The knowhow of Research at service of Industry

Mattia Tavernini
2010-2011 (early): first idea of StartUp from the results obtained in European projects

**2009:** Ph.D. school

**2012:** SeedMoney

**2012 (November):** Robosense was founded\funded

**2013:** Ph.D. defence

... 

... 

Today
OUR STORY SO FAR
European projects

Protoypes for lab:

- Object identification for logistic
- Dense motion capture structure
IDEAS

NEW SOLUTIONS need NEW OPPORTUNITIES

Seed Money 2012

9° place on 40 proposals

113.000€ of funding

Technological innovativeness

Business proposal

Hire
Academic Research StartUp

- Product Mock-up/Idea
- Limited knowledge of the market
- No active partnerships

Academic StartUp

- Product/s
- Knowledge and experience of the market
- Active partnerships
- Customers
Acquire technologies
Development
Networking
Consultancy
PH.D. Education - Devices

**Camera**
- Wide field of view
- Graphic features

**2D laser scanner**
- Deep field of view
- Geometric features
- Accurate

**3D Time of Flight camera**
- Image & 3D Depth map
- Innovative technology

**Robots**
- Educational/Industrial
AGILE – Eurostars Project

Research project for the development of technologies aimed at increasing the level of automation in the automatic logistics, the versatility of mobile robots, and the destructuration of the plants.

The project has led to the realization of a prototypal device able to autonomously identify a pallet and plan the manoeuvre of picking for an AGV.
Logistic plant

Automatic logistic plant

COMPLEXITY: interaction between AGV and workers, plant, AGVs.
900 identifications

Accuracy (95%ci):
± 0.8 cm transverse
± 0.4 cm longitudinal
± 0.5º Attitude
3D technology
More than 1000 AGV installed each Year in Europe
**Constraints mean costs.**
An automatic logistic plants costs hundreds of thousands of Euros. **The modern technology uses complex plants to manages vehicles with a low grade of artificial intelligence on board!**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Costs</th>
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<tbody>
<tr>
<td>AGVs</td>
<td>N x 60.000€</td>
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<tr>
<td>CAD + Path planner</td>
<td>~80.000€</td>
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<tr>
<td>CAD + Localization system</td>
<td>~50.000€</td>
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<tr>
<td>Pallet management: machines for the load/unload</td>
<td>+100.000€</td>
</tr>
<tr>
<td>Design and organization of the plant</td>
<td>+100.000€</td>
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<tr>
<td>Expert operator for the interaction with the AGVs</td>
<td>+</td>
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<tr>
<td>Time</td>
<td>+</td>
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<td>...</td>
<td>+</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>&gt;400-500.000€</strong></td>
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A **smarter AGV** would reduce many of the fixed cost related to the technology used today.
Our first Business plan - Pessimistic

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![Cash Flow Graph](chart.png)

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Our first Business plan - Optimistic

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<td>€95,467</td>
<td>€58,788</td>
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Seed money 2012 → 113,000€
Smart finder sold till today: 0
Did we survive?
How?
Projects obtained thanks to SmartFinder

Some

The initial prevision was definitely not correct?

Does the market need the SmartFinder? Probably not.

But it needs some minor stuffs that are part of the KnowHow included in the SmartFinder!
Be versatile!

From a product different ones can be derived. There are 3 kind of «better» products:

• The ones that do more
• The ones that do better
• The ones that cost less
We made a system for 2D pallet recognition and picking. Ok, not so successful...

We derived:
- Object recognition system
- Path planning
- Vehicle navigation
- Scanning systems
- 2D/3D measurements
- Shape analysis

We used:
- New technologies
- Industrialized technologies
- Mixed solutions
0 Smart finder.

BUT a demo of SmartFinder in action allowed us to sign our first contract with a customer (more than 100,000€).

The main results were:
• the engineering of functional modules for mobile robotics, calibration and object recognition.
• the development of a SmartFinder 2.0 based on 3D technology
• The first customer! creation of contacts and a commercial network!
Robotic Platform for development
2016 New Product! 😊

Low level control library for autonomous navigation and control for industrial forklift.

- Strong collaboration with PLC producers.
- Integration of algorithms on industrial hardware
- Modular solutions
VERITAS – FP7 Project

Research project aimed at **modelling physical disabilities** resulting from pathological states or diseases in order to structure a simulation environment/assisted CAD.

Within the project Unitn developed a multi-camera system dedicated to the measurement of body’s shapes and motions.
• Full body scansion is very complex and expensive
• Many competitors
• Not a very big market

The body scanner technology was and is a «dream» technology. *Every one wants it, but no one wants to pay its price (nightmare)*..

**Solution: do something simple and focused on a specific part of the market!**
Knock to the door of experts (users, technicians and developers)
Sometimes new technologies change the scenario..
And the market..

In 2013 our device was the most competitive one (about 12,000€).
In 2014 we became too expensive...
The **needs** of the customers changed according to the new price of a similar technology.
Again...
But sometimes we can change the situation again: we know both the market both the initial «real» needs of the customers.

Our main issue with Morphos was the hardware costs.

Morphos 3D 2.0
Low cost torso 3D scanner
The identification of **transversal applications** is a very good practice!
→ “low” cost 3D scanner (low depends on the application and field!!!!)
Sometimes, from a simple talk, some bright ideas can born..

One of our customer was working in the airport field. One of its devices did not completely satisfy the requirements, so he asked us if we were able to create something better.

We did it.
We also did some interesting networking activities!

Where to find ideas?

Villazzano Office

2013-2018
Project is going on also today (Dusseldorf Messe 2018)

**Key points:**
- Eye control for electronic wheelchair
- Semi-Autonomous navigation with Augmented Reality integration

**Next steps:**
- Automatic navigation for indoor (patient home)
- Integration of features for communication and home automation control
- Remote diagnostic of the wheelchair
Did we give up with LOGISTIC? NO
During 2017 we were contacted by one of the major company in pallet wrapping in Italy/Europe (thanks to a customer).

Aims:

• Modernize one of their most selling product, the semi-automatic wrapping machine.

• Use of sensor to avoid contact with pallet/goods.

• Create a prototype on which develop more automatic functions
Key points:
• Management of low structured warehouses
• Wrapping of pallet with any shape

Next Steps:
• Follow-me feature
• Automatic fastening to the pallet
• Automatic detection of the pallet
• Remote diagnostic of the vehicle
Spring 2018: contact with BALYO.

Standard truck + Driven by Balyo software = Robot

In 2015, the company signed a partnership with the European leader in material handling, Linde Material Handling, to jointly develop and market a unique range of smart robots. To build on this success, in 2016, Balyo signed a second partnership with the American specialist in material handling, Hyster-Yale Group, to boost growth in the Americas.

Balvo signs a seven-year commercial agreement with AMAZON

- A decisive step in BALYO’s development that supports the added value of BALYO’s robotic solutions and will potentially boost their deployment
- AMAZON would obtain the right to subscribe up to 29% of BALYO’s capital depending on the level of potential future orders by AMAZON up to EUR 300 million
- Both BALYO’s industrial partners and major financial shareholders support this transaction
Balyo

Procter & Gamble Manufacturing GmbH
Picking of pallet from warehouse with automatic fork-pallet relative pose

Key points:
• Management of low structured or automatic warehouse
• Detection of any object “forkable”
• Reduction of AGV fleet installation time (speed up in the picking point design on first installation)

Next Steps:
• Customer automatic configuration of picking point
• Safe dropping of pallets
Summer 2018: collaboration with IFM Italy

3D TOF Industrial camera

Best Industrial TOF

Same camera used in Balyo application

Replace a very expensive logistic volume measurement instrument
**Key points:**
- Configurable number of 3D cameras
- Bounding box to estimate shipping costs
- 3D shape measurement for warehouse optimization
- Measure instrument certification

**Next Steps:**
- Diagnostics based on 3D shape and color information

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<th>Y[cm]</th>
<th>Z[cm]</th>
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<tr>
<td>94.4</td>
<td>127.6</td>
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Our initial idea of possible market automated logistic

OURS markets
Automated logistics
Robotic navigation
Airports
Orthopaedics
Our Business Today

Consultancy

Products > Consultancy

![Cash Flow Chart](chart.png)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
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<tbody>
<tr>
<td>2019</td>
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<td>2020</td>
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<td>2021</td>
<td>€90,363</td>
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Our future

At the end of 6 years we managed to create a commercial network.

**2016 was the first year during which the customers began to contact us for new proposals** (instead of being us the propositive part).

**In 2017 and 2018 most of the works comes out from direct contact of the customers or mutual customers/suppliers**

We need more incomes, our objective is **250,000€ /year.**

This target can be achieved by:

- acquiring new customers
- working together with our current customers in the identification of new market possibilities
- developing new products/solutions
- strengthen the consultancy activity

→ Once the goal is achieved, the next step will be hiring/stabilize new positions.
SOME IDEAS FROM OUR EXPERIENCE
“Go big or go home”

Yea.. Nice slogan.. But I always heard it from subjects that do not have a StartUp and usually have instead a salary...

**Easy to say, very difficult to make in practice..**
The **motto is correct**, but are we in the right place (nation)?

Maybe yes, maybe not..

What is the meaning FOR YOU of “going big”? 
Wait...

I got an idea.

We got a deal.
An **elevator pitch**, elevator speech or elevator statement is a short summary used to **quickly and simply** define a process, product, service, organization, or event and its value proposition.

The name 'elevator pitch' reflects the idea that it should be possible to deliver the summary in the time span of an elevator ride, or approximately thirty seconds to two minutes and is widely credited to Ilene Rosenzweig and Michael Caruso (while he was editor for Vanity Fair) for its origin. The term itself comes from a scenario of an accidental meeting with someone important in the elevator. If the conversation inside the elevator in those few seconds is interesting and value adding, the conversation will either continue after the elevator ride, or end in exchange of business cards or a scheduled meeting. A variety of people, including project managers, salespeople, evangelists, and policy-makers, commonly rehearse and use elevator pitches to get their points across quickly.
“Pitch is (almost) everything”

Learn how to pitch properly

Usually the subjects that are very good in doing stuffs are very, very, very bad in presenting them. They tend to present the development instead of the product ...

If you are not good at speaking.. Find someone that it is.

Build a team! NOT EASY!
“Explain why, not how!”

Persons that have habit in developing and doing research usually speaks on the methods and technical details of their solutions.

99.99% of customer ARE NOT INTERESTED in the details (probably they do not even understand them). If you are proposing a technological solution it is implied that it is good, so you must focus only on showing to your customers why they need what you are offering!

99.99% of the times are not the “details” that make a solution a good product!

Try to keep your knowledge. Dealing with big companies is not easy and they try to under-estimate your works!
“There are no competitors..”

A very common assumption... better call it MISTAKE..
If there are no competitors.. you are probably doing something useless... and so wasting your time, resources and energy.

Motivations:
1. Failure in searching competitors
2. Working on something that has no market
3. Repeating the errors of someone else (back to 1)
4. Your idea could be too new(back to 2) or too old(back to 1)
“Sell cocaine, not aspirin”

a) If a customer has a problem your aim is to solve it.

b) If a customer has a problem your aim is to solve it, but at the same time make such customer dependent on you!

The difference between the 2 options will be your money over time, so the stability of your business.
“Understand your business”

What is your business? What are you offering?

Products, Solutions, Services?

The only one that can give you the answer is yourself.
You MUST understand it before understanding your customers.
We offer 3 kinds of services
GOOD - CHEAP - FAST
But you can pick only two

GOOD & CHEAP won’t be FAST
FAST & GOOD won’t be CHEAP
CHEAP & FAST won’t be GOOD

Choose what YOU want to offer
Discuss it with your customers
There are two rules for success:

1. Never reveal everything you know

R. Lincoln

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info@robosense.it

Thank you
Trentino:

Coi soldi en scarsela e la lengua en boca se va dapertut

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