Building up a Start-up in Embedded Vision: Lessons from Machine Vision

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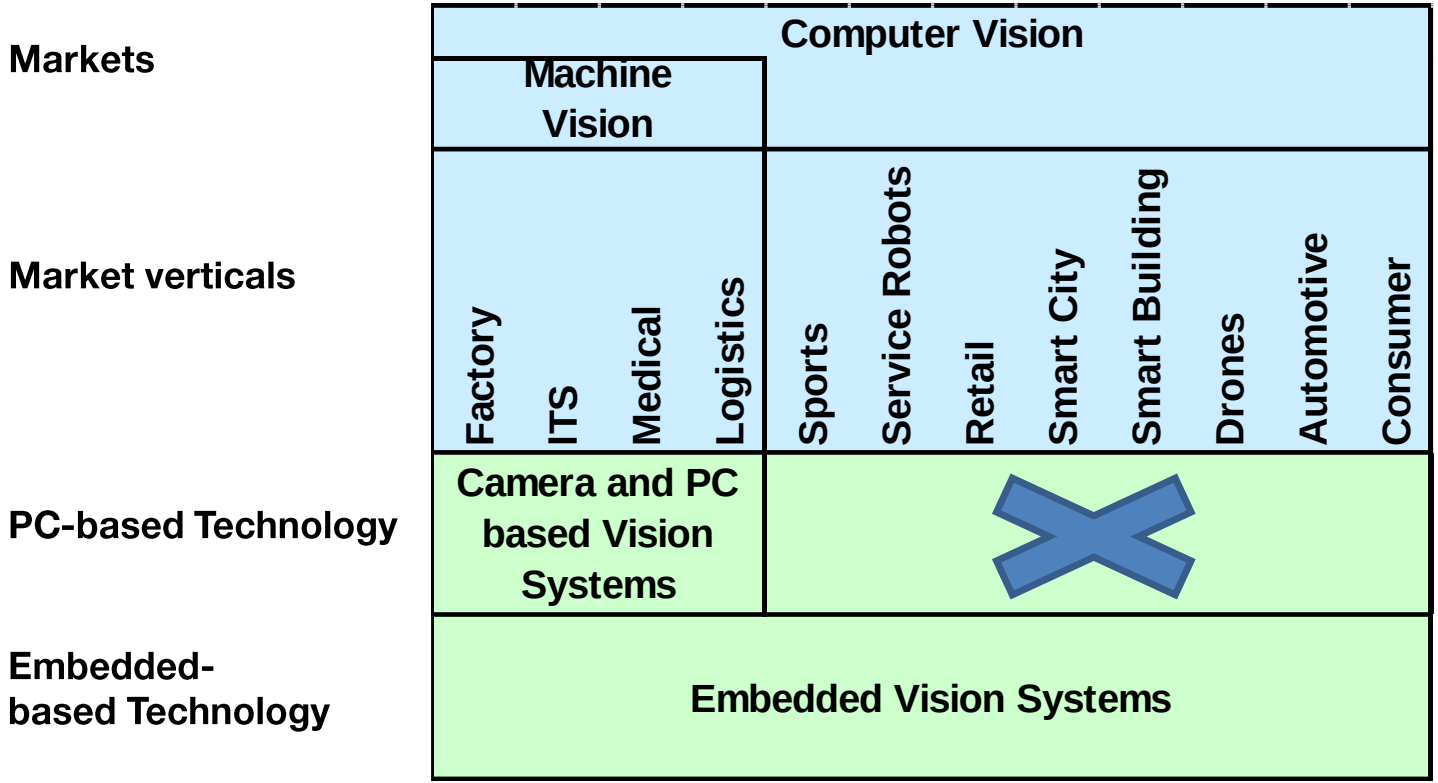
Outline

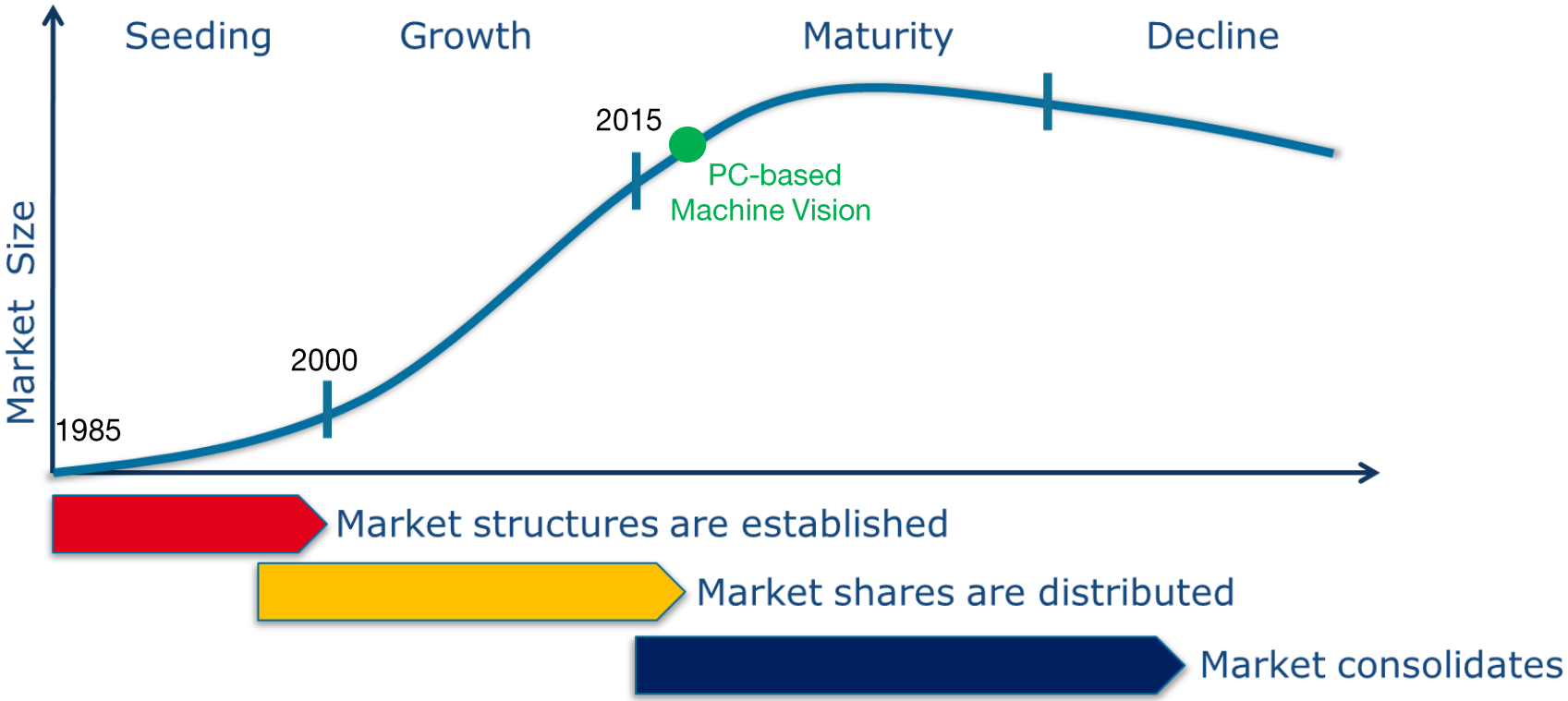
- Definition of Markets and Technology
- Lessons from the PC-based Machine Vision
- Start-up Opportunities for Embedded Vision
- Summary
- Questions

Definition of Markets and Technologies



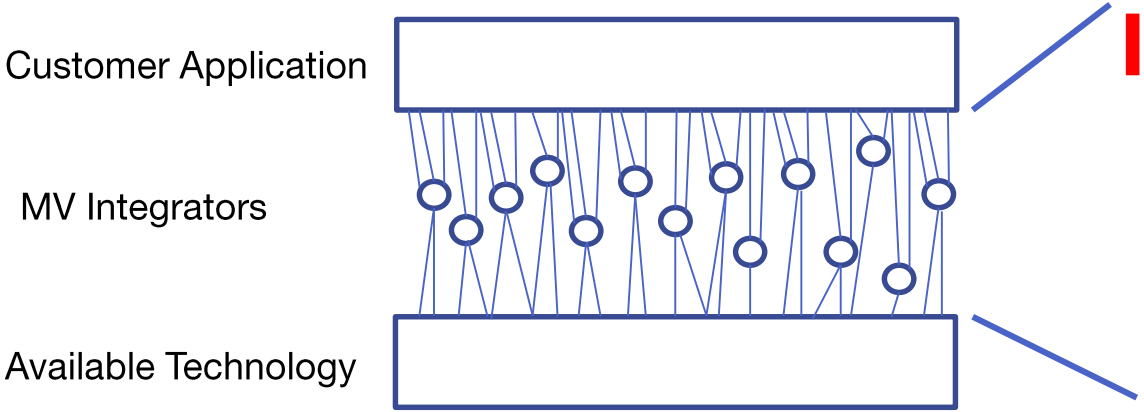
Lessons from PC-based Machine Vision

Market Cycle PC-based Machine Vision



Machine Vision – The founding years 1985-2000

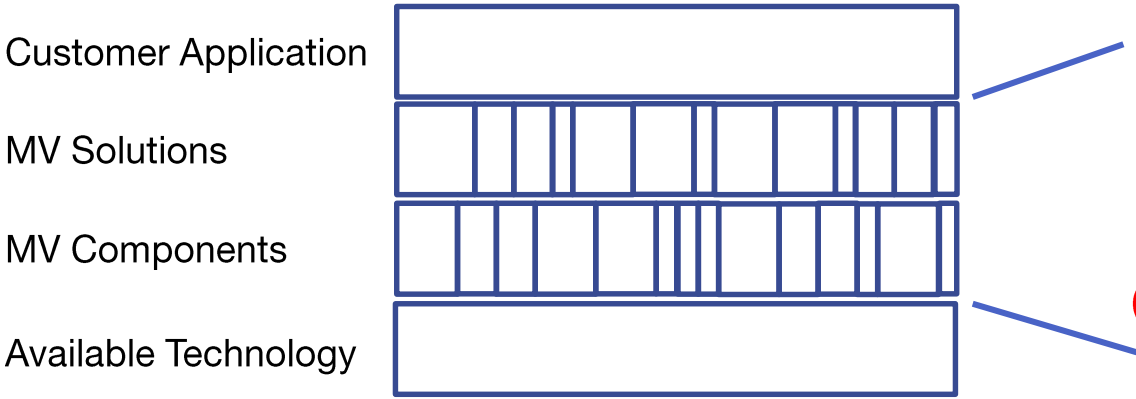
- **Many Machine Vision (MV) Start-ups using PCs & analog cameras**
- **Software is written to solve individual customer problems with Machine Vision Technology**
- **Many individual solutions: MV is diverse and technically challenging**
- **Integrators are KING during this time**



It is all about solving the customer problem

Machine Vision – The growth years 2000-2015

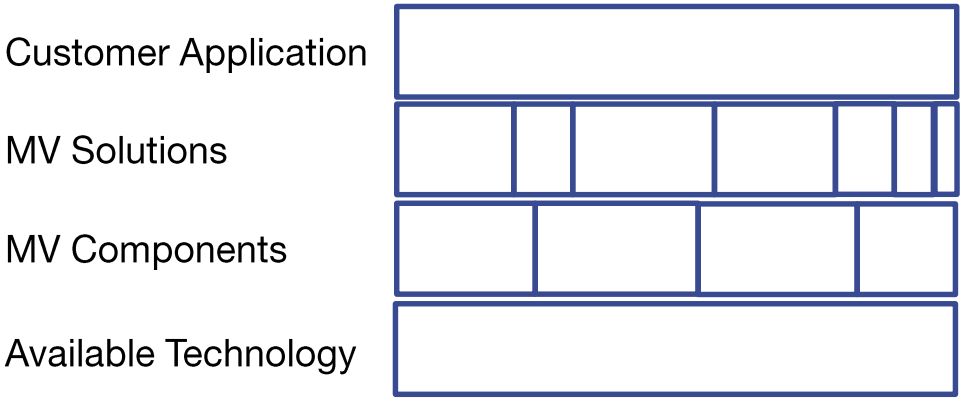
- System integrators morph into MV Solution or MV Component companies
  - They focus on standards & interoperability of products
- Everyone grows, but some grow faster than others:
  - They selected the right market segments
  - Win through product differentiation and better execution



It is all about product differentiation

Machine Vision – The consolidation years 2015-

- **Product differentiation becomes less and price competition increases**
- **A few big players separate from the rest**
- **Big players start to buy smaller companies**
- **This phase only started 3 years ago…**



It is all about market access

Machine Vision case: AOI for PCB lines

- **Description:** Automated Optical Inspection **(AOI)** for Printed Circuit Boards **(PCB)** production lines
- **Customer problem:** Customer wants to verify if the right components are placed in the correct places and if the solder joints are free of defects.
- **Product:** **AOI machine** for a **PCB line**
- **Company founding:** Key players between **1984 – 2002**
- **Typical revenue:** 2017 **100M€ - 150M€**
- **Organization:** Either independent **stock-listed** companies or **business units** in larger corporations

Machine Vision case: Intelligent Traffic Systems (ITS)

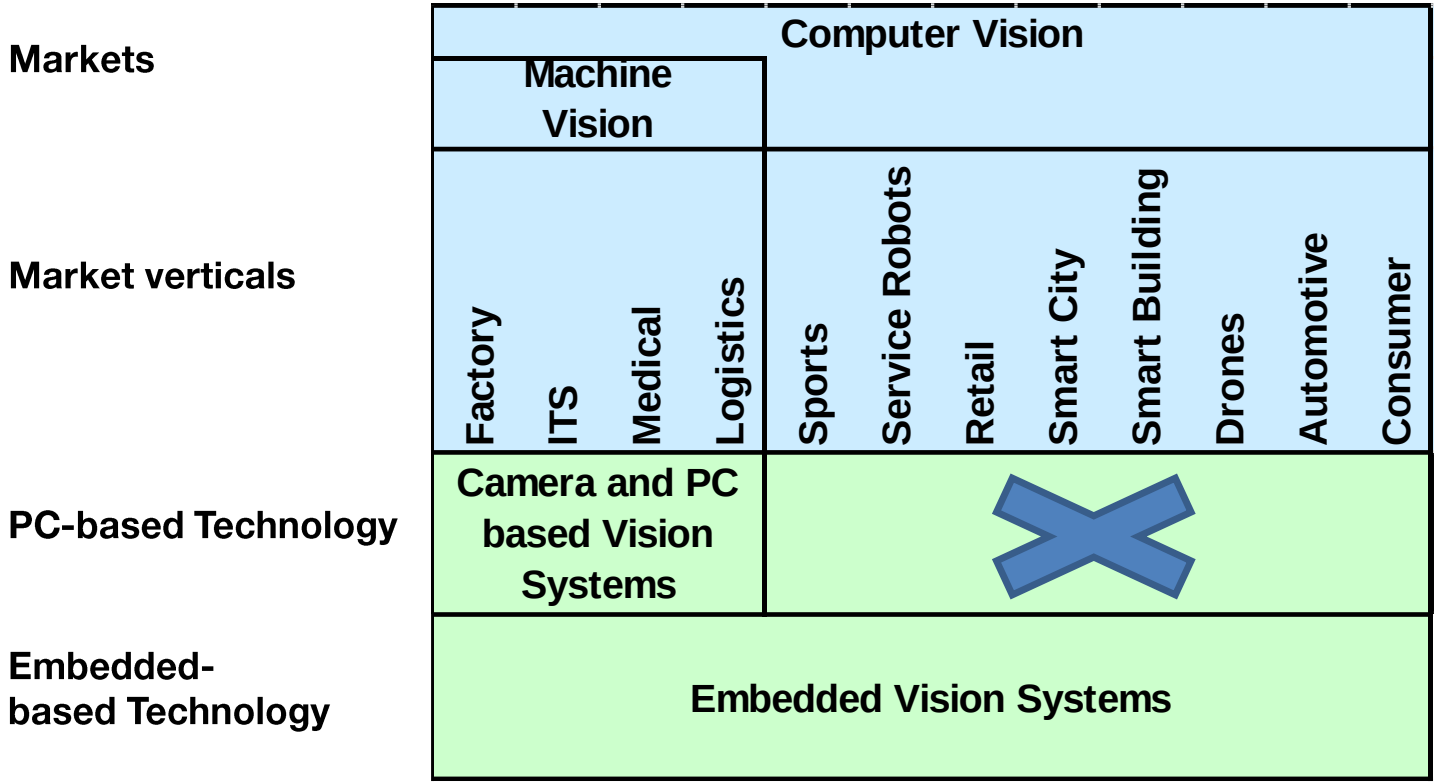
- **Description:** Automatic number-plate recognition **(ANPR)** for Intelligent Traffic Systems **(ITS)**
- **Customer problem:** Customer wants to identify the license plate of cars in case of traffic violation, for tolling or for access control
- **Product:** Installed **ITS System**
- **Company founding:** Key players **1998 – 2002**
- **Typical revenue:** 2017 **100M€ - 150M€**
- **Organization:** Either independent **stock listed** companies or **business units** in larger corporations

Success recipes of Machine Vision companies

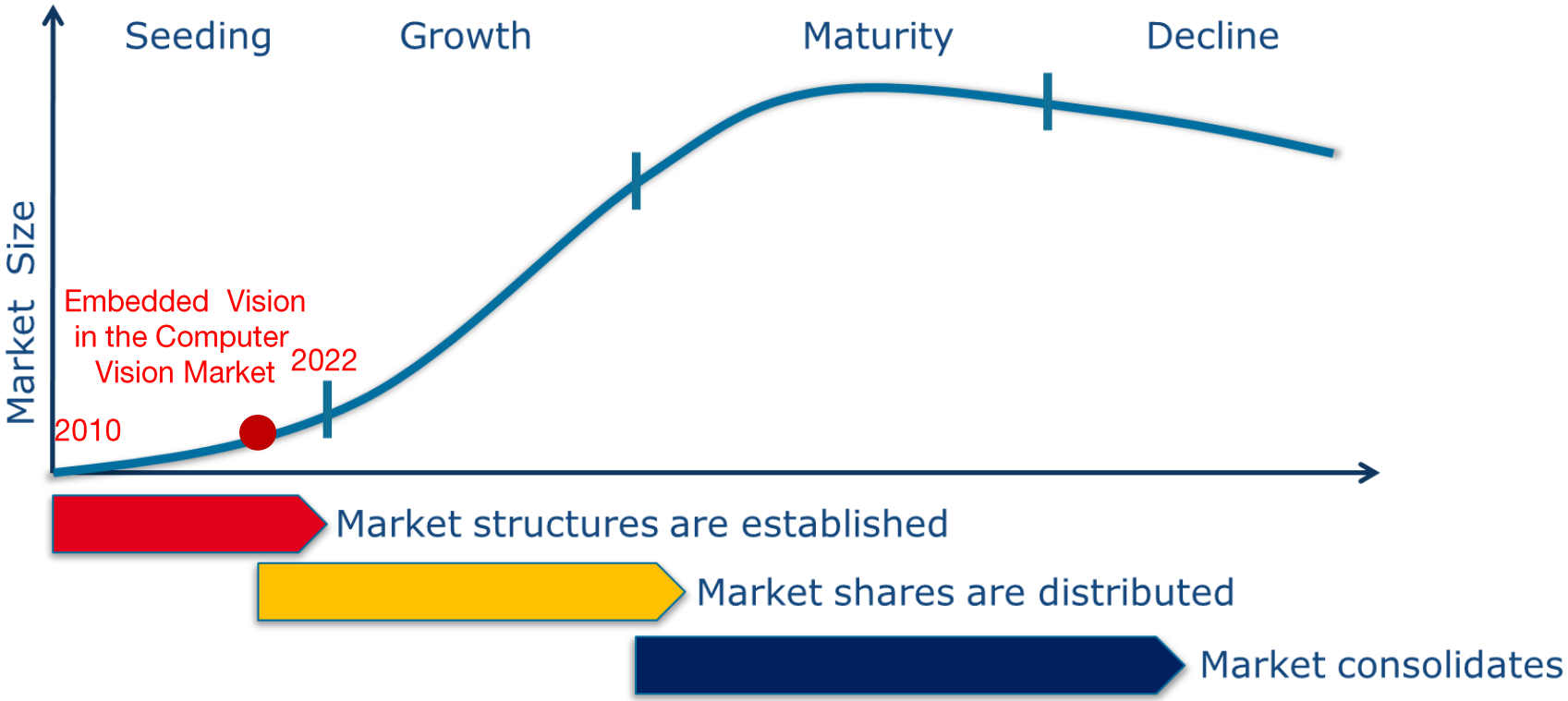
- Started the company in the founding phase: Timing was key
- Solved a singular real-world customer / application problem REALLY well
- Built products and a company around this problem
- Stayed focused:
  - Made sure it is the market leader before it diversified
  - Went international very early
- Focus on Hardware or Software?
- The combination of both was the key:
  - Software provided the key differentiation over the competition
  - But customers are looking for a solution consisting of Hardware and Software

Start-up opportunities for Embedded Vision

Definition of Markets and Technologies

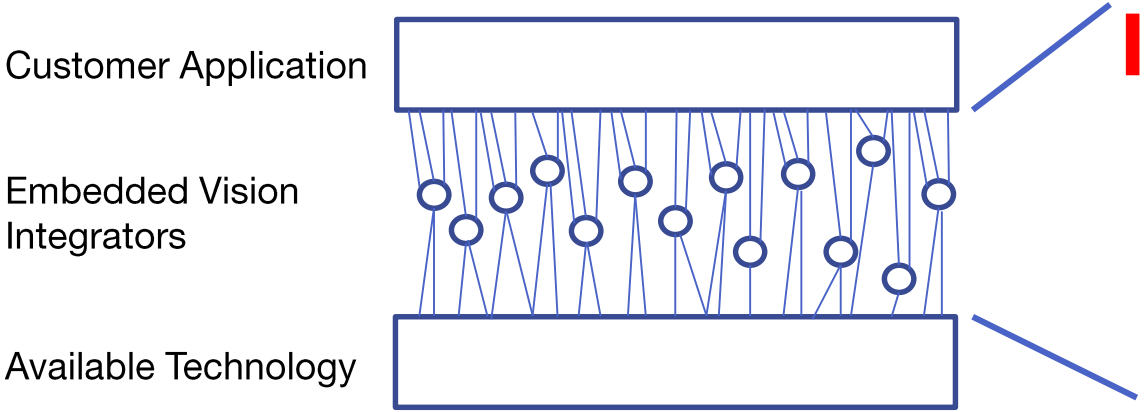


Embedded Vision in the Computer Vision Market



Embedded Vision – The founding years 2010-2022e

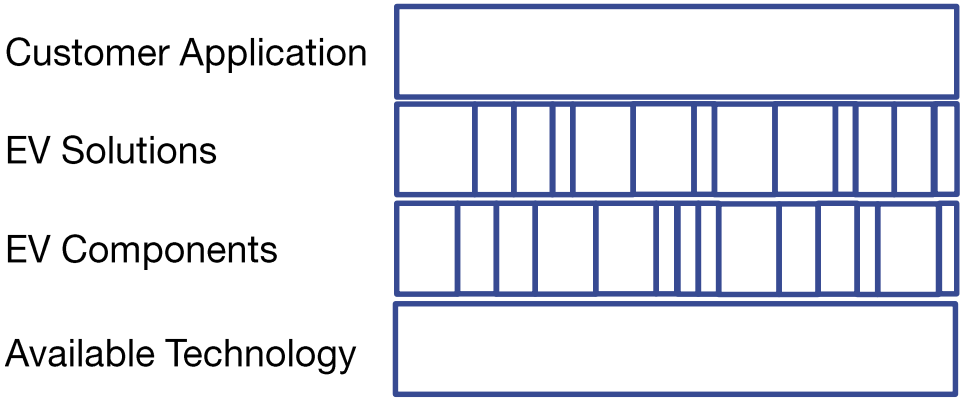
- **Many Start-ups using embedded processors & camera modules**
- **Software is developed to solve individual customer problems with Embedded Vision Technology, AI is commonly used!**
- **Many individual solutions: EV is diverse and technically challenging**
- **Integrators are KING during this time**



It is all about solving the customer problem

Embedded Vision – The growth years 2022e -

- **Embedded Vision System integrators could morph into Solution Companies**
  - **They focus on a single customer problem**
- **Many will grow, but some grow faster than others:**
  - **They select the right market segments**
  - **They see trends early and win through product differentiation**



It will be about the right market segment and about product differentiation

Computer Vision Market verticals in the founding phase

• Medical lab automation	Seeding window starting to close
• Retail solutions	Open – many opportunities
• Service robots	Open – started
• Smart City	Open – started
• Smart Building	Open – started

Examples Not a complete list

What are the customer problems in the above verticals?

How can Embedded Vision help to solve the customer problems?

⇒I cannot answer these questions for you

⇒If you find the answer, you might have a start-up idea on your hands

Summary

- Good time to start an Embedded Vision company: Timing is key
- Find your own customer / application problem in one of the new Computer Vision market verticals
- Solve the customer problem exceptionally well
- Build your product and company around a very focused problem
- Combine your Software solution with Hardware and a cloud connection
- Focus your staff on AI technology
- Stay focused: Say NO a lot!
- As soon as you have a success recipe, go global

Good luck

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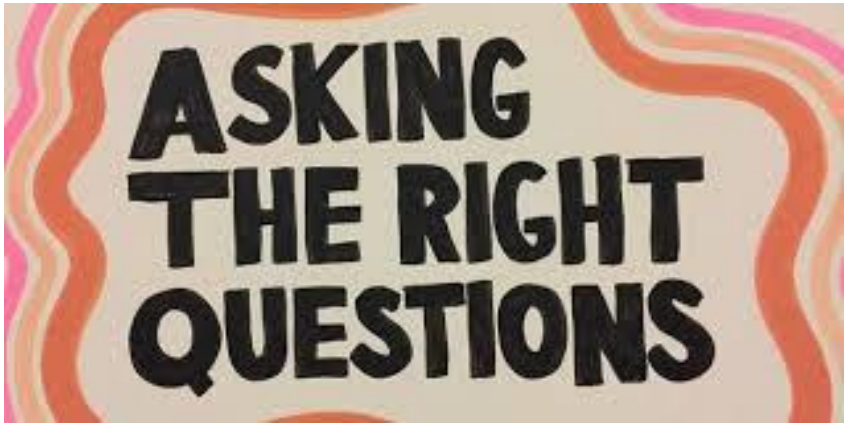
Questions



Resources

- The single biggest reason why startups succeed | Bill Gross
  - https://www.youtube.com/watch?v=bNpx7gpSqbY
- Embedded Vision Alliance | Market Information
  - https://www.embedded-vision.com/industry-analysis/market-analysis
- Imaginghub | a community for makers & professionals who create things with Vision on board
  - https://imaginghub.com/
- Basler Vision Campus | Information on Vision Markets, Applications, Products, Standards and Technologies
  - https://www.baslerweb.com/en/vision-campus/