EXAM

Product Planning – Needs and Opportunities

Course code: PPU085

Wednesday 2023-04-05 at 14.00-18.00

Examiner: Professor Johan Malmqvist.

Questions: Professor Johan Malmqvist, 031 – 772 1382, johan.malmqvist@chalmers.se. Prof Malmqvist will visit the exam rooms at approximately 14.30 and 15.45.

Department: Industrial and Materials Science.

Solutions: Will be posted on the course's Canvas page on Thursday 2023-04-06.

Note that the posted answers may be copied from the lecture notes or the book, but that does not mean that verbatim answers are required or even expected for full points on an exam question.

Results: Will be announced no later than Wednesday 2023-02-01.

Exam review: In Inspera, you will be able to access your own answers also after the exam. Requests for correction of the marking should be sent by e-mail to Lena Bendrioua (lena.bendrioua@chalmers.se) using the "Request for correction_review of grade.pdf" form that is available in Canvas under Templates.

Grades: The maximum score on the exam is 20 points. 8 points are required for passing the exam and a "3" grade. For grades "4" and "5", 12 and 16 points are required, respectively.

Tools

The exam is run in the Inspera digital exam system. In addition, pen, paper and dictionaries and "Chalmers approved calculators" are permitted.

NB! Solutions should be documented with text and drawings. Equations should be motivated. Also partially solved problems will be assessed. If some details are missing in the problem statement, introduce suitable parameters and assume, if necessary (reasonable) numbers.

It is recommended that graphics are drawn using the functionality available in Inspera. However, you may also draw them on paper and hand them into to the exam staff. Ask the exam staff for assistance in the matter.

1 Product planning (2 p)

The table below identifies some reasons why product development projects may fail. For each of the reasons, identify a tool (or a combination of tools) introduced in the course that, if applied, may counteract the particular risk for failure and explain how.

Failure reason	**Tool(s) + explanation**
Nothing new and beneficial is offered by the product	
Poor timing, the product is launched too late or too early	

Solution:

Failure reason	**Tool(s) + explanation**
Nothing new and beneficial is offered by the product	• Benchmarking, quantified comparison with existing design • Patent analysis, which determines the uniqueness of a technical solution
Poor timing, the product is launched too late or too early	• Technology roadmaps, which when in time a particular technology is expected to be introduced into the market

The answers above are examples, and there may be other adequate answers.

2 Opportunity identification (2 p)

Explain the meaning of the acronym VRIN and identify the VRIN resources of some company that you admire.

Solution:

The acronym stands for Valuable – Rare – Inimitable – Non-substitutable.

The terms refers to assets – can be product solutions, production technology, engineering competence that is valuable (adds value or solves a problem for a customer), rare (there are few similar offers in the market), inimitable (difficult or expensive for a competitor to copy) and non-substitutable (the is no alternative way of solving the same problem).

The VRIN of aeroengine component manufacturer GKN is grounded in their capability for precision manufacturing of large components made from advanced materials. This requires mastery of the use of expensive machinery.

3 Target costing (2 p)

Describe the principles of the method "target costing" and explain how it can be used to set a target product cost in a development process.

You can make assumptions concerning numbers if needed for your explanation.

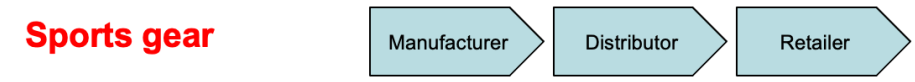
Solution:

The target costing method is based on the idea that in the supply chain from manufacturer to end customer there will be a number of supply chain actors who will add a margin M_i to the cost C, and that those actors and margins are relatively well known in a particular industry (e.g., cars of sports equipment). With a known market price P, this enables the backwards computation of a target product cost.

The targer cost C is then

$$C = P \prod_{i}^{n} (1 - M_i)$$

Example:



P (kEUR)	M1, min	M1, max	M2, min	M2, max	M3, min	M3, max	C, min	C, max	C, avg	C %, avg
1	20	50	8	16	40	75	0,11	0,44	0,2733	27,33

4 Sampling (3 p)

Some kind of sampling is most often necessary when deciding who should be included in a customer needs study. There are different sampling strategies depending upon the situation. Name and describe briefly maximum three different sampling methods that can be used in a qualitative customer needs study.

Solution:

Sampling strategies suited for qualitative market studies include:

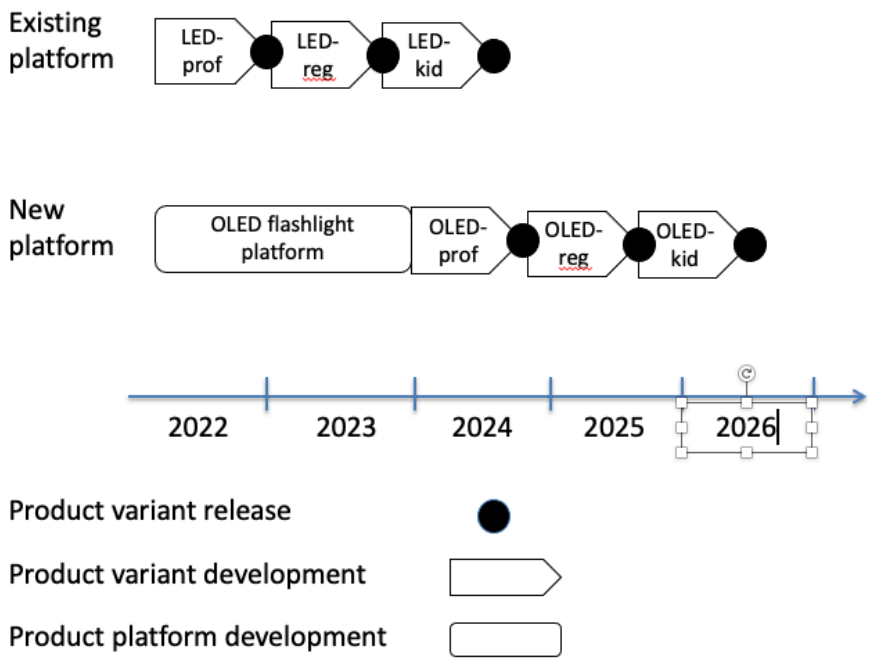
- ***Theoretical (representative) sampling*** – participants with a particular property are selected, e.g. elderly people who are frequent public transport users.
- ***Critical sampling*** – participants who are critical are selected, e.g software user how have logged complaints in a support system.
- ***Lead users*** – participants who are first or ahead in using the product are selected, e.g elite athletes for sports equipment.

5 Product platform plan for a flashlight manufacturer (3 p)

Imagine that you a product planner for a flashlight company. Your company sells flashlights in different variants aimed at children, regular and professional users. You are currently using LED (light emitting diodes) technology, but you realize that there will be a shift to the currently more expensive OLED (organic light emitting diode) technology in a few years.

Your task is to draw a product platform plan for your company that accommodates both the need to maintain and upgrade your current product portfolio and to develop a new generation of products based on the new technology.

Solution:



6 Technology planning (4 p)

A bicycle manufacturer is considering the future for bicycles. Today, the products of the firm represent current state-of-the-art, with personal ownership, lightweight frames electric power assistance and so on. However, it is worried about the safety hazards associated with bikes.

Now it wants to move into the future with a zero vision for dead or seriously injured bicyclists.

Your task is to identify bicycle functions that need to take significant steps forward in the future in order to radically improve bicycle safety and to suggests technologies/solutions that may be acquired or developed by the bicycle manufacturer in order to realize those functions.

Solution

First you need to consider two basic ways of making vehicles safe:

- Accident (collision) avoidance
- Protecting the cyclist when an accident is unavoidable

You will also need to equip bicycles for monitoring their own status, own traffic actors as well as road conditions, and to process that information in order to guide avoidance and accident avoidance and protection actions.

Provided these functions, are number of solutions may be devised, as summarized in the table below. Some are already commercially available (“Hövding”) others are under development (check youtube if you are interested).

Functional area/subfunction		Technology/existing solution
Sensing		
	Monitor other moving objects (vehicles, people)	360 degree multi-camera system
	Monitor non-moving objects (road, barriers)	360 degree multi-camera system
	Monitor bicycle status	Gyro-sensor
		Accelerometer
		Wheel speed sensor
Computing		
	Integrate and process information from multiple sensors	Electronic control unit (ECU)
Actuating		
	Accelerate bicycle away from danger	”Turbo” use of electric bicycle propulsion system
	Brake bicycle	Anti-skid braking system for bicycles
	Steer bicycle away from danger	Autonoumous steering system for bicycles
	Balance bicycle (in order not to fall over)	Flywheel-based balancing system
Protecting		
	Protect driver by driver-worn equipment	Bicycle helmet with integrated airbag (“Hövding”)
		Bicycle clothing with protective function
	Protect driver by bicycle-mounted equipment	Bicycle-integrated airbags, directed towards driver
	Protect driver by slowing down impact	Bicycle-integrated airbags, directed towards colliding objects

7 Course learning outcomes (4 p)

Account for in text and graphics for what you know about the following course learning outcome:

"Explain and differentiate between the meaning of key terms such as customer, user, needs, user or engineering requirements, etc., including sub-categories of the terms".

Solution

As this question can be answered in many ways, no single solution is presented. However, the underlying contents is mainly found in lectures notes 3.