Developing a Business Case for Space

A basic introduction and practical guide for start-ups and SMEs

Inês Castelão, Country Desk Officer for Slovakia
Riga, 28th of October 2024

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What is this training and who is it for?

OBJECTIVES

- Highlight the importance of a Business Case in the **development plan** of a product/service,

- Shed light on the trajectory **from idea to project to product,** and ESA's involvement in all of them,

- Provide tools to guide you in your planning and forecast (defining **what comes next**).

TARGET AUDIENCE

- **High-level** overview of the development of a Business Case – introducing concepts, but not comprehensively detailing on them

- Therefore, the course is not very suitable for/not sufficient for those with a strong business background. Instead, the target audience is:
  - ⤷ **SMEs/Startups**, companies establishing their **first product** or expanding/spinning off to the Space market
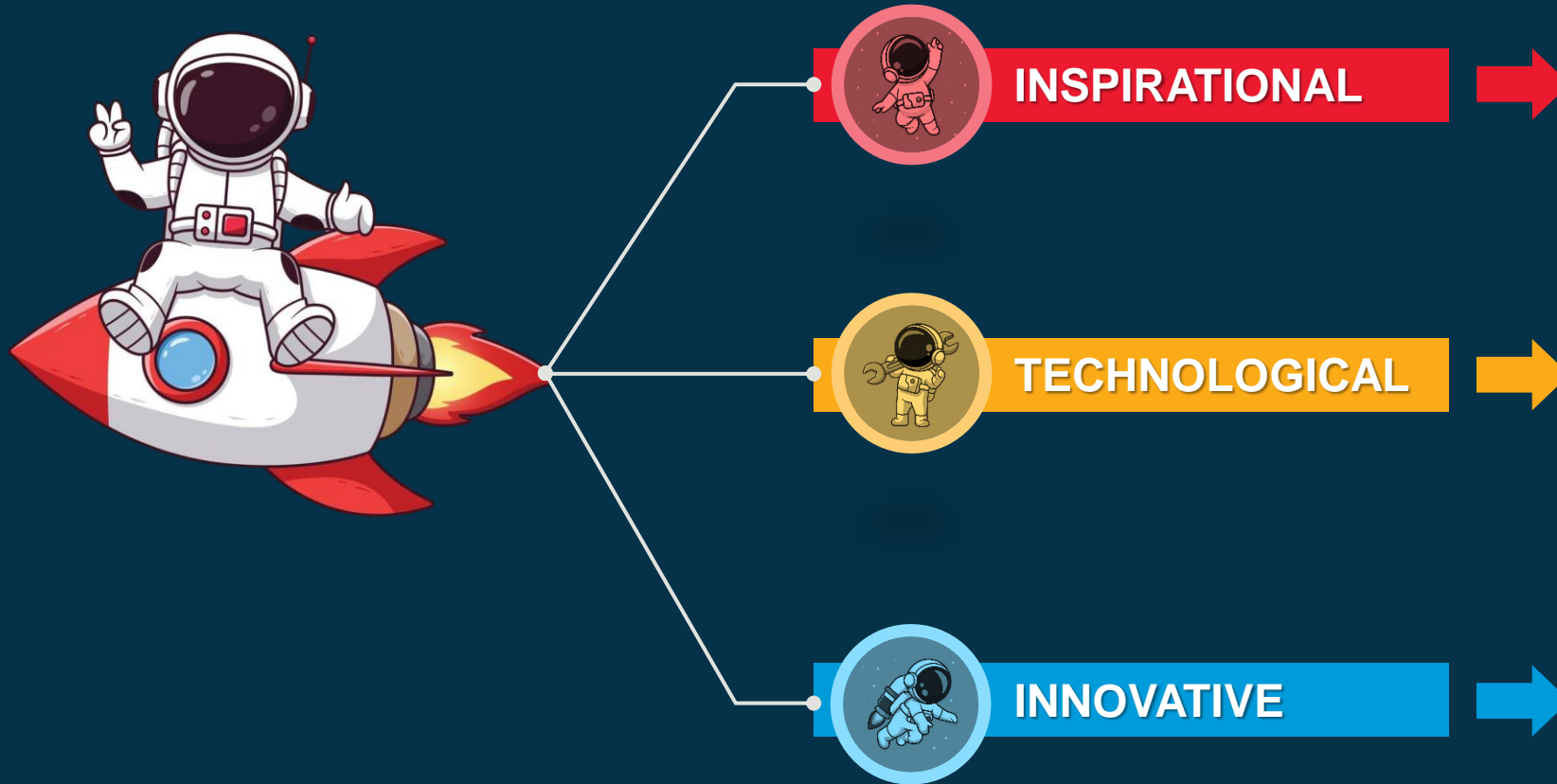
💡 **It will also help you to consolidate your business case (and get higher marks on** Criterion 2)

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FROM IDEA TO VALUE

Space's Special Case

INSPIRATIONAL

Audacious goals such as taking humanity to the Moon and Mars, delivering global internet, fighting climate change, etc.

TECHNOLOGICAL

Most of the workforce has a **higher education (post-secondary)** and is mostly linked to fields like engineering, astrophysics and astronomy, remote sensing, etc.

INNOVATIVE

Space technologies continue to push the boundaries of knowledge even on Earth. This innovation also comes with a certain **degree of uncertainty and risk**

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Space's Special Case (II)

HUGE INVESTMENTS

LONG LEAD/DEV TIMES

RISKY AND UNCERTAIN
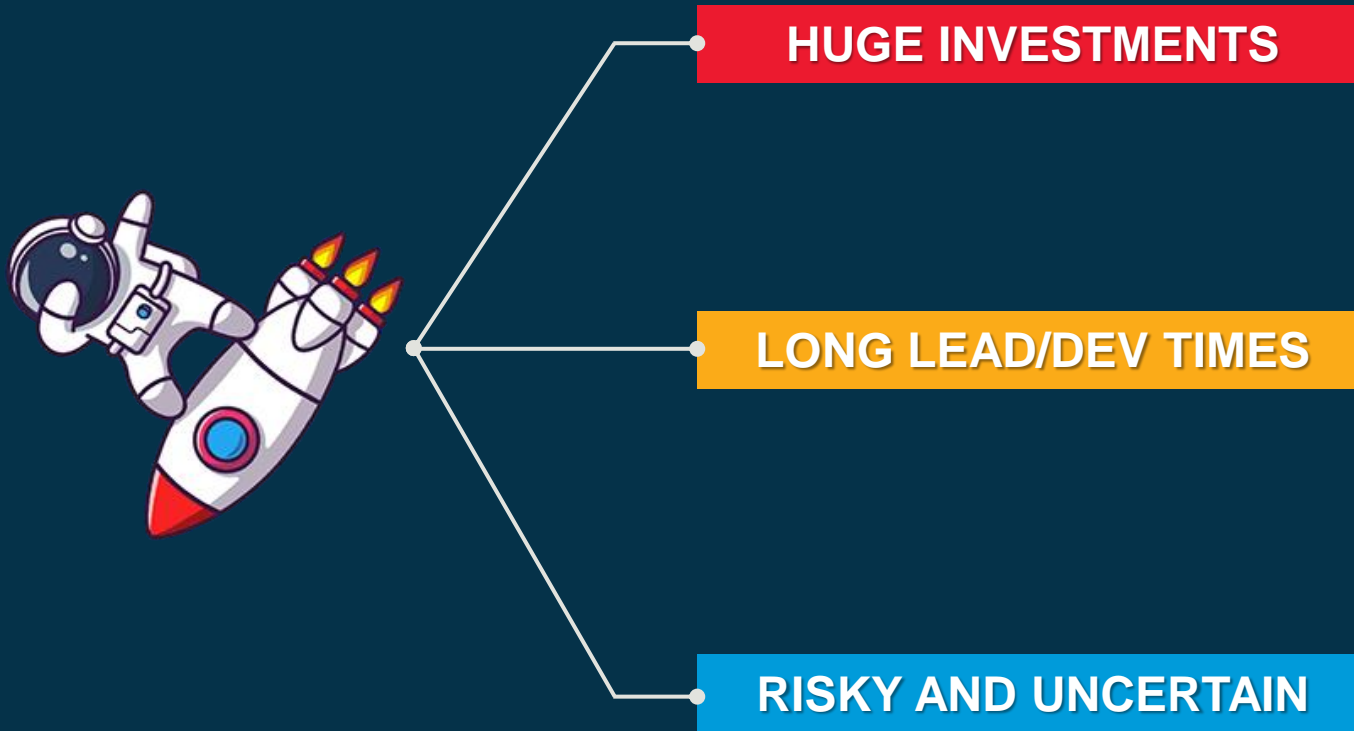
- Can be a **high-risk/high-reward** market

- High quality (rigorous testing) leads to long lead and development times resulting in a **long time to market.**

- **Government/Institutional funding** to overcome the risk.

- ESA prefers **recurring IOD products** (lower cost/risk) for our missions

- Focus on **developing (and qualifying) products and services** instead of funding research/one-offs.

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Technology Push vs. Market Pull

TECHNOLOGY PUSH

"Game-changing" new products and services

- **Innovation** at the forefront, forward-thinking
- The goal is to **pioneer** changes that redefine market standards and consumer expectations
- By introducing new products and services that were previously unimaginable, has the risk of being deemed "**ahead of its time**"

💡 In space, it usually tends to need more in-flight demos before the solution is accepted and taken up by the market.

MARKET PULL

Solving known customers' problems

- Priority is the identification and satisfaction of existing **consumer needs and desires**
- Consumer-centric viewpoint, reactive approach
- Higher likelihood of **market acceptance**
- Tends to be improvements on the same solution (e.g. lower cost, higher performance, smaller)

💡 It's crucial to define "improvement" in a metric that is relevant to the customer. This is why it is so important for us to have a customer involved in your ESA projects.

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Technology Push vs. Market Pull

TECHNOLOGY PUSH

MARKET PULL

💡 No approach is better than the other. Finding a balance between these is crucial for a business's success

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Value Proposition

RELEVANCE

Who is your customer and why is this product/service **relevant** to them?

VALUE

What is the **added value** of having this product/service?

UNIQUENESS

Why is the product/service better than **what already exists**?
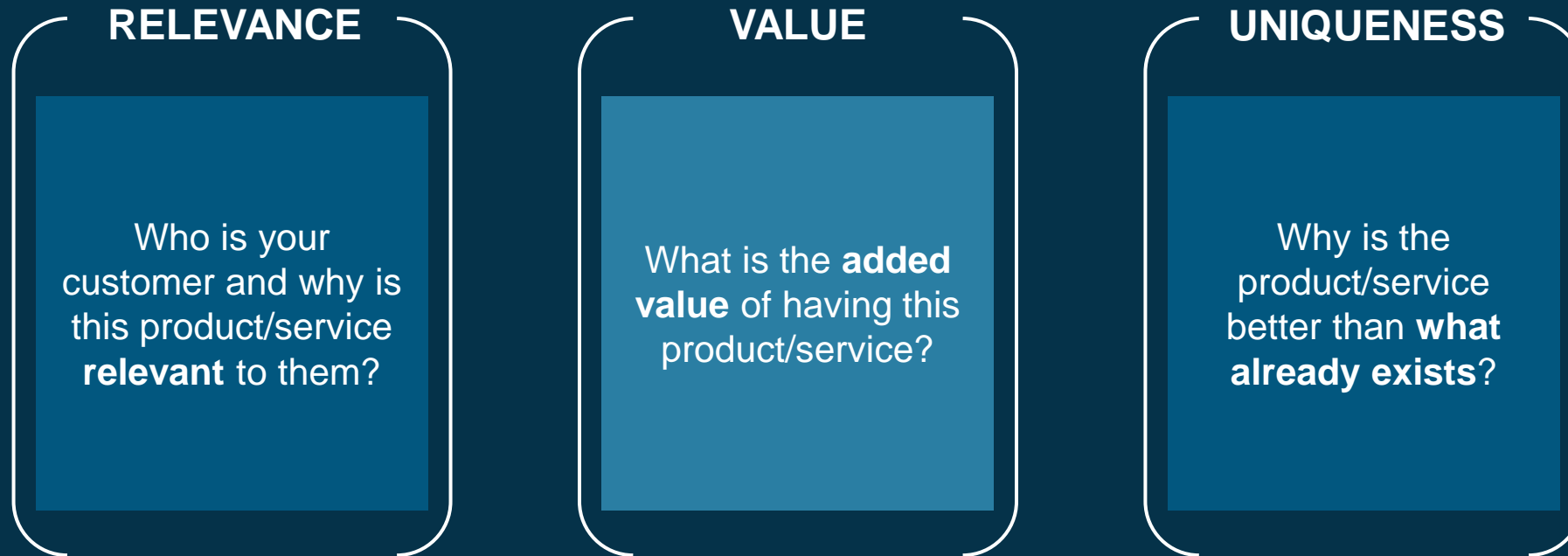
💡 **By stating the RELEVANCE and identifying your users/customers in Section 1.6 and the UNIQUENESS of the solution vs. the state-of-the-art in 1.4.1, it should become clear to any ESA reviewer what is its VALUE.**

Mission Statement vs. Value Proposition

SpaceX **aims** to revolutionise space technology to enable people to live on other planets.

Mission Statement

Value Proposition

- Goal-oriented
- What is your objective as an organization

- Product/Service-oriented
- What you offer customers and why they should choose you

SpaceX's Falcon **offers** cost-effective, flexible and reliable access to space

Value Proposition – Practical Exercise

You own a coffee shop.
What is the value proposition of your products?

- *What makes your product **relevant** to your customers?*
- *What makes it **better** than what already exists?*

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Value Proposition – Our answers

INNOVATIVE FLAVORS

Is there a need for this innovation?

Our coffee ~~res~~ ... **and faster** ~~n't~~ sacrifice quality.

Use of AI does not even make sense

UNIQUE LOCATION

Our cof~~fee~~ ~~competition~~.

No competition but also no clients…

For the record, these are NOT good

Value Proposition – Our real answers

FAST & CHEAPER

Our staff has a proven background in handling our coffee machines. By lowering the need for maintenance, we can reduce costs and thus the price by 10%, and our delivery time is 20% better than competitors.

UNIQUE LOCATION

Our coffee shop is located near the beach, offering a beautiful view of the ocean. It is also the only coffee shop in this area, and thus the alternative for coffee lovers is driving 5km into town, making it very inconvenient.

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Products & Services

PRODUCTS

"Selling coffee and baked goods in our coffee shop"

- Generally tangible items (something that customers can physically hold in their hands)
- Frequently one-off purchase
- Usually it can **not** be returned (warranty)

Products are **not** only one-off procurements – depending on the business, usually, the customers buy many times, but for different missions
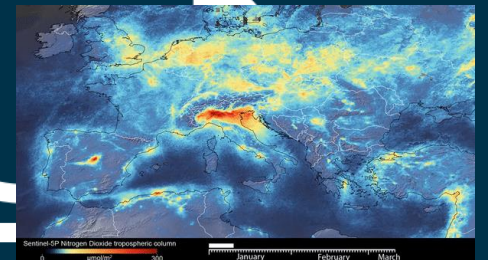
SERVICES

"Providing coffee catering service for companies"

- Typically intangible (something that the business provides or performs for its customers)
- Frequently a recurring purchase (subscription)
- Usually it can be cancelled (notice period)
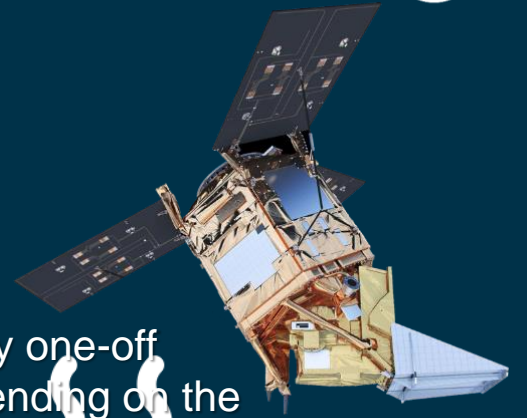
Services can be about providing **information** (e.g., downstream apps)

Same technology can be a service or a product

Customer Jobs – Practical Exercise

Let's go back to our coffee shop. Why are our clients there? What are they attempting to **get done**?

- *What are they doing with our products/services?*
- *What kind of **tasks** are they trying to complete?*
- *What **wants/needs** are they trying to satisfy?*

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Customer Jobs – Answers

FUNCTIONAL

- To have a quick cup of coffee on the way to work
- To have their favourite pastry

EMOTIONAL

- Experience relaxation and cosiness
- Small luxury: having someone else brew one's coffee

SOCIAL

- Neighbour café feeling
- Meeting place to connect with friends, dates, etc.

Gains & Pains – Practical Exercise
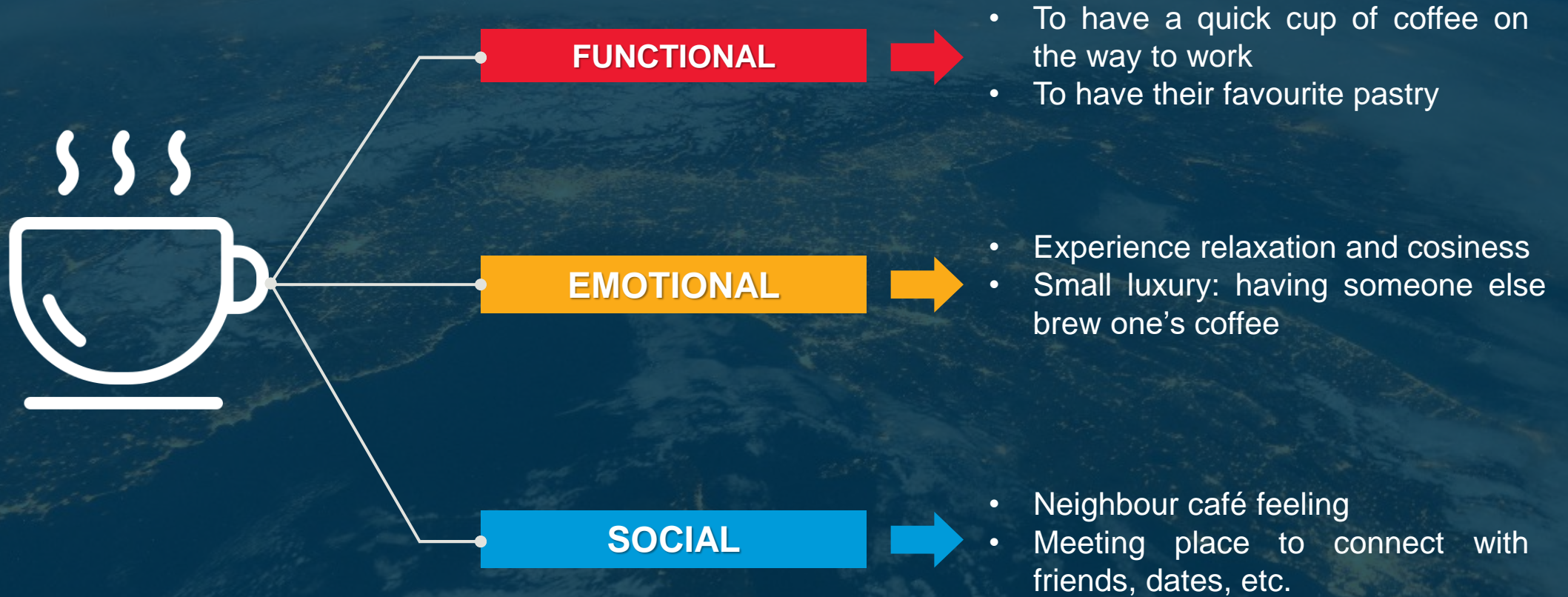
From our clients' point of view, what are their associated **pains and gains** when buying coffee?

- *What kind of **pains** can happen while there?*
- *What potential **gains** can our clients have?*

Pains – Answers

WAITING TIMES

- More baristas and multiple queues
- Creation of an app with functions for ordering online and order tracking

HIGH PRICES

- Use of local products to save on logistics and thus lower the price

Gains – Answers

GOOD AMBIANCE

- The baristas are friendly and helpful
- The coffee place has free Wi-Fi
- The coffee shop has a good location and a cozy decoration inside

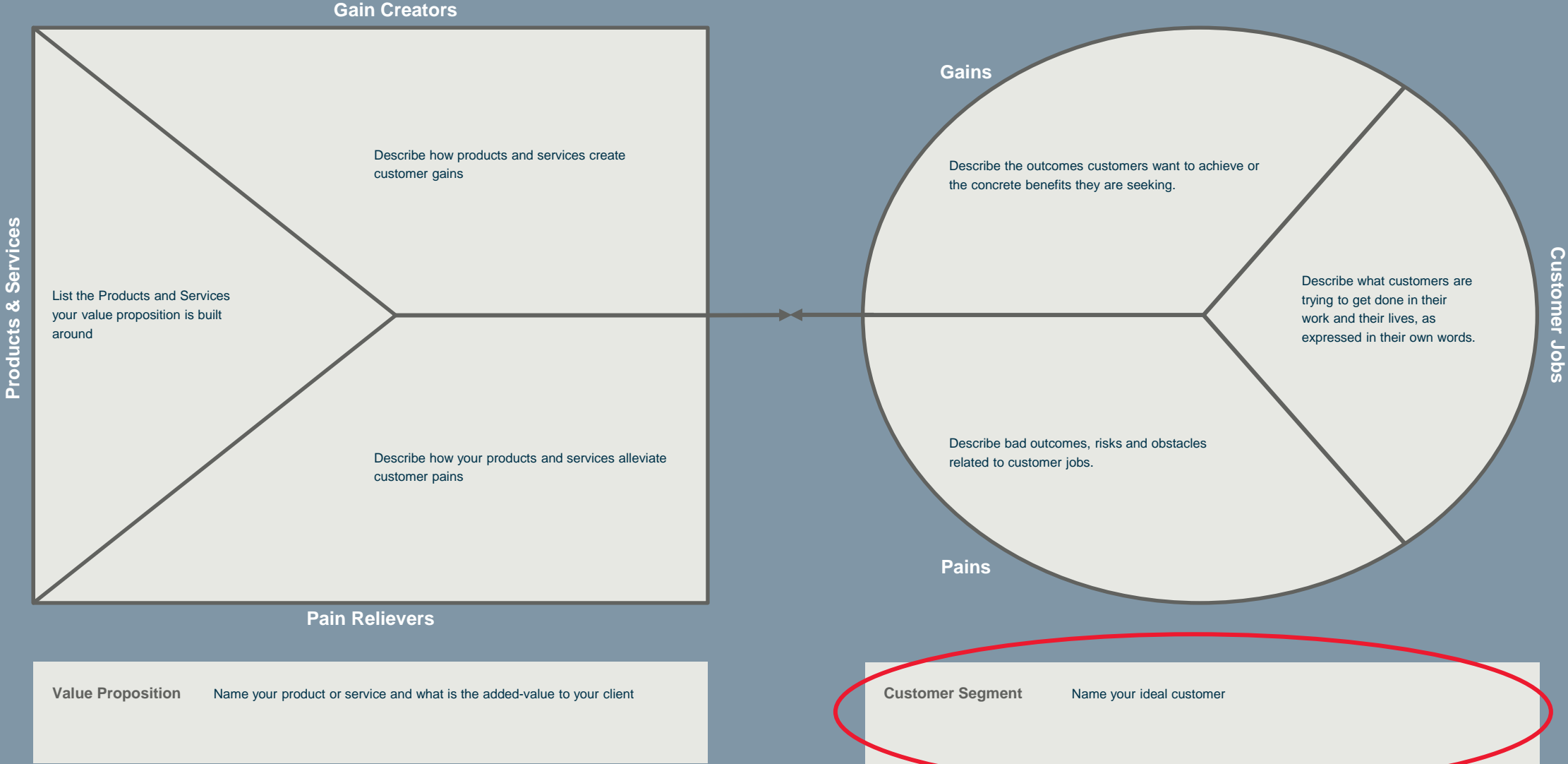**SIMPLE PROCESS**

- The menu is simple and does not have excessive options/variations
- Creation of an app that allows clients to save their usual order

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It's time for a **real** cup of coffee!

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Value Proposition Canvas – Template

Gain Creators

Describe how products and services create customer gains

Products & Services

List the Products and Services your value proposition is built around

Describe how your products and services alleviate customer pains

Pain Relievers

Gains

Describe the outcomes customers want to achieve or the concrete benefits they are seeking.

Customer Jobs

Describe what customers are trying to get done in their work and their lives, as expressed in their own words.

Describe bad outcomes, risks and obstacles related to customer jobs.

Pains

Value Proposition   Name your product or service and what is the added-value to your client

Customer Segment   Name your ideal customer

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Value Chain and Key Partners

- Up until now, we have defined our value, products and services mostly as if we operated **in a vacuum**

- To show the unique value a business offers, one must understand **their customers** and **competitors/alternatives**

- To do so, we need to define our "**neighbours**" in the value chain

We have
COFFEE
at home

💡 **This information is crucial for a good mark in the State-of-the-Art section (Criterion 1) of ESA proposals!**
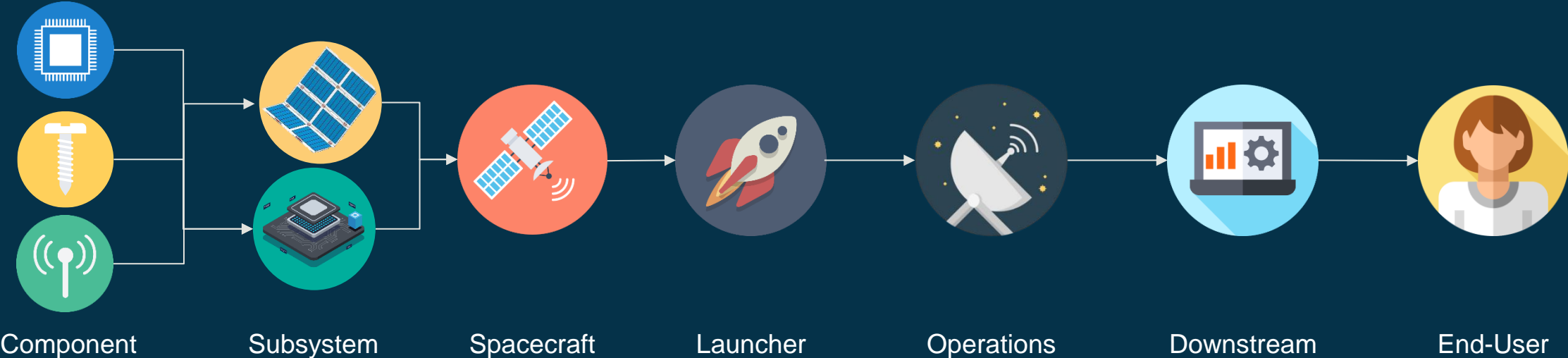
Value Chain and Key Partners – Coffee Shop

Farm → Logistics (I) → Mill & Roasters → Logistics (II) → Grocery Stores / Your Coffee Shop / Other Coffee Shops → End Customer

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Value Chain and Key Partners – Coffee Shop

Farm

Logistics (I)

Mill & Roasters

Logistics (II)

Grocery Stores

Your Coffee Shop

Other Coffee Shops

End Customer

SUPPLY CHAIN

Value Chain and Key Partners – Coffee Shop

Farm

Logistics (I)

Mill & Roasters

Logistics (II)

Grocery Stores

Your Coffee Shop

Other Coffee Shops

COMPETITORS & ALTERNATIVES

End Customer

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Value Chain and Key Partners – S/C Provider POV

Component → Subsystem → Spacecraft → Launcher → Operations → Downstream → End-User

Value Chain and Key Partners – S/C Provider POV

Assembly (PCB, etc.)

Testing (EGSE, etc.)

Ground Station (Infrastructure, etc.)

Mission Control Centre vs. Payload/Science Data

Component

Subsystem

Spacecraft

Launcher

Operations

Downstream

End-User

Logistics & Transport

Launch Campaign

Governmental Agency

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Value Chain and Key Partners – Final Notes

- **Coopetition**: To complicate matters, some component suppliers can have vertical integration up to subsystem level (or subsystem providers can double as spacecraft suppliers), which means that sometimes our competitors are also our suppliers or customers depending on the situation.

- **Lack of knowledge adds to risk**: it can become **complex or overwhelming** to determine who our neighbours are in the value chain and it's not uncommon to find **new key partners** throughout a product development process (e.g., unforeseen supply needs and thus costs).

- **Costumer Relationship**: For upstream in particular, the market is built on **low volume**, **high-risk** business with **bespoke** solutions and thus customer relationship becomes key. It is a **trust-based** business, and this is built via **transparency** and **cooperation** (e.g., with more established players).

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From Market to Target

Total Available Market (TAM)

In 2023, the **global revenues from EO** data and value-added services amounted to €3.4 billion

Serviceable Available Market (SAM)

EO data and value-added services **focused on Agriculture** are responsible for 13% of the revenue

Serviceable Obtainable Market (SOM)

Europe accounts for approximately 30% of the total market share of EO for Agriculture. European companies operating in this sector can **realistically** estimate to capture a % of that

Your target market and most likely your first customers

We strongly recommend selecting an end-user from this last group and engaging them as subcontractors

Source: EUSPA EO and GNSS Market Report | Issue 2, 2024

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From Market to Target – Limiting Factors

28,800 satellites are forecasted to be launched between 2023 and 2032 for a total market of 400 USD Billion

Source: Euroconsult's satellites to be built and launched, 26th edition (2023)

Mega-constellations and other awarded contracts → 13% of the total market is already restricted, as part of the 5 mega-constellations

Non-European (institutional) markets → The U.S. still manufactures the vast majority of commercially procured satellites (46% in 2023)

Different sizes, target applications → Satellites >50kg still account for a large portion of the market (estimated 336 USD Billion)

New Space vs. High Reliability → Different missions will have different (i.e., more or less strict) requirements

More established competitors → Airbus is the leading European market player (with 65% of the market share in 2022)

💡 **You can find ESA's market estimates (equivalent to SOM) from the Technology Harmonisation in this link.**

TAM/SAM/SOM – Practical Exercise

Who is the **target customer** of our coffee shop?

TIP: *Let's do some reverse engineering: who can we exclude?*

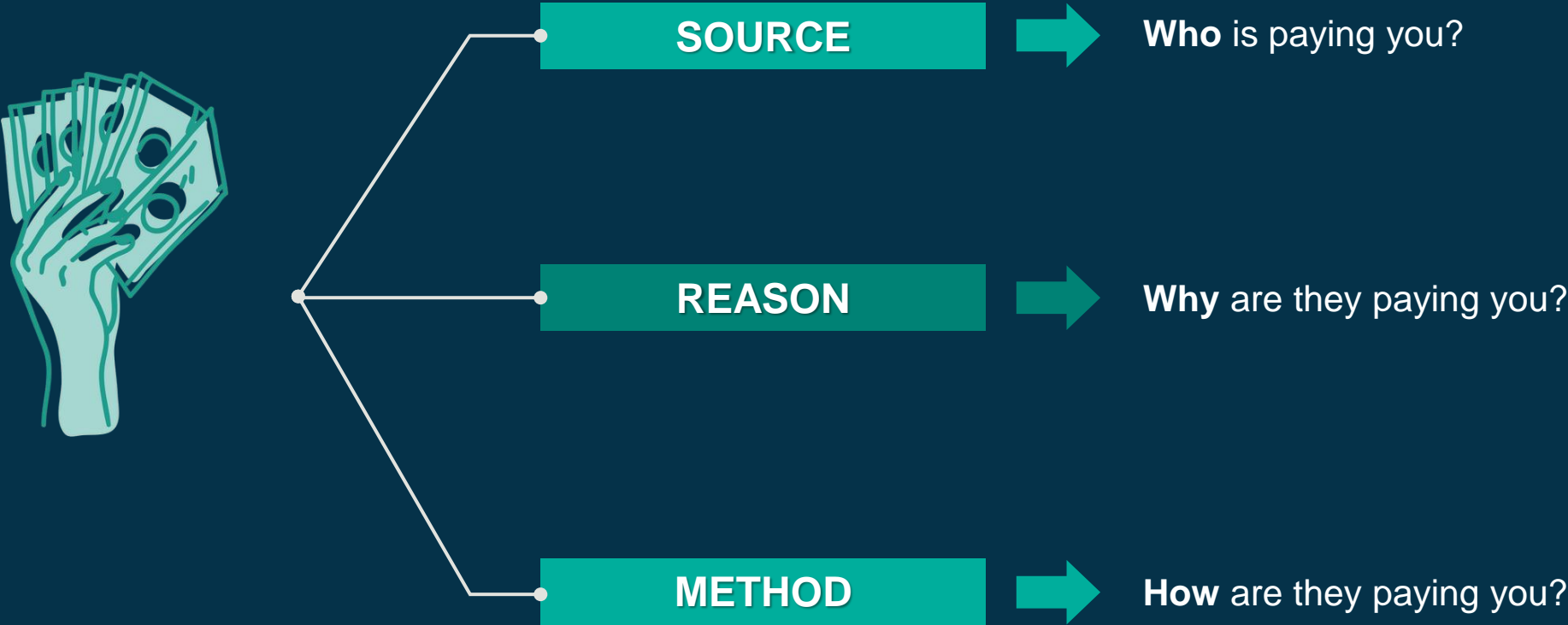→ THE EUROPEAN SPACE AGENCY

TAM/SAM/SOM – Our Answers

Potential limiting factors

- People who **don't like** coffee
- People who live **too far away** from Riga
- People who **cannot afford** it
- People with **medical conditions** (cardiovascular, immobile, etc.)
- People **unavailable** during the café's working hours (e.g., night shift)
- People with **existing brand loyalty**
- People **under the age** of 10
- …

Some food for thought

- Tourists and one-off costumers
- Competition in the area
- …

Revenue Stream

SOURCE → **Who** is paying you?

REASON → **Why** are they paying you?

METHOD → **How** are they paying you?

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Revenue Stream – Product vs. Service

PRODUCT-BASED

Selling coffee and baked goods in our coffee shop

- Directly selling an item from stock to a customer (B2C)
- Revenue is obtained directly from the customer and exchanged for the good

SERVICE-BASED

Catering service for companies

- The customer is now another company (B2B)
- Revenue is obtained by agreeing to price a priori. Revenue can be obtained in several ways (e.g., 50 upfront and 50 after service, monthly fee, etc.)

Not all products follow this approach and there are several models, each with their own pros and cons.

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Revenue Stream – Pricing

We have now explored the answers to:
- **Who** is paying you?
- **Why** are they paying you?
- **How** are they paying you?
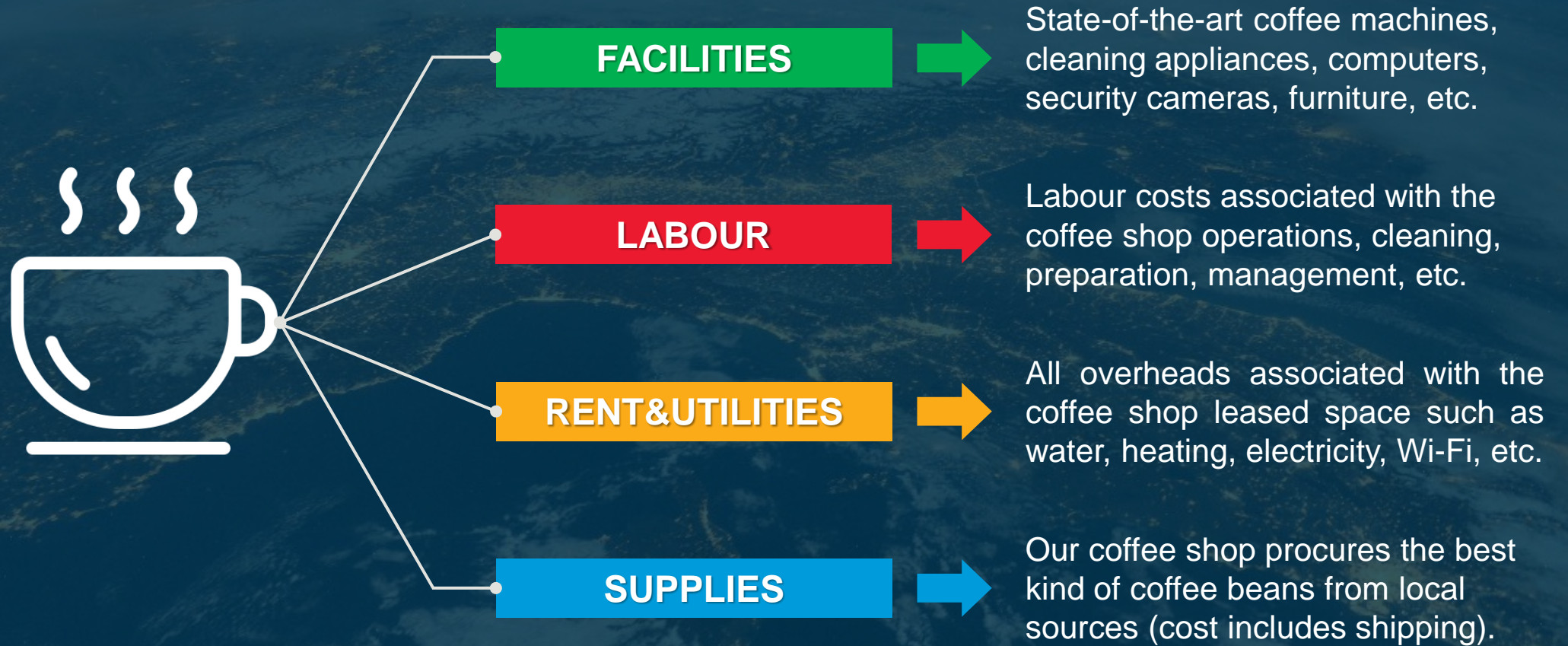
But how much are they paying you?

Cost-plus pricing

Competitive pricing

Price skimming

Penetration pricing

Value-based pricing

Cost Structure – Practical Exercise

What are the **main costs** associated with running a coffee shop?

- What are the **key activities** involved in running a café?
- What are the **main resources** needed for our product/service?
- What kind of **costs** are associated with those?

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Cost Structure – Our answers

FACILITIES → State-of-the-art coffee machines, cleaning appliances, computers, security cameras, furniture, etc.

LABOUR → Labour costs associated with the coffee shop operations, cleaning, preparation, management, etc.

RENT&UTILITIES → All overheads associated with the coffee shop leased space such as water, heating, electricity, Wi-Fi, etc.

SUPPLIES → Our coffee shop procures the best kind of coffee beans from local sources (cost includes shipping).

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Costing – Recurring vs. Non-Recurring

RECURRING COSTS

Regular, ongoing expenses that are required to conduct normal business operations.

For a coffee shop, these include:
- Rent & Utilities
- Labour / HR
- Supplies / Stock

NON-RECURRING COSTS

These occur infrequently or only once, being often related to the setup, expansion or significant changes in operations.

For a coffee shop, these include:
- Purchases of major equipment
- New furniture, renovating
- Unexpected repairs

Costing – Depreciation & Amortization

AMORTIZATION & DEPRECIATION

- Depreciation involves expensing a **fixed** asset as it's used to reflect its anticipated deterioration (i.e., how much of its value was used up in that time.

- Amortization is the practice of spreading an **intangible** asset's cost over that asset's useful life (e.g. patents, franchise agreements, trademarks)

EXAMPLE

- **Example**: Imagine a bakery that buys a delivery van of €50,000 with a useful lifetime of 10 years.

- Following the straight-line method, it would cost €5,000 per year over the next 10 years.
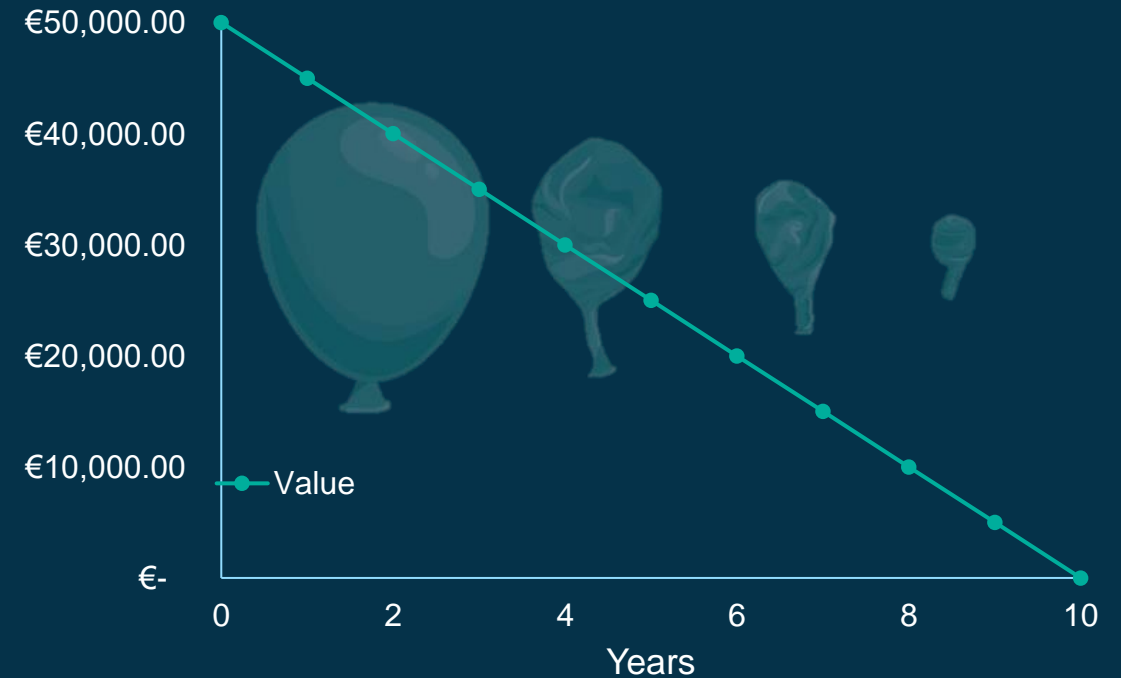
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
€5,000	€5,000	€5,000	€5,000	€5,000	€5,000	€5,000	€5,000	€5,000	€5,000

Costing – Cost to deliver the product

Items for costing	Costs	Cost per cup
Amortised own **infrastructure** investment	Amortised Rent: €20,000 per year	€0.1
Amortised **development** costs – e.g., new machine	Often paid by ESA for Space	€0.01
Amortised advertising costs/ bidding costs and other **overheads**	Amortised Overheads: €20,000 per year	€0.1
Labour costs (approx. 5mins per cup)	€12 per hour	€1.0
Parts and materials (milk, paper cup, beans, sugar etc)	€0.5 per cup	€0.5
Licences and taxes	€0.2 per cup	€ 0.2
Wastage (e.g. due to minimum order quantities, mistakes, failures)	€0.05 per cup	€0.05
		TOTAL: €1.96 /cup
We would need to charge at least €1.97 per cup to not make a loss		

Assuming 200,000 cups sold per year

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Revenue & Costing – Cash Flow

WHAT IS IT?

Cash Flow (CF) refers to the movement of money into and out of a business organisation at a certain moment in time.

$$CF = TCI - TCO$$

Where:
TCI is the Total Cash Inflow
TCO is the Total Cash Outflow

WHY IS IT IMPORTANT?

Cash flow planning is essential: you need cash in the bank to pay your bills.

Any lucrative business can experience short-term cash flow issues – e.g. if they have excessive costs while delivering a service while they wait to receive a payment from a customer.

Cash flow planning is also helpful to see if you can afford new investments (e.g. new products, bigger premises, or recruiting new staff, etc.)

Cash Flow – Practical Exercise

In 2023, a bakery decided to expand its business operations and start selling coffee at its premises. To do so, it hired a barista and invested into a new espresso machine and seating area:

Operating Cash Flow Statement for 2023:

Cash inflows:

- Coffee sales: €90,000
- Pastry sales: €60,000

Cash outflows

- Payments to coffee bean suppliers: €10,000
- Payments to baked goods suppliers: €20,000
- Bakery labour costs: €60,000
- Barista labour costs: €30,000
- Rent and utilities: €10,000

- New espresso machine: €10,000
- New seating area: €20,000

CF from Operations = €150,000 - €160,000 = - €10,000

A business can operate with negative cash flow as long as it has cash reserves or access to funding to continue operations. But we want CF to be positive eventually!

Cash Flow – Practical Exercise

The bakery had cash reserves to cover the negative operating cash flow in 2023.
In 2024, it continued its operations with the following results:

Operating Cash Flow Statement for 2024:

Cash inflows:

- Coffee sales: €90,000
- Pastry sales: €60,000

Cash outflows

- Payments to coffee bean suppliers: €10,000
- Payments to baked goods suppliers: €20,000
- Bakery labour costs: €60,000
- Barista labour costs: €30,000
- Rent and utilities: €10,000

- ~~New espresso machine: €10,000~~ **(paid in 2023)**
- ~~New seating area: €20,000~~ **(paid in 2023)**

CF from Operations = €150,000 - €130,000 = + €20,000

With the non-recurring costs of the espresso machine and seating area behind,
the bakery started operating with a positive cash flow in 2024

Return on Investment (ROI)

Before the coffee shop expanded its operations, it performed an assessment of its potential ROI:

Annual Cash Inflows:

- Coffee sales: €35,000
- Pastry sales: €15,000

Annual Cash Outflows:

- Payments to suppliers: €10,000
- Annual barista labour costs: €30,000
- Annual rent and utilities: €2,000

- New espresso machine: €10,000
- New seating area: €20,000
- (Lifetime: 10 years)

- ROI is a simple way of evaluating the efficiency of an investment relative to its cost but it has some limitations, e.g. it does not account for the time value of money or inflation

- A more advanced financial forecast, looking at **Pay Back period, Net Present Value** and **Internal Rate of Return**, can be performed with the help of this template

$$ROI = \frac{Revenues - Costs}{Costs} = \frac{(10 \times €50,000) - (€10,000 + €20,000 + 10 \times €42,000)}{€10,000 + €20,000 + 10 \times €42,000} = 11\%$$

Business Model Canvas – Template

Key Partners

Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?

MOTIVATIONS FOR PARTNERSHIPS: Optimization and economy, Reduction of risk and uncertainty, Acquisition of particular resources and activities

Key Activities

What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue streams?

CATEGORIES: Production, Problem Solving, Platform/Network

Key Resources

What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships Revenue Streams?

TYPES OF RESOURCES: Physical, Intellectual (brand patents, copyrights, data), Human, Financial

Value Proposition

What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?

CHARACTERISTICS: Newness, Performance, Customization, "Getting the Job Done", Design, Brand/Status, Price, Cost Reduction, Risk Reduction, Accessibility, Convenience/Usability

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?

Channels

Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines?

Customer Segments

For whom are we creating value? Who are our most important customers? Is our customer base a Mass Market, Niche Market, Segmented, Diversified, Multi-sided Platform

Cost Structure

What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?

IS YOUR BUSINESS MORE: Cost-driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing), Value-driven (focused on value creation, premium value proposition).

SAMPLE CHARACTERISTICS: Fixed Costs (salaries, rents, utilities), Variable costs, Economies of scale, Economies of scope

Revenue Streams

For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?

TYPES: Asset sale, Usage fee, Subscription Fees, Lending/Renting/Leasing, Licensing, Brokerage fees, Advertising

FIXED PRICING: List Price, Product feature dependent, Customer segment dependent, Volume dependent

DYNAMIC PRICING: Negotiation (bargaining), Yield Management, Real-time-Market
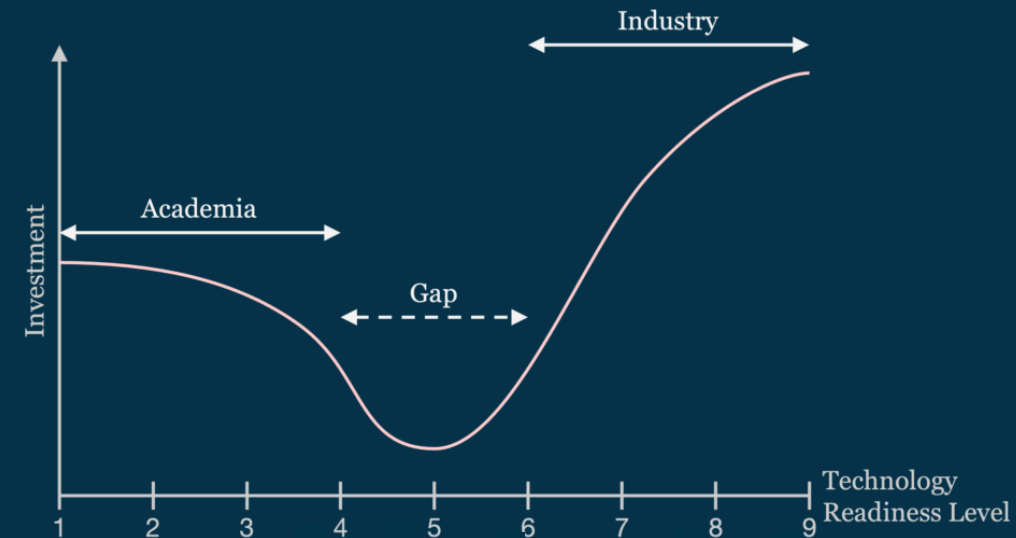
WHAT'S NEXT?

Are you ready to apply for an ESA project?
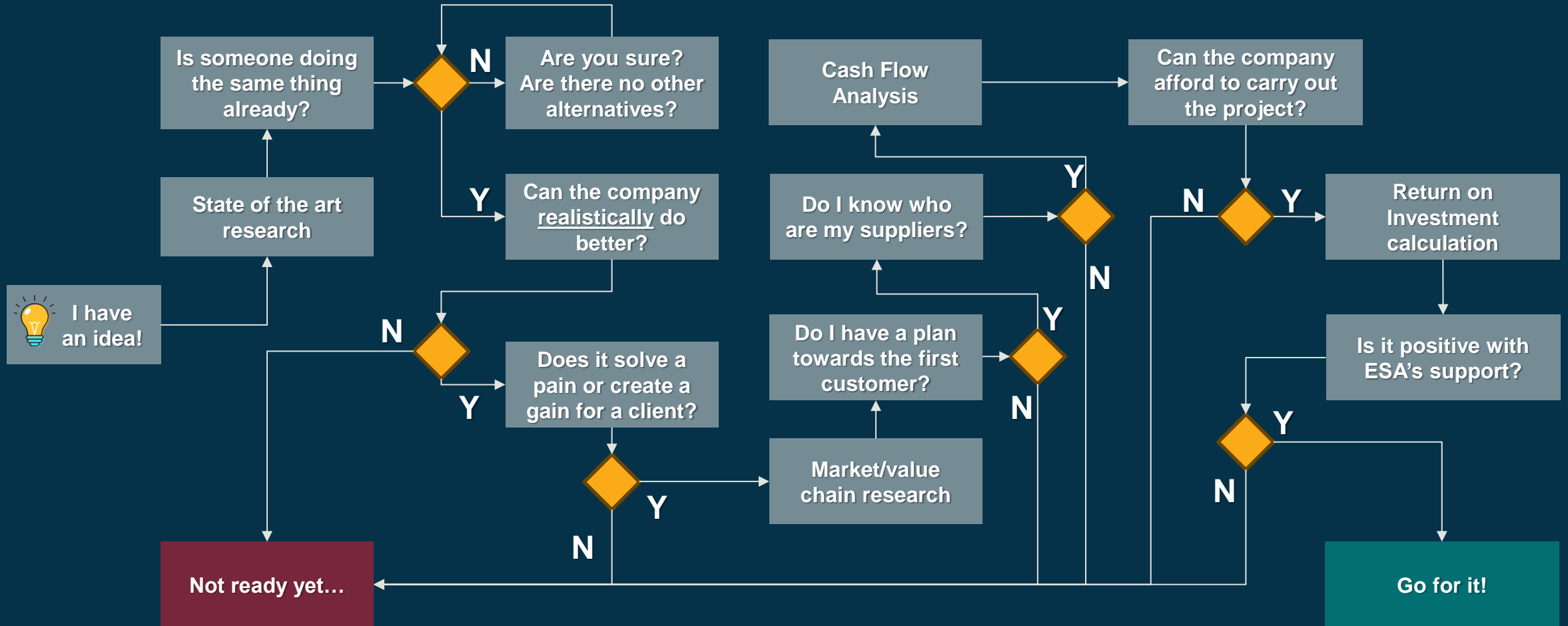
How can ESA help your business?

TRL 1	Basic principle
TRL 2	Application and Market formulated
TRL 3	Proof-of-concept, partial BBs, all key reqs
TRL 4	Functional and Performance verification
TRL 5	Engineering Model
TRL 6	Single unit generic qualification
TRL 7	Customer tailoring and qualification
TRL 8	Flight demonstrated/ Customer demo
TRL 9	Operationally Flight Proven

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How can ESA (PECS/RPA) help your business?

TYPE A (PREPARATORY ACTIVITIES)
- TRL 1 — Basic principle
- TRL 2 — Application and Market formulated

Business Concept

TYPE B (R&D ACTIVITIES)
- TRL 3 — Proof-of-concept, partial BBs, all key reqs
- TRL 4 — Functional and Performance verification
- TRL 5 — Engineering Model

First iteration of Business Plan

Refined Cost Estimates

TYPE C (Upstream)
TYPE F (Downstream)
- TRL 6 — Single unit generic qualification
- TRL 7 — Customer tailoring and qualification
- TRL 8 — Flight demonstrated/ Customer demo
- TRL 9 — Operationally Flight Proven

Productionisation plans

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How can ESA (PECS/RPA) help your business?

TYPE A (PREPARATORY ACTIVITIES)

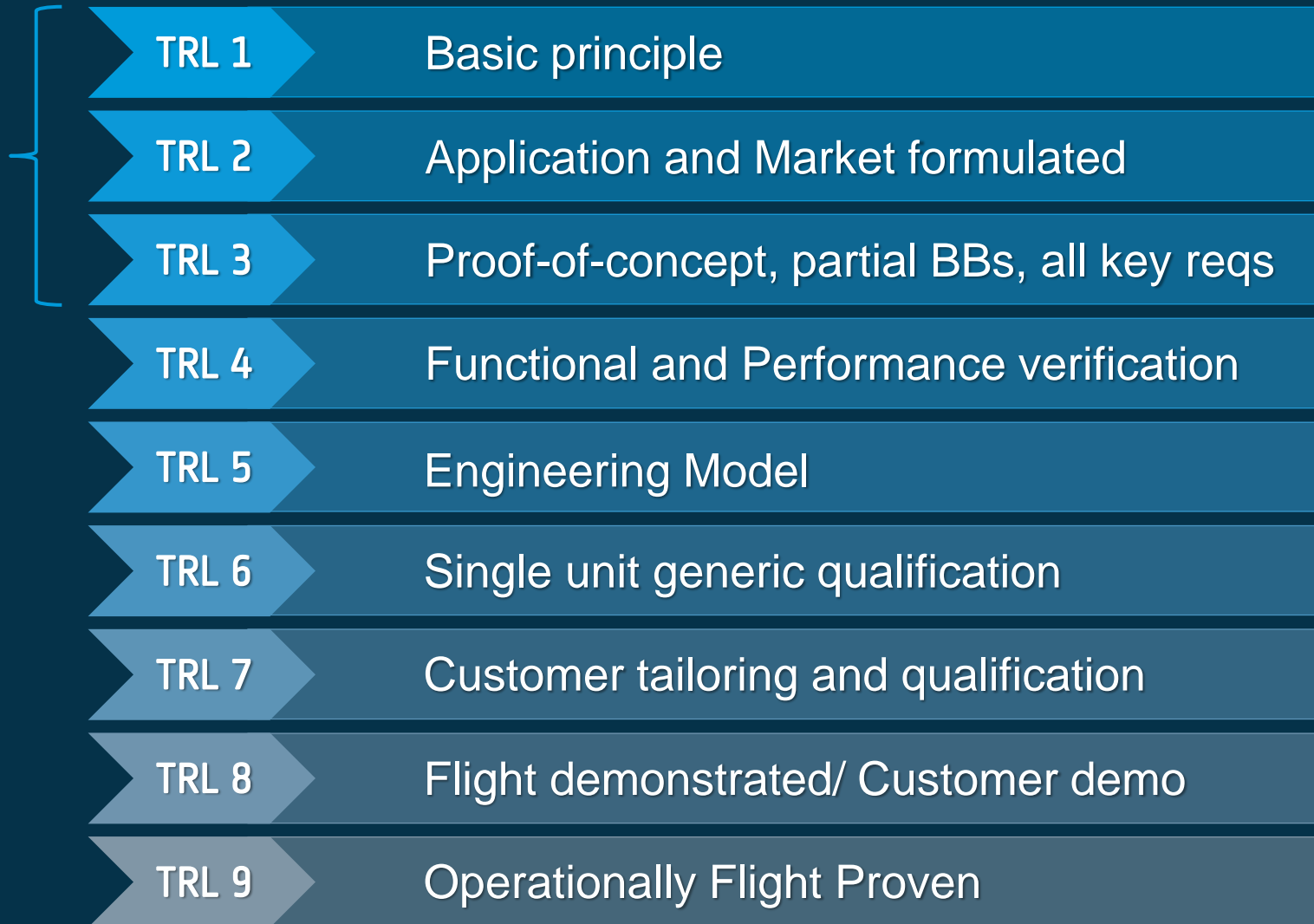|	
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TRL 9	Operationally Flight Proven

You can include the development of a Business Plan in the scope of a Type A activity

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What is the **best business pitch?**

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FINAL EXERCISE – INSTRUCTIONS

1. Read the pitches from **three companies** and analyse the provided information

2. Using the concepts we learnt today, discuss in groups and rate the three pitches from **best to worst.**

3. **Assign a representative to present your group's choices and justifications to everyone.**

SHARK TANK

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FINAL EXERCISE – RECAP

1. **KNOW YOUR MARKET AND YOUR NEIGHBOURS:**
   - Who are your competitors and alternatives?
   - Who are your suppliers? Who are your clients?
   - What is realistically your market share?

2. **GENERATE VALUABLE PRODUCTS FOR YOUR CLIENT:**
   - Do you already have a first client? If not, who are they and what is the path towards them?
   - What pains are you solving/gains are you adding?
   - What is your competitive advantage (vs. others)?

3. **MAKE SURE IT'S A GOOD INVESTMENT:**
   - What is your investment? Why do you need funding?
   - What are the key resources needed for this product development? How much do they cost?
   - How much revenue will you make with the product?

SHARK TANK

→ THE EUROPEAN SPACE AGENCY

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