

# *When Quantity Matters...*

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## ***Topics recently addressed:***

USU Small Satellites 2008: *“Small Satellites Big Business”*

IAA Symposium of 2009 in Berlin: Panel Discussion on *“Commercial Exploitation of Small Satellites for Earth Observation Satellites”*

## ***Will Small Satellites be mass produced?***



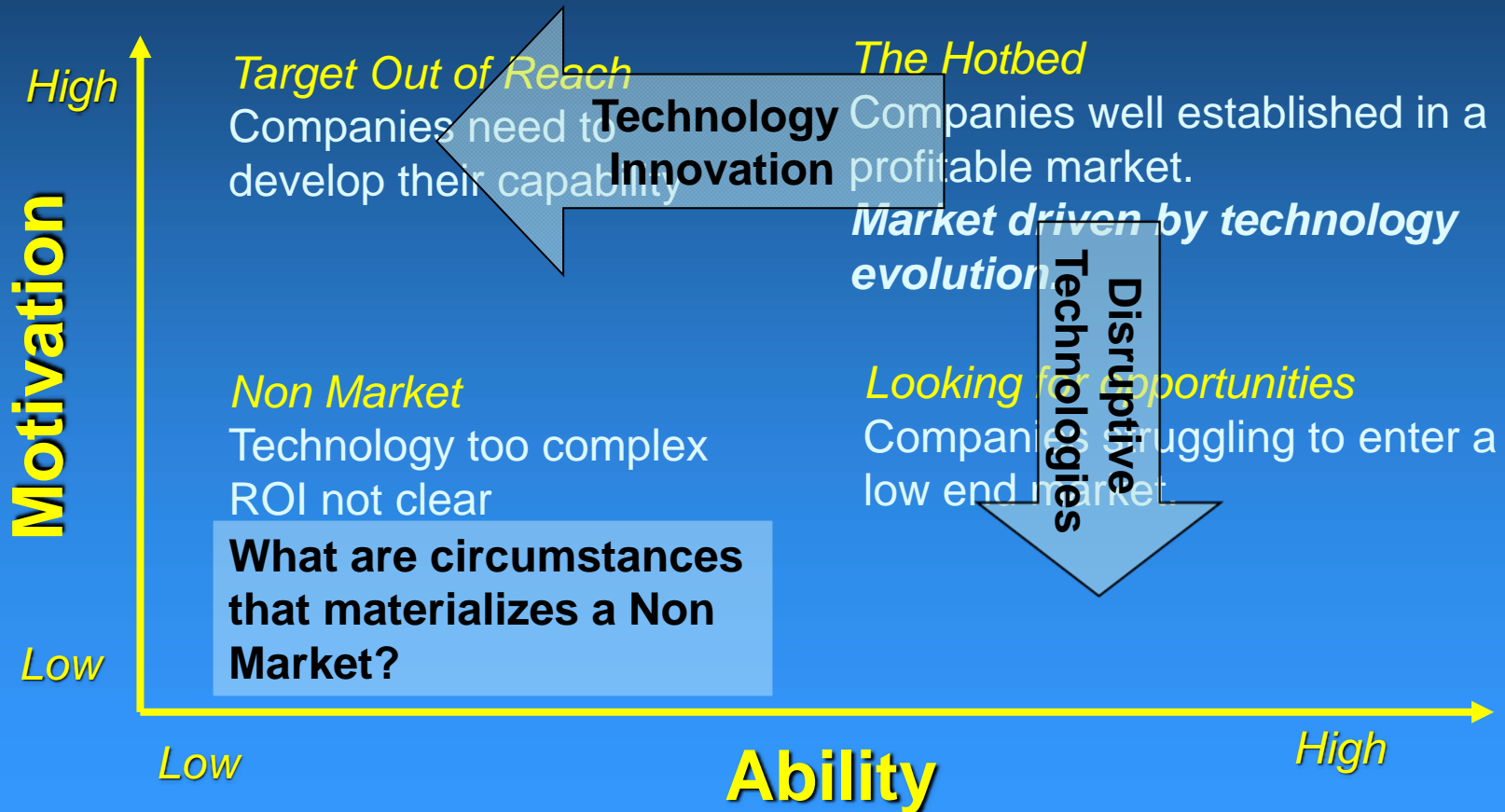
The Model T (1908)

Ford's innovations:

Cost reduction: from individual hand crafting to assembly line

*pay the workers a wage proportionate to the cost of the car, so that they would provide a ready made market.*

# The Motivation/Ability Matrix



## ***One example: Finding our way through the traffic***

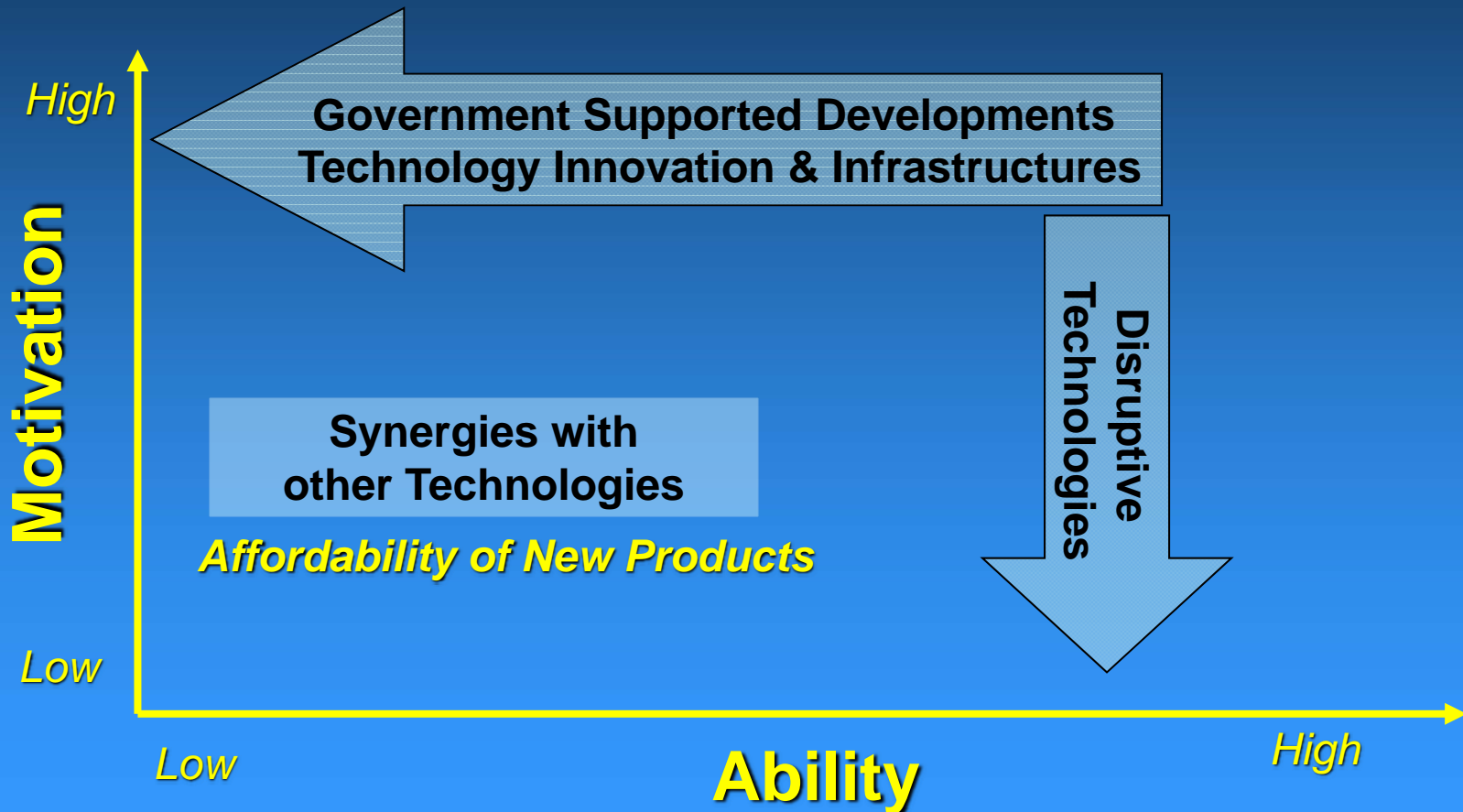
Tom-Tom produces GPS navigation systems. For a mere 10€/m provides very accurate traffic information and suggests possible detours.

### *How it works?*

The traffic information is obtained monitoring the average speed at which mobile phones switch between cells.

Tom-Tom didn't have the resources to develop the GSP and the ground network of mobile phones.

# From the Hot Bed to the Non-Market



## Case Study

### Real Time Direct Broadcast of HiRes Images.

*Ref. E-Corce Small Satellite Constellation: One-meter, One day, One Earth, J.P. Antikidis (CNES), The 4S Symposium, Rhodes 2008.*



# The Motivation/Ability Matrix for EO Sats





## *Government Sponsored Infrastructures*

*Fast Response to Natural Disasters requires near real time broadcast of HiRes Images, posing new requirements on the Ground Infrastructures*

### *TacSat-3*

*“[the objective of TacSat-3 is] to give the commanders direct access to, and tasking authority over, a set of space assets.”*

## *Disruptive Innovation*

The disruptive role of Small Satellite was debated here in Logan already in 2004. Numerous satellites have been developed and launched for EO application.

*Space Review wrote about TacSat-2:*

*“The ORS program is building and launching a set of small, relatively inexpensive, and technically innovative satellites that could change the way the military, if not the intelligence community, does business...”*

## *The Role of Synergic Technologies*

*The bandwidth of wireless access to internet is growing at a surprising pace.*

*Image processing SW (image compression, automatic feature recognition) is evolving under government sponsored development and for commercial uses.*

## *Affordability of the Final Product*

*How far the cost of small satellite shall go down before direct broadcast of HiRes Image will be affordable?*

- *Market dynamics*
- *Evolution of Cost/Performance Ratio*

## *Market Dynamics: Replacing Quality with Quantity*

*One of the obstacles to replace Quality with Quantity lays in the current procurement process.*

*Customer-Supplier relation is based on requirements as Performance, Availability and Reliability...*

*Nobody is willing to trade on quality.  
Even in design-to-cost projects.*

## *From Design-to-Specs towards In-Orbit Delivery*

*A low motivation market accepts a degraded service provided that the cost is affordable.*

*We need to look for market dynamic with different procurement schemes, as “In-orbit Delivery” .*

*www.dmcii.com: “If we do not meet your cloud cover requirements, you need not accept the imagery, though it can be purchased for a discounted fee”*

## *Evolution of Cost/Performance Ratio*

ERS-1 (1991): 500M€

*European Remote Sensing Satellite*

Sentinel-2A (2012): 200 M€

*Sentinel-2A, multispectral HiRes satellite for GMES.*

Sentinel-2B (2016): 100M€

*Recurrent of S-2A*

## *Performance Evolution*

Landsat-1 (1972): 100 meters

SPOT-1 (1985): 10 meters

Ikonos-2 (1999): 1 meter

*Over the last 15 years, the cost per square km of satellite imagery decreased of approximately 100 times.*



## *All Indicators...an Overview*

- *Governments are supporting technologies to reduce costs, improve resolution and availability of HiRes Images*
- *Synergic technologies (e.g. broadband wireless connections) are evolving at a relentless pace driven by a massive commercial market.*
- *Cost per Mb of Data is decreasing at a pace of one order of magnitude every 7.5 years.*

## *Conclusion & Questions*

*Keep an eye on the evolution of the Indicators.*

*Questions?*

- *What's the place of our products in this market?*
- *What are the technologies we need to have ready when Quantity will matters more than Quality?*