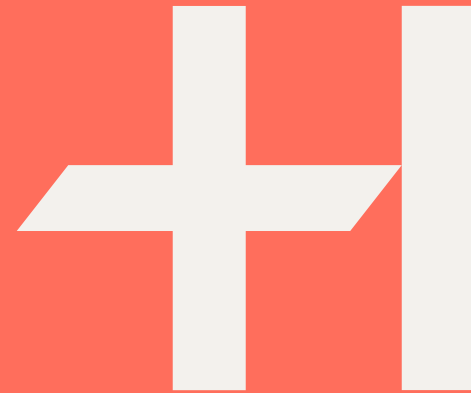


The Power of Human

Industry application deck

HUSKK

Confidential



Company identity card

HUSKK

Company Name: **HUSKK**
 Address: T.B.D. (Flanders or Brussels)
 Website: www.yourhuskk.com
www.brubotics.eu

Creation date : **seed funding** ongoing – estd. 2023
 Legal structure : **to be founded**
 Workforce: /
 Share capital: /

HUSKK is a new spin-off from BruBotics VUB, bringing a range of **next-generation industrial exoskeletons** to market, to support and augment workers performing physical hard work, without hindering them.

Key figures:

7 million units/year
 Total Available Market

€6 million
 Research funding to date

1500 units/year
 To reach break even

5 years
 Until expected break-even

Market : Logistics; Industry; Construction

Definition: Industrial/Occupational Exoskeletons

Size : 7 million units/year by 2040
 (main industrialized countries)

Trend : Industry 4.0; Robotics; A.I; Prevention

HUSKK Team



**Lennert
Vierendeels**

CEO 

Business Engineer;
Business Developer
BruBotics since 2015



**Dr.ir. Joost
Geeroms**

CTO 

PhD. in Robotics;
VUB Exoskeleton lead



**Jacques
Langhendries**

CFO 

Co-founder & CFO of
Axiles Bionics
Former Founder & CEO
High5 Recycling



**Prof.dr.ir.em.
Dirk Lefeber**

Advisor &
Mentor

Scientific advisors:

Prof. Tom Verstraten (VUB – Robotics)
Prof. Bram Vanderborght (VUB-imec)
Prof. Kevin De Pauw (VUB – Physiology)
Prof. An Jacobs (VUB – Sociology)
Prof. Ann Nowe (VUB – AI)

To be hired:

+ Chief
Customer

+ Chief Ops

+ Engineering
support



Dr. Sander De Bock
Movement Scientist



Ir. Vincent Ducastel
Robotic actuation



Dr.Ir. Marco Rossini
Exoskeleton design

+ several other robotics' engineers from
BruBotics expected to join



40%

European workers suffer from
work-related musculoskeletal disorders

70%

of absenteeism due to locomotoric problems at Colruyt

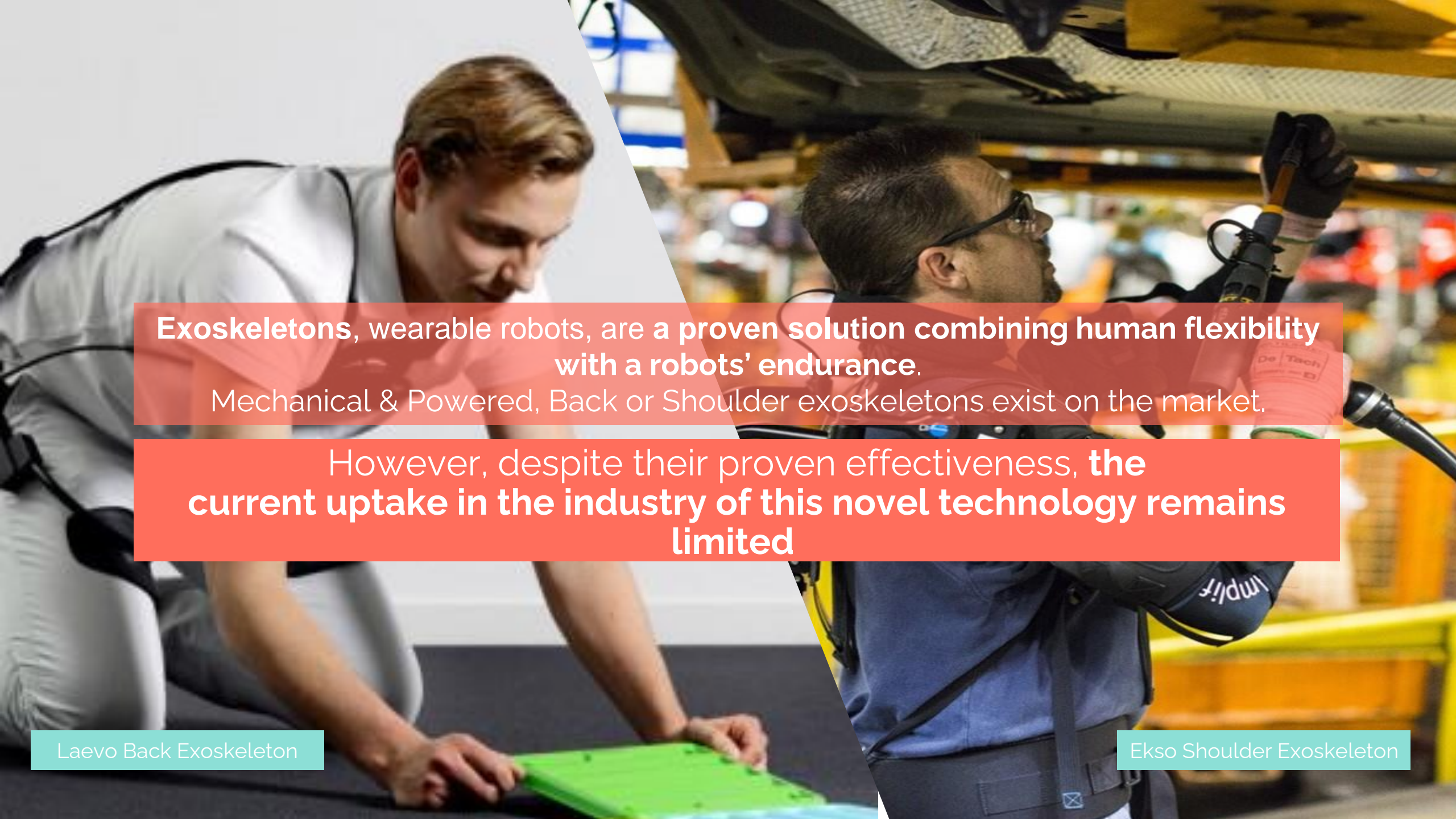
Over 50% of people perform physical hard work

52%

Construction workers had back pain in last 12 months

100.000 €/day

Cost of absenteeism at Audi Brussels



Exoskeletons, wearable robots, are a proven solution combining human flexibility with a robots' endurance.

Mechanical & Powered, Back or Shoulder exoskeletons exist on the market.

However, despite their proven effectiveness, **the current uptake in the industry of this novel technology remains limited**

Laevo Back Exoskeleton

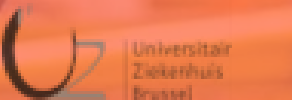
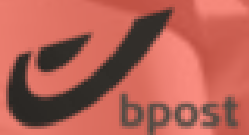
Ekso Shoulder Exoskeleton

Why?

1. 77% of customers look for an exoskeleton for load handling, supporting the full upper body (back, shoulders and arms).








No such exoskeleton exists currently.

2. The ones that do exist hinder more than they help and are suited for only a handful of static tasks



Competition exists,

but not where the demand is

			Type			
			Textile Exoskeleton	Passive Exoskeleton	Smart Exoskeleton	Powered Exoskeletons
		Shoulder Exo 		12 exo's	1 exo	1 exo
		Back Exo 	7 exo's	8 exo's	3 exo's	4 exo's
		Carrying Exo 	1 exo	1 exo		2 exo's
	Upper-Body	Lifting Exo 				
		Leg Support 				
Body Support	Lower-Body	Exo 		3 exo's		
	Full-Body	Full-Body Exo 		1 exo		1 exo

No load handling support

Introducing Levar Exo

We will develop the world's first **powered load handling** exoskeleton

- + Provides enough **support** when needed
- + **Does not hinder** when not needed
- + Assists during **load handling**
- + As full upper body exoskeleton, it can assist **any demanding task**, not just the obvious ones

Building on years of expertise and protected IP, putting us in unique position



Product roadmap

Huskk will work towards the largest market demand, Levar Exo, **step-by-step**, building upon research results & prototypes from **VUB-BruBotics**.



All three products will be worked towards in parallel, to avoid lost time.

Dors Exo

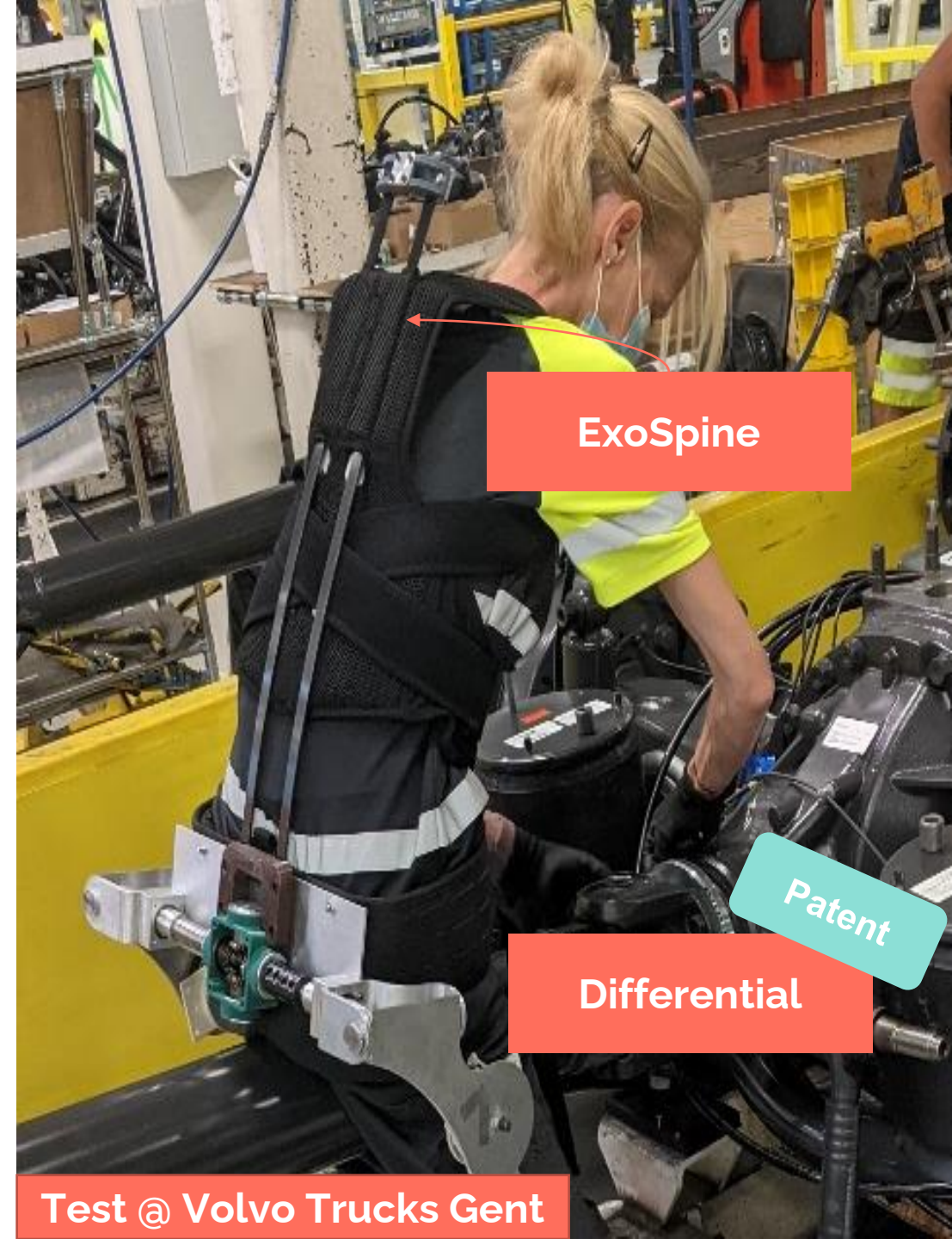
Passive Back support

- + Decrease of dangerous loads & forces in the spine
- + Proven limited hindrance

	HUSKK	Laevo	Otto Bock	Others
Walking	+++	+	++	-
Freedom of Movement	+++	++	+	-
Asymmetric lifting	+++	+	+	-
Extra bulk	++	+	-	-



Strictly confidential



Test @ Volvo Trucks Gent

Umer Exo

Smart Shoulder support

- + 41% fatigue decrease
- + Less hindrance
- + Supporting larger variety of tasks

	HUSKK	Others
Moving arms down	++	-
Freedom of Movement	+	+
Support range	++	-



Strictly confidential



Patent

Remote
actuation

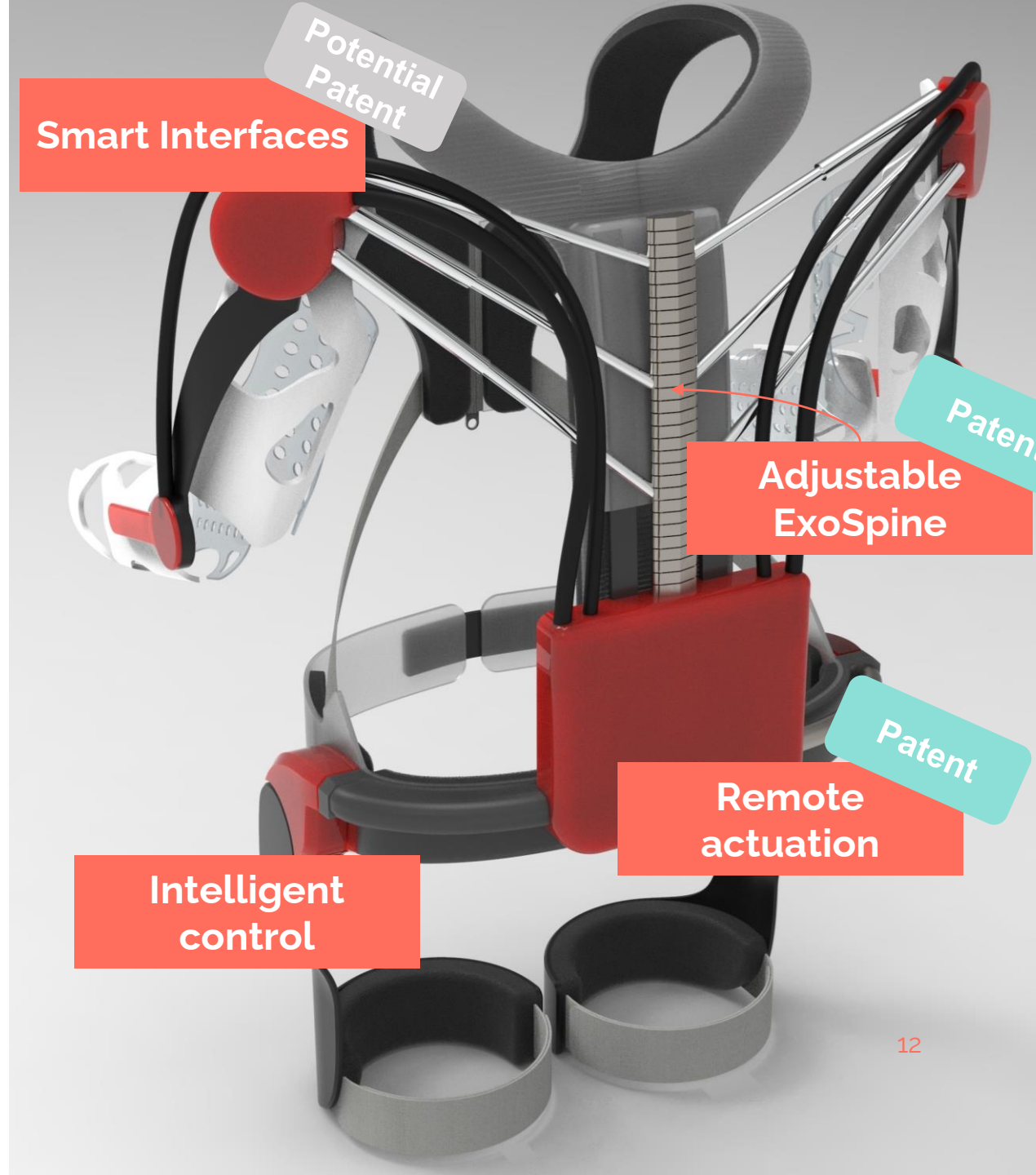
Test @ Alstom Brugge

Levar Exo

Powered full upper body

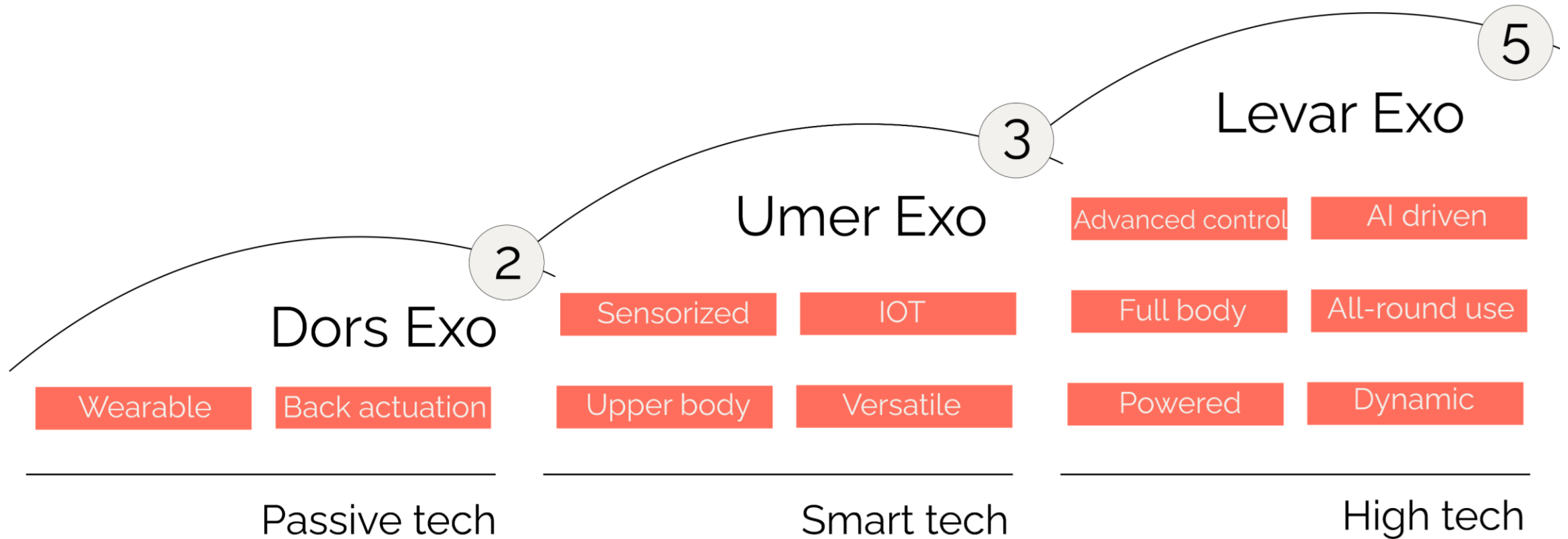
- + Upper body support
- + Assisting a variety of tasks, incl. load handling
- + Responsive & intelligent

No such product is on the market today.



+HUSKK

5 year tech roadmap



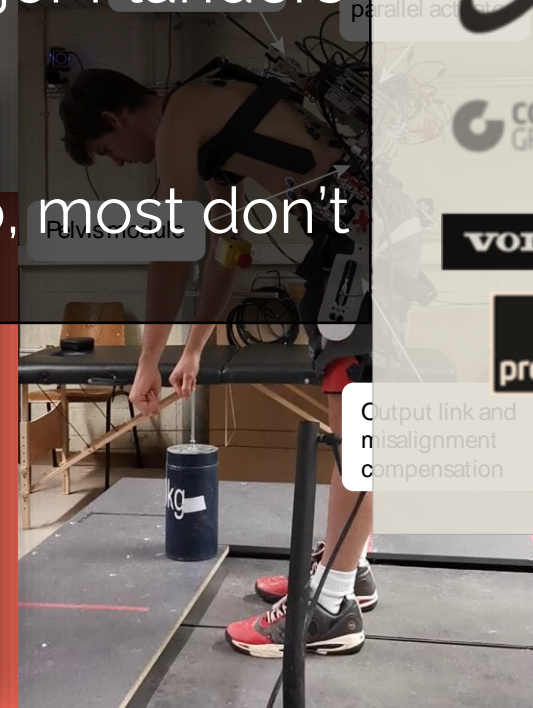
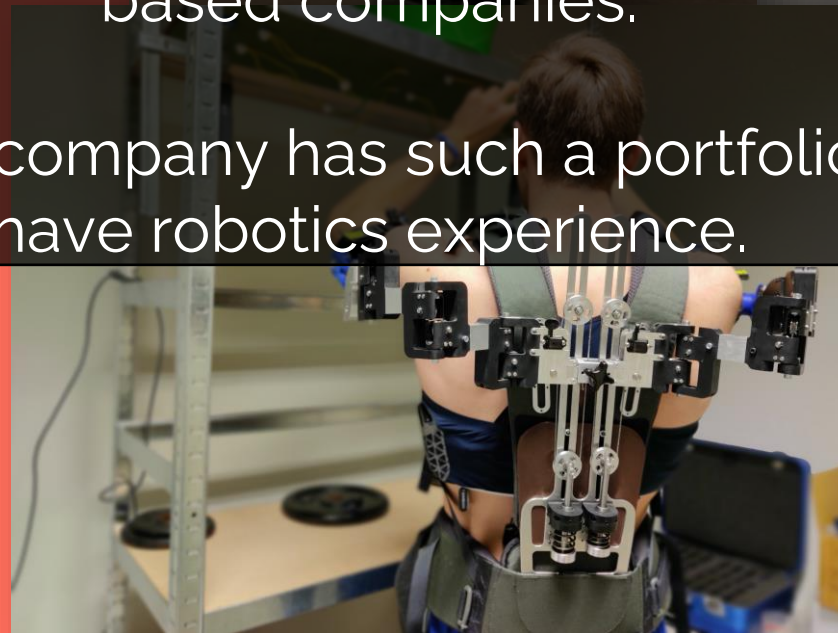
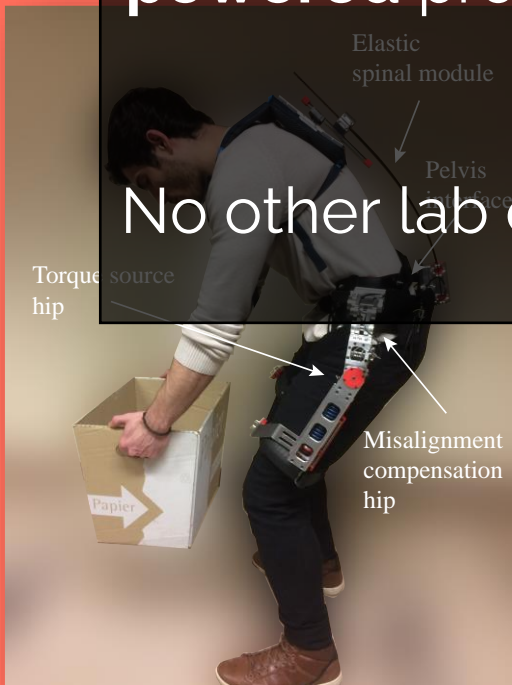


The Exo4Work project was done in co-creation with

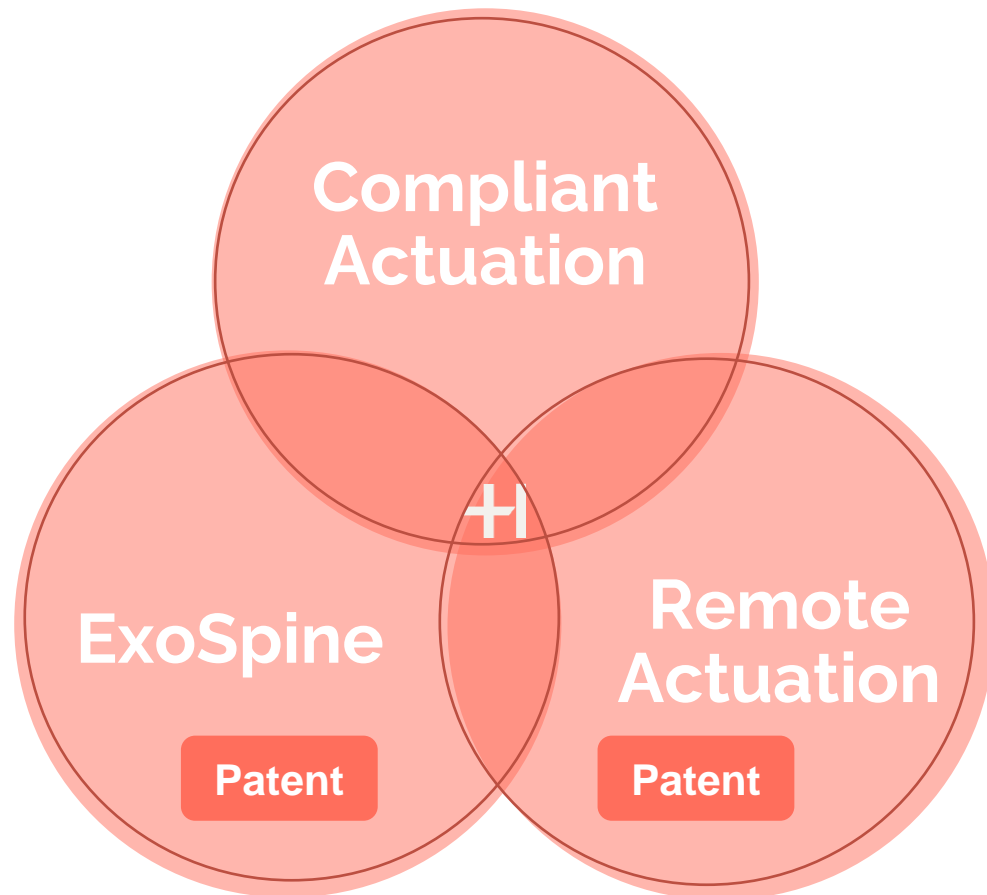


The result of 2 research projects worth €6M, resulting in a series of **back** and **shoulder**, **passive**, **smart** and **powered** prototypes, **co-created** with 16 major Flanders based companies.

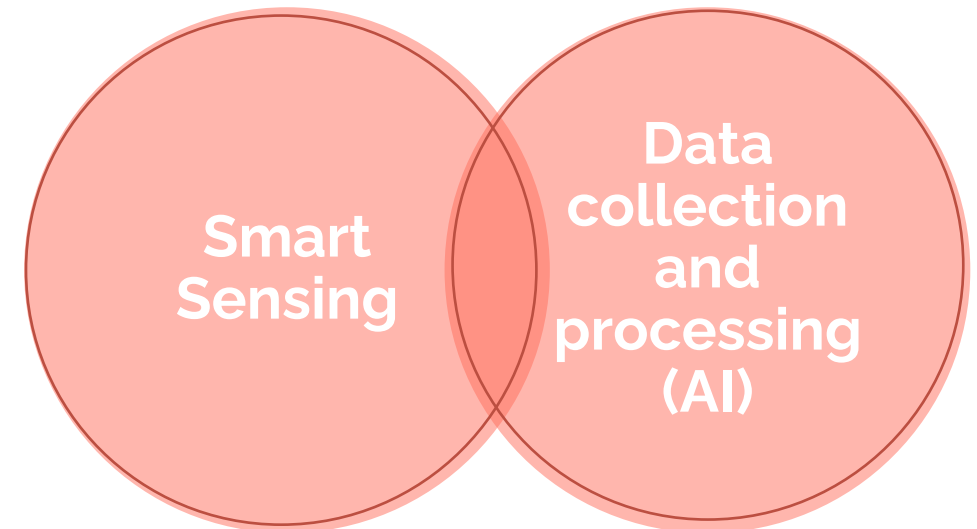
No other lab or company has such a portfolio, most don't have robotics experience.



The HUSKK secret sauce towards Levar



Long term differentiators



 **imec**



BRUBOTICS
HUMAN ROBOTICS
RESEARCH CENTER

Intellectual Property

All Patents and IPR are owned by VUB, an exclusive license will be negotiated.

Remote Actuation	EP3781360A1	Status: Pending	Protects actuation method	Umer exo & Levar Exo
Pulleys (Remote Actuation)	EP18174881A	Status: Pending	Protects actuation method	Umer exo & Levar Exo - tbd
Dors Exo	EP21206969.4	Status: application	Protects the USP of back exoskeleton	Dors Exo + others
Polyarticular spine	EP21206969.4	Status: application	Protects weight transmitting to pelvis	Levar Exo

Market potential, Acquisition strategy & Industrialization

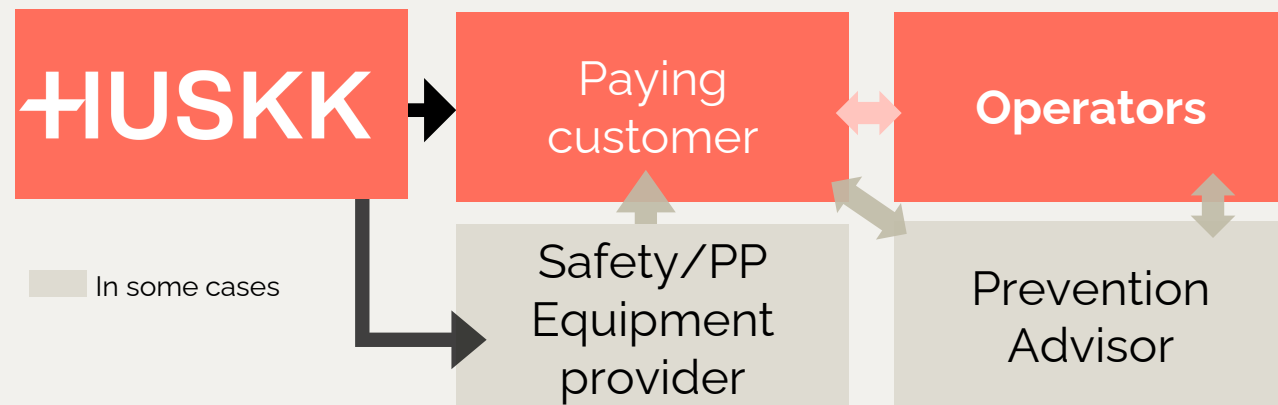
+HUSKK

Market

Exoskeleton market is in the early stage, with numerous start-ups eyeing the big potential. Based on discussions with **customers**, our model predicts following TAM & SAM:

	Total Available Market	Serviceable Available Market
2030	1.700.000 units	460.000 units
2040	7.200.000 units	5.800.000 units

With HUSKK focussing inititally mainly on **logistics & construction** (combined 85% of market) and **Europe**, before expanding to other domains, the U.S. and eventually Japan & China.



Competitive advantages

We are the only ones with the know-how and technological building blocks needed to work towards a load handling exoskeleton, the biggest gap in the market.

- + Our patent pending **IP** allows us to build a wearable(!) powered exoskeleton.
- + We are one of the only ones with **experience** in both passive as robotic / powered devices.
- + We are the **only ones** to work on back, shoulder and full upper body.
- + We have a **multidisciplinary** team & approach, from the start.
- + Support from **research leaders**; We will benefit from continued collaboration and tech pipeline from **BruBotics** and **Imec**.

At HUSKK, we want to thoroughly understand the **customer** pain. We have co-created the prototypes with 17 majors potential customers. Customer centricity will remain a cornerstone of HUSKK, and we will work in continuous co-creation with customers.



Income Model

Customers can benefit from: absenteeism reduction, higher retention, increased productivity, with a ROI of 1 to 2 years.

Initially: focus on **non-recurring revenue**

- + Exoskeleton unit sales
 - + 75-85% gross margin (Price-COGS)
- + Trial packages

€5.000	€5.500	€6.000	€9.000
Dors-Exo	Umer-Exo	Levar-Exo MVP	Levar-Exo 2.0

Evolve towards more **recurring revenue** models

- + Premium service package
- + Data monitoring

and to **Exo As A Service** offering

- + "Leasing"
- + Working/recent exo available at all times
- + Regular trainings
- + Follow-up

33% would like
this option



SALES CHANNELS

We will deploy a hybrid sales approach:

+ **Direct sales** in key markets and to key accounts:

- BeNeLux, Nordics, France, Germany, UK, US
- Logistics, manufacturing, construction.

+ **Distributor sales** (40% margin expected) in other markets.



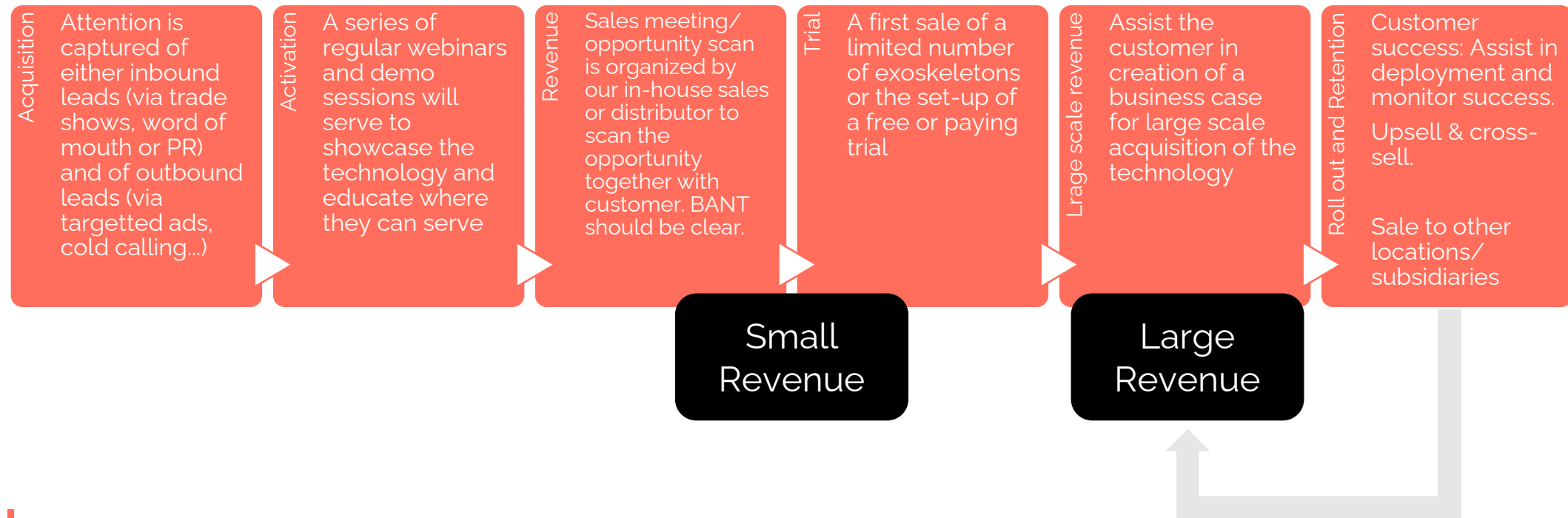
	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7/8
Product			Dors	Umer		Levar		
Customer			Exo4Work partners. Logistics	Construction; Manufacturing		Others (except Health)		
Region			BeNeLux	Nordics	France Germany	UK	EU-DACH EU-MED	US EU-CEE

Full cycle, large orders

Expected length for large order: 6 months

Key decisionmakers: operations managers, health&safety managers, prevention advisor

Thanks to VUB we already have key contacts at **50+** potential **customers**



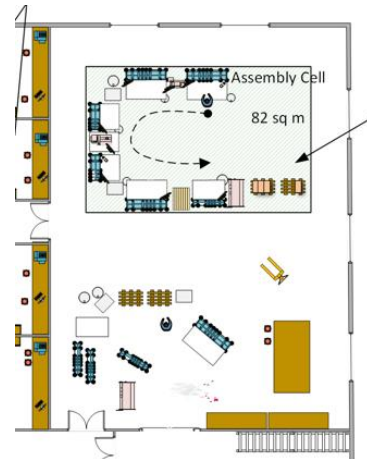
Manufacturing Strategy & Approach

HUSKK will start with setting up **own production** while the quantities are limited, moving towards **outsourcing** when quantities increase and flexibility becomes more critical.

Phase 0 Product Development

Phase 1 the **Pipe&Joint** Phase

Very small scale.
+ flexible pipe-and-joint system
+ allowing flexible and easy design and set-up
+ Kaizen approach
Goal: design most optimized Assembly Cell for the next phase



Phase 2 the **Workshop** phase

Upgrade to
+ a series of Assembly Cells
+ + organized warehouse
+ assembly in 2 shifts.

Optimization of:
+ the supply chain
+ ERP/MRP system
+ the product design
+ decrease lead times
+ insight for next phase



Phase 3 the **Factory** phase

+ linear, fish-bone assembly line
+ higher degree of automation
+ more sub parts assembled in house

Outsourcing to third parties.

+ assembly done in **Europe**
+ cheaper work force and space
+ HUSKK retaining full control over the process (supply chain + quality control)
+ Key partners & lead times to be defined

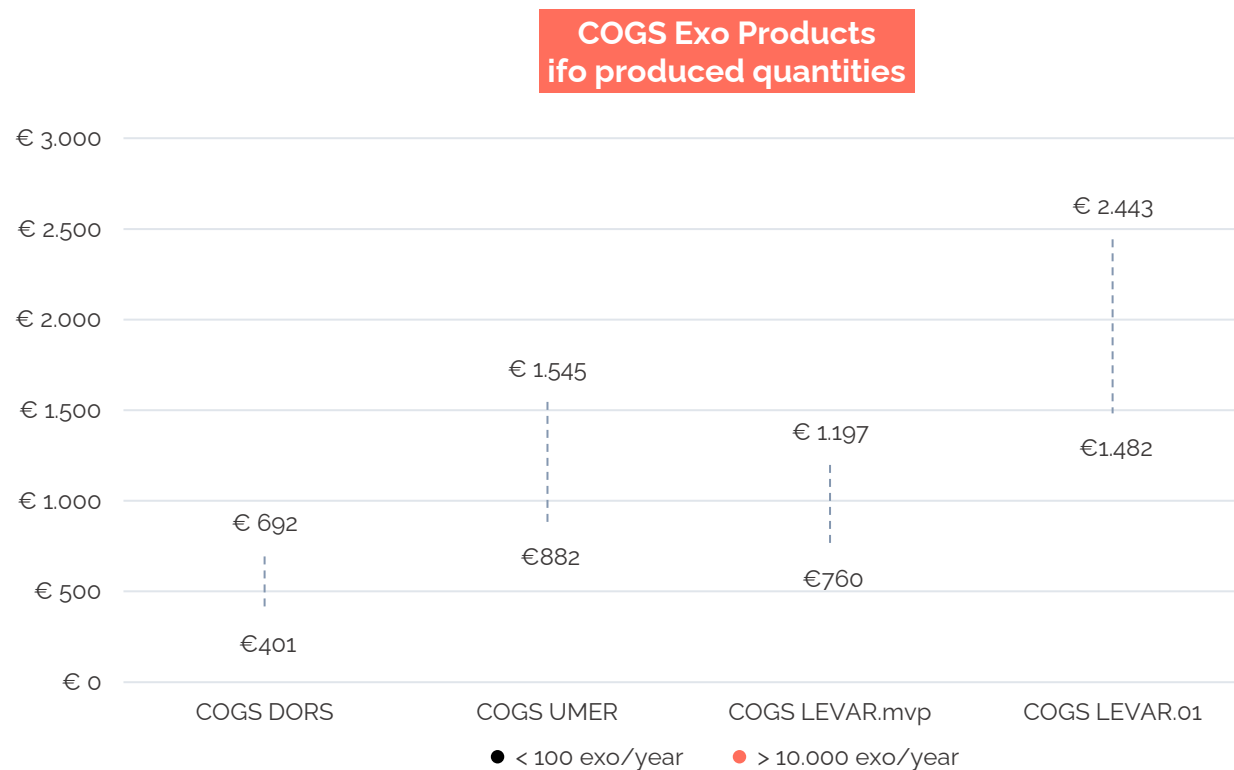
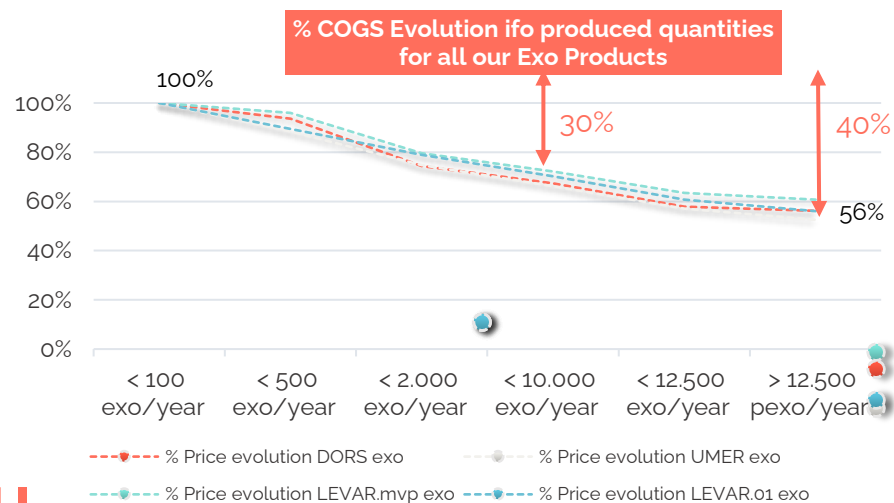


Cost of Goods Sold

We defined the COGS in function of quantity purchased

Exercise done by **Voxdale** for Dors Exo

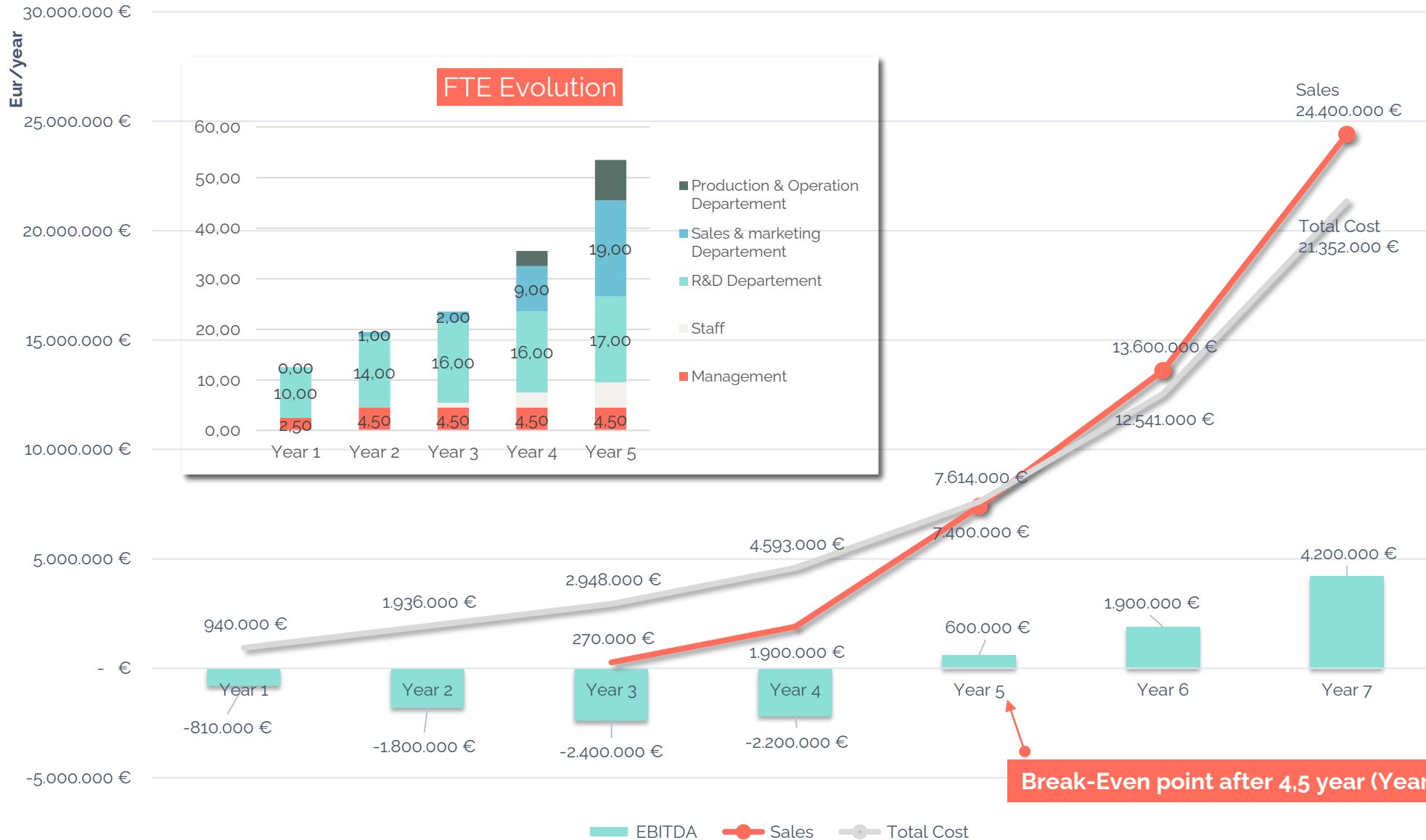
	COGS ifo produced quantities	
	< 100 exo/year	> 10.000 exo/year
COGS DORS	692 €	401 €
COGS UMER	1.545 €	882 €
COGS LEVAR.mvp	1.197 €	760 €
COGS LEVAR.01	2.443 €	1.482 €




Financial Information & Funding

+HUSKK

Sales - Total Costs - EBITDA Forecast 7 years



PROFIT & LOSS / YEAR OVERVIEW

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
 <p>Inflation rate 4,0%</p>	* START-UP INFRASTRUCTURE PHASE		* SCALE-UP INFRASTRUCTURE PHASE / ASSEMBLY WORKSHOP			* FACTORY PHASE				
			* Launch DORS.mv	* Launch UMER.01	* Launch LEVAR.mvp		* Launch LEVAR.01			
			* Launch BNLX Sales	* Launch NORDICS	* Launch FRA	* Launch UK Sales				* Launch USA Sales
					* Launch GER Sales					
Sales	- €	- €	270.000 €	1.900.000 €	7.400.000 €	13.600.000 €	24.400.000 €	39.000.000 €	67.000.000 €	113.700.000 €
Number of sold Exo's	0	0	50	360	1300	3.000	6.200	11100	18.000	28.600
Cost of Goods Sold	- €	- €	40.000 €	300.000 €	1.200.000 €	2.600.000 €	5.200.000 €	9.300.000 €	17.200.000 €	27.700.000 €
Brutomargin	- €	- €	230.000 €	1.600.000 €	6.300.000 €	11.100.000 €	19.300.000 €	29.700.000 €	49.900.000 €	86.100.000 €
					85,1%	81,6%	79,1%	76,2%	74,5%	75,7%
Costs	900.000 €	1.800.000 €	2.700.000 €	3.900.000 €	5.800.000 €	9.200.000 €	15.200.000 €	20.500.000 €	28.800.000 €	39.000.000 €
Personel	600.000 €	1.400.000 €	2.000.000 €	2.700.000 €	4.100.000 €	6.900.000 €	11.000.000 €	14.300.000 €	19.400.000 €	25.000.000 €
Outsourcing Cost& Other Production Co	- €	- €	100.000 €	100.000 €	100.000 €	100.000 €	700.000 €	1.500.000 €	2.600.000 €	4.600.000 €
Overheadcosts + Unforseen	300.000 €	400.000 €	700.000 €	1.200.000 €	1.700.000 €	2.300.000 €	3.600.000 €	4.800.000 €	6.900.000 €	9.600.000 €
EBITDA	- 810.000 €	- 1.800.000 €	- 2.400.000 €	- 2.200.000 €	600.000 €	1.900.000 €	4.200.000 €	9.200.000 €	21.100.000 €	47.100.000 €
Depreciation	40.000 €	136.000 €	208.000 €	393.000 €	614.000 €	741.000 €	952.000 €	1.083.000 €	1.090.000 €	1.075.000 €
EBIT	- 850.000 €	- 2.000.000 €	- 2.700.000 €	- 2.600.000 €	100.000 €	1.200.000 €	3.200.000 €	8.200.000 €	20.000.000 €	46.000.000 €
Financial costs	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €
EBT	- 850.000 €	- 2.000.000 €	- 2.700.000 €	- 2.600.000 €	100.000 €	1.200.000 €	3.200.000 €	8.200.000 €	20.000.000 €	46.000.000 €
Taxes (Belgian Taks Rate) 34% patent tax shelter 85%	- €	- €	- €	- €	- €	- €	- €	242.000 €	1.025.000 €	2.352.000 €
EAT	- 850.000 €	- 2.000.000 €	- 2.700.000 €	- 2.600.000 €	100.000 €	1.200.000 €	3.200.000 €	7.900.000 €	19.000.000 €	43.700.000 €
EBITDA / SALES					8,11%	13,97%	17,21%	23,59%	31,49%	41,42%
EAT / SALES					-1,35%	8,82%	13,11%	20,26%	28,36%	38,43%

Assumption 1 We take inflation into account at an inflation rate = 4%

Assumption 5 % of Unforseen costs = 8% on total investments



Assumption 2 Normal Belgian tax rate = 34% + Tax-shelter R&D 85%.

Assumption 6 Total Patent Costs over 20 years = + /- 270.000 €

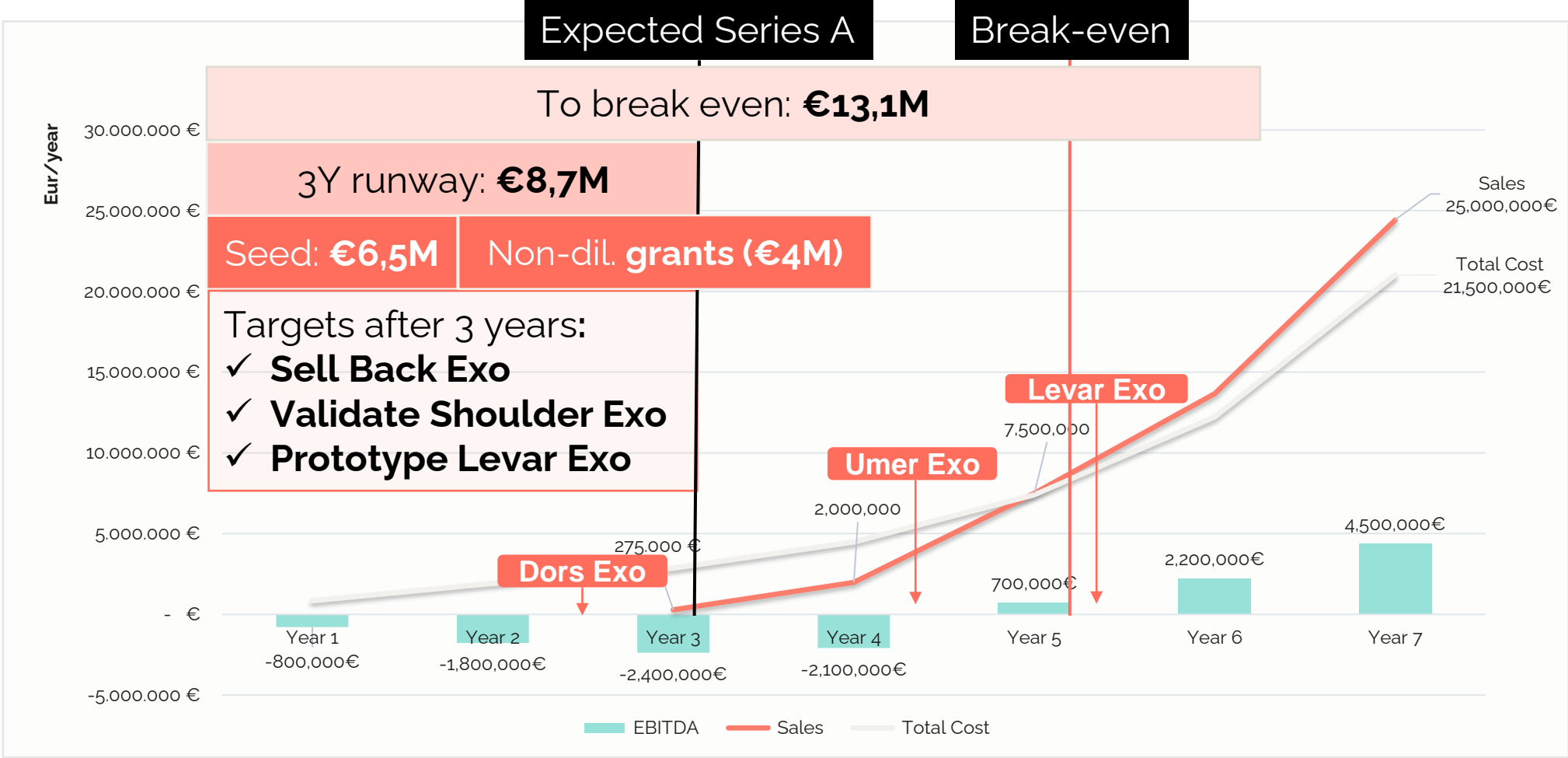
Assumption 3 Distributors margin on sales price = 40%

Assumption 7 We use our TAM model as baseline to forecast sales

Assumption 4 License Fee to VUB/BruBotics = % on shares + a license fee of 2,25% (!to be negotiated)

Currently raising €6.5M seed funding

FOR A 3 YEAR RUNWAY USING MILESTONE BASED APPROACH



HUSKK ambition

**Market leader
in Europe**

Technologically & by
market share

**Be active on 3
continents**

EU, US, Asia

Industrya to
accelerate go-
to-market

Access to customer(s),
accelerators & prod. dev
know-how



Confidential

HUSKK

The Power of Human

Contact:

www.yourhuskk.com

Lennert Vierendeels – +32 472 712 969

lennert.vierendeels@vub.be