** process

Generic Product Development Process

- A generic, well-defined process is very useful and the **advantages** of this are:
  - **Quality assurance**
    - a development process specifies the **phases** a development project will pass through and the **checkpoints** along the way
    - when these points and checkpoints (often called **milestones**) are chosen wisely, following the development **process** is one way of assuring the **quality** of the resulting product

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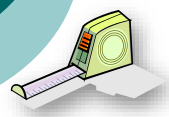
Generic Product Development Process (cont.)

- **Coordination**
  - a **clearly articulated** development process acts as a **master plan** which defines the **roles** of each of the players on the development team
  - This plan tells the members of the team **when** their contributions will be needed and **who** they will need to exchange information and materials with

- **Planning**
  - a development process contains **natural milestones** corresponding to the **completion** of each phase
  - The **timing** of these milestones anchors the **schedule** of the overall development project

Generic Product Development Process (cont.)



- **Management**
  - a development process is a **benchmark** for assessing the **performance** of an ongoing development effort
  - by comparing the **actual** events to the established **process**, a manager can identify possible **problem** areas

- **Improvement**
  - the careful **documentation** of an organisation's development process often helps to identify **opportunities** for improvement

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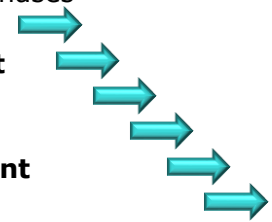
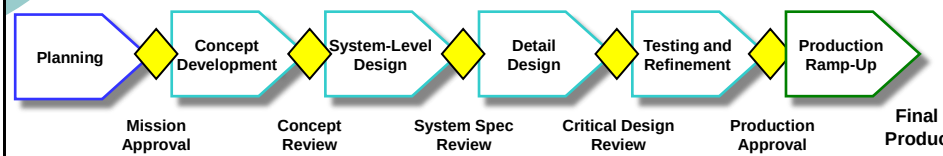
Generic Product Development Process (cont.)

- Product development **starts** with planning and **concludes** with product launch
- A **generic product development process** can be used as an example
- The process has six distinct phases
  - 0. **Planning**
  - 1. **Concept development**
  - 2. **System-level design**
  - 3. **Detail design**
  - 4. **Testing and refinement**
  - 5. **Production ramp-up**



Generic Product Development Process (cont.)

- At the end of each phase, there is an outcome



Source: Product Design and Development, Karl T Ulrich and Steven D Eppinger, International Edition (3rd) McGraw-Hill, 2012, page 14

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0. Planning

- Often referred to as "phase zero"
- It **precedes** a **project approval** and launch of the actual product development process
- Begins with a **corporate strategy** – includes an assessment of **technology** developments and **market** objectives
- The **output** of this phase is the Project Mission Statement
  - **Project Mission Statement** – specifies the target market for the product, business goals, key assumptions and constraints

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1. Concept development

- The **needs** of the target market are identified
- **Alternative** product concepts are generated and evaluated
  - A concept is a **description** of the form, function and features of a product
- One or more concepts are selected for further **development** and **testing**
- **Evaluation** and **screening criteria** are used to aid in the **selection**
- Usually accompanied by a set of **specifications**, an **analysis** of competitive products and an economic **justification** for the project

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2. System-level design

- Includes the definition of the **product architecture** and the **decomposition** of the product into subsystems and components
- The **output** of this phase usually includes:
  - a geometric **layout** of the product
  - a **functional specification** of each of the products subsystems
  - A preliminary **process flow** diagram for the final assembly process

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3. Detail design

- Includes the **complete specification** of the geometry, materials and tolerances of all the unique parts of the product
- Also includes any information regarding parts to be purchased from **suppliers**
- The **output** of this phase is the **control documentation** – the drawings or computer files describing the specifications of each of the parts of the product and how it is to be assembled
- Two **critical issues** addressed in the detail design phase are:
  - Production **cost**
  - Robust **performance**

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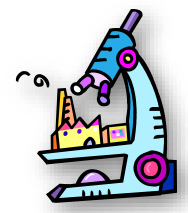
4. Testing and refinement

- Involves the construction and **evaluation** of **multiple** preproduction versions of the product – prototypes, GUI designs etc.
- Initial testing **within** the organisation
- Further **customer testing** will be carried out at this stage – usually with the **lead customer**
- Feedback used to make **improvements** and **adjustments** to the products



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5. Production ramp-up

- The product is **made** using the intended production system (this is relevant for both hardware and software)
- Purpose of the ramp-up is to **train** the work force and to work out any remaining **problems** in the **production** process
- Products from this phase are often delivered to **preferred customers** for initial feedback – changes may be incorporated into the final product
- At some point during this phase, the product is **launched** and therefore available for widespread **distribution**

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A Generic Product Development - Process and Decisions

- At the **end of each phase** a decision will be made as to whether to proceed with development or not
- Going straight to widespread distribution with a poor quality product which is costly to produce could cause many problems for the organisation
- Costs can be reduced using **early evaluation**

- **In the next topics, we will look at the generic product development process in more detail**

The Key Departments in Product Development

- **Marketing**

  - Mediates the interactions between the **firm** and its **customers** – i.e. communication
  - **Identifies** possible products, market segments, customer needs etc
- **Design (R&D)**

  - Plays the lead role in defining the **physical form** of the product and how this can best meet customer needs
  - This may be in the form of hardware, software, electronics etc
- **Manufacturing**

  - Design and operation of the **production** of the product
  - Often includes **supply chain** management

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Marketing					
• Articulate market opportunity. • Define market segments.	• Collect customer needs. • Identify lead users. • Identify competitive products.	• Develop plan for product options and extended product family.	• Develop marketing plan.	• Develop promotion and launch materials. • Facilitate field testing.	• Place early production with key customers.
Design					
• Consider product platform and architecture. • Assess new technologies.	• Investigate feasibility of product concepts. • Develop industrial design concepts. • Build and test experimental prototypes.	• Develop product architecture. • Define major sub-systems and interfaces. • Refine industrial design. • Preliminary component engineering.	• Define part geometry. • Choose materials. • Assign tolerances. • Complete industrial design control documentation.	• Test overall performance, reliability, and durability. • Obtain regulatory approvals. • Assess environmental impact. • Implement design changes.	• Evaluate early production output.
Manufacturing					
• Identify production constraints. • Set supply chain strategy.	• Estimate manufacturing cost. • Assess production feasibility.	• Identify suppliers for key components. • Perform make-buy analysis. • Define final assembly scheme.	• Define piece-part production processes. • Design tooling. • Define quality assurance processes. • Begin procurement of long-lead tooling.	• Facilitate supplier ramp-up. • Refine fabrication and assembly processes. • Train workforce. • Refine quality assurance processes.	• Begin full operation of production system.
Other Functions					
• Research: Demonstrate available technologies. • Finance: Provide planning goals. • General Management: Allocate project resources.	• Finance: Facilitate economic analysis. • Legal: Investigate patent issues.	• Finance: Facilitate make-buy analysis. • Service: Identify service issues.		• Sales: Develop sales plan.	• General Management: Conduct postproject review.

[1]

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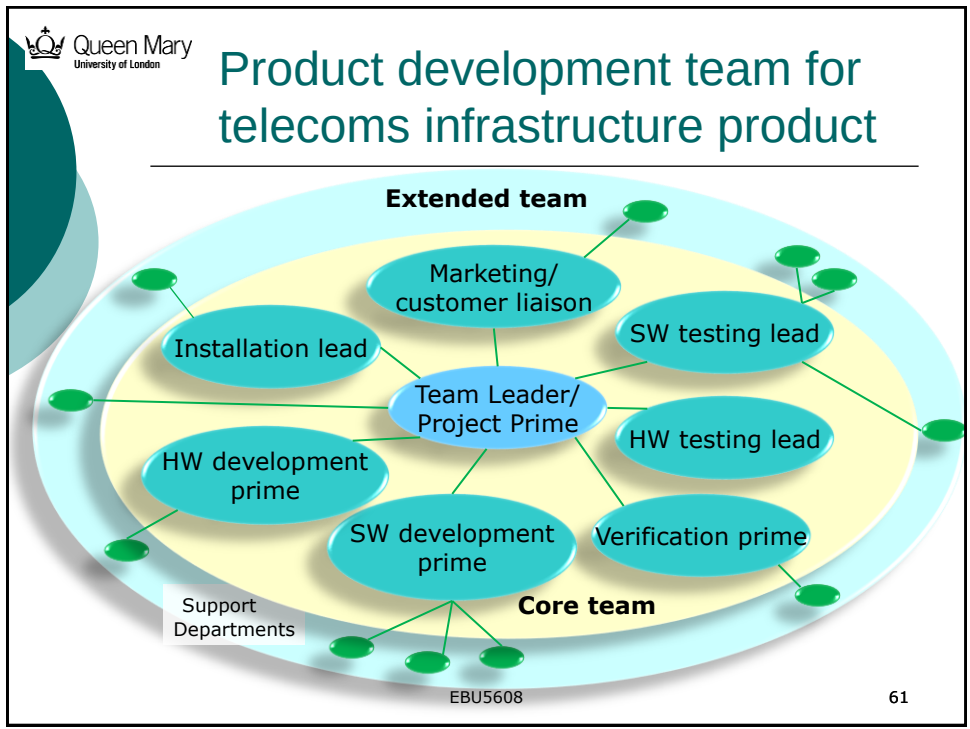
Project Teams

- Project teams are created with **representatives** from each of these areas
- Project teams are made up of
  - **Core team** – usually with a **team leader** and **one representative** from each of the areas involved in the stages from product conception to delivery
  - **Extended team** – **all** of the people involved in the development (multiple team members, etc.)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Product development team for telecoms infrastructure product
Extended team
Marketing/ customer liaison
Installation lead
SW testing lead
Team Leader/ Project Prime
HW testing lead
HW development prime
SW development prime
Verification prime
Core team
Support Departments
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Summary

- New Product
- New Product Development
- Reasons for a product failure
- Characteristics of asuccessful product development
- A generic product development process
- Key departments and teams in product development

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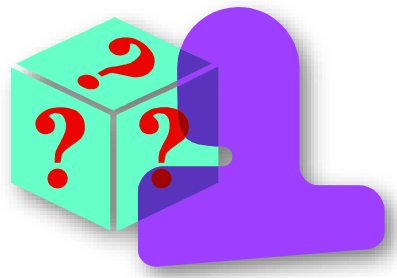
Questions?



Go to www.menti.com to post your questions

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Reading

- **Core Textbook** (Ulrich & Eppinger, 7th Edition)
  - Chapter 2. Product Development Process and Organisation, **pages 11 - 32**

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References

1. Product Design and Development, Karl T Ulrich and Steven D Eppinger, International Edition (3rd) McGraw-Hill, 2012