FROM MAKING TO MANUFACTURING: THE MISSING LINK

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Area Manager – America

FTF – May 17,2016

Embedded with **passion**
for over **35 years**

Creativity and **innovation** with a strong R&D area

Partnership with the most important **technological players**

Collaboration with important **research institutes**

In house manufacturing and System **Integration Plants**

Worldwide presence

Today's AGENDA

FROM MAKING TO MANUFACTURING: THE MISSING LINK

- **Birth of the DIGITAL Maker Movement**
  - MAKER
  - MANUFACTURING
  - DEPLOYMENT
  - ARDUINO
- **Makers Contributing to Manufacturing Revolution**
  - Manufacturing in US Economy
  - Makers Role in Modern Manufacturing
- **The Missing Link**
  - Manufacturing Strategy
  - Basic Terms and requirements
  - Product Lilfecycle Management
- **«R» before «D»**
  - Manufacturing in US Economy
  - Makers Role in Modern Manufacturing
- **The Perfect Partner from Concept to Product**
  - SECO
  - UDOO
  - SA62
  - UDOO NEO

SECO

Birth of the DIGITAL ProMaker

MAKERS:

"They [MAKERS] spend time in makerspaces because they just love to make things. They **don't need** to make Christmas presents; they want to."

- *THE MAKER MOVEMENT MANIFESTO*

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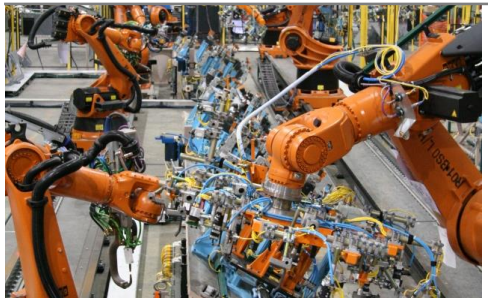
MANUFACTURING:

"The process of making wares by hand or by machinery especially when carried on **systematically** with **division of labor** "

- MERRIAM-WEBSTER.COM

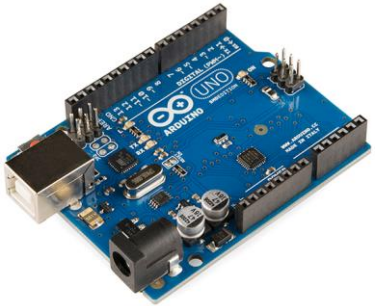


Birth of the DIGITAL ProMaker

ARDUINO

Arguably the main reason for the **explosion and success** of the **DIGITAL Maker Movement**!

Enabled **an endless world of possibilities**, when it comes to **mass production**



> "So people realized they could use Arduino to build circuits and make prototypes. It became a world of possibilities where people were even starting to make companies out of their Arduino prototypes."
>
> *- Massimo Banzi*
> *ARDUINO*
> *Inventor and CEO*

- a missing step, or **MISSING** LINK, **between making** a proof of concept **and manufactured product**

Birth of the DIGITAL ProMaker

HARDWARE V. SOFTWARE: THE ETERNAL BATTLE!!!

MANUFACTURING:

"The process of making ***wares*** by hand or by machinery especially when carried on ***systematically*** with division of labor."

- MERRIAM-WEBSTER.COM

≠

DEPLOYMENT:

"Software ***deployment*** is all of the activities that make a **software system** available for use."

- WIKIPEDIA

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PMs Contributing to Manufacturing Revolution

Manufacturing

Extremely vital as well as dynamic economic activity

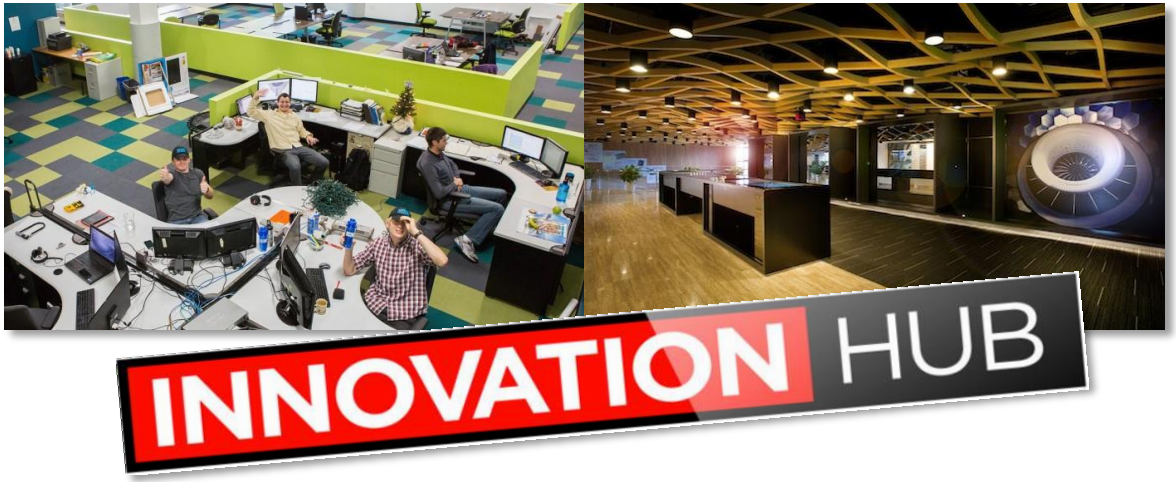
According to the ***Bureau of Economic Analysis***:

- In the US manufacturers contributed $2.09 trillion to the US economy
- 12% of GDP
- This would be the 5th biggest global GDP alone
- US Manufacturers account for more than 75% of all private-sector R&D leading all other sectors in the US in innovation.

PMs Contributing to Manufacturing Revolution

> "What a lot of folks don't understand is that we have real innovations coming out of these spaces that are worth billions of dollars, that are saving lives and changing the world, and we've only just started."

- Mark Hatch
CEO Techshop



PMs Contributing to Manufacturing Revolution

Evidence to back up these statements:

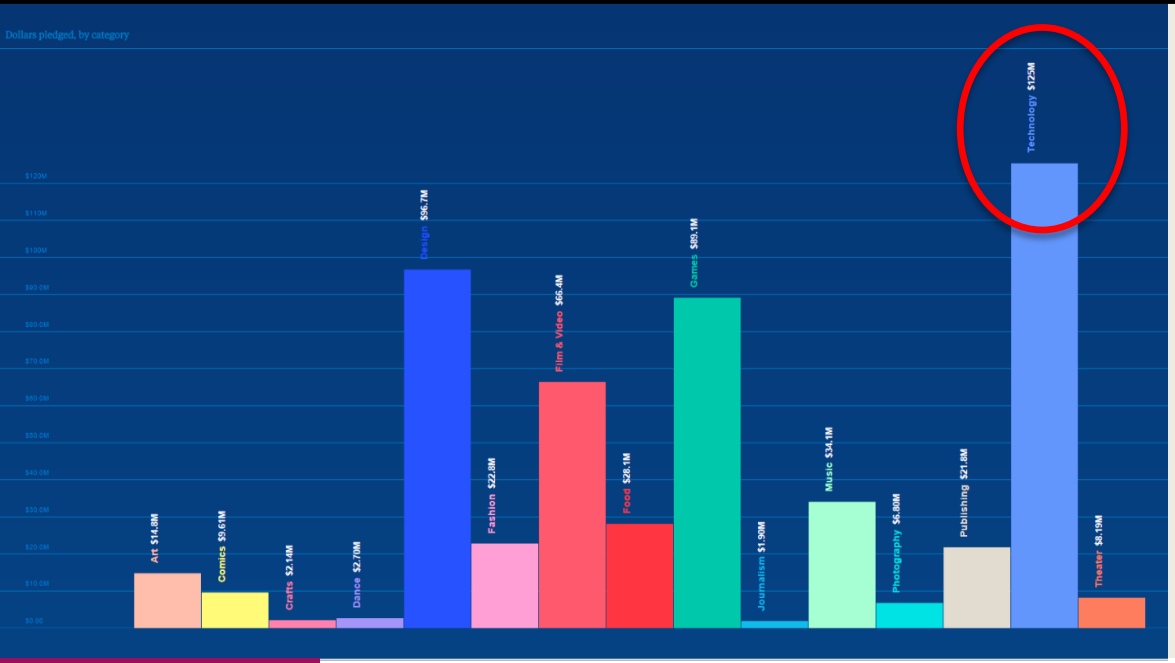
- First ever Maker Faire at the White House in June of 2014
- President promising "**new support for startups that want to file for a patent**"
- And "**Your projects are examples of a revolution that's taking place in American manufacturing -- a revolution that can help us create new jobs and industries for decades to come**."
- The success and proliferation of Crowdfunding platforms

KICKSTARTER

The prime example!

SECO

PMs Contributing to Manufacturing Revolution



KICKSTARTER

$480 million in 2013

$529 million in 2014

10% increase

leading field: **Technology** about **24% of the totals**

How much is hardware?

Since our focus is on technology manufacturing, we will focus on the hardware, or **embedded systems**, to be exact.

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The Missing Link

TONS of innovative ideas and drive from, as well as the support for, the Maker Movement and makers

The majority of concepts and projects still fail and disappear!

- **This is due in large part to one factor…**

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The Missing Link

- when ProMakers decide to manufacture their product, they typically have:
  - a well thought out business plan
  - excellent marketing pitches
  - consultants to guide them in this process

- **but they are missing one important link:**

a manufacturing strategy

- THIS IS THE **MISSING LINK!**

SECO

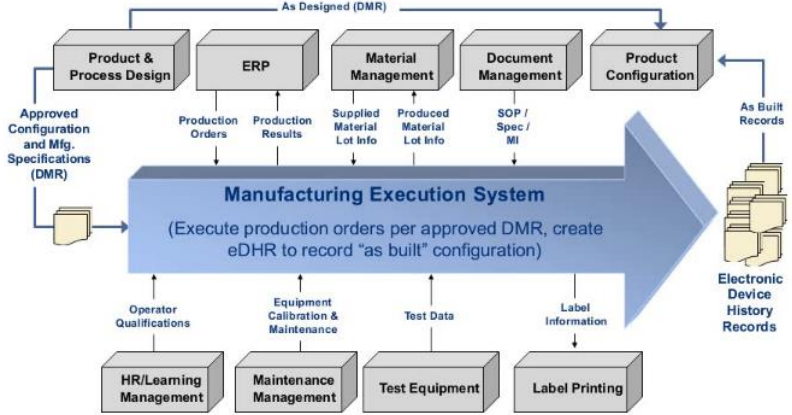
The Missing Link

Creating a **Manufacturing Strategy**

Deciding market placement
(Consumer, Industrial, Medical, Automotive, etc.)

Learning the manufacturing process
from a manufacturing point of view:
ASPECTS & REQUIREMENTS

Choosing the most effective path



Impossible to list all the processes, details and requirements.

- These are the premise to technology manufacturing
- **Tech manufacturing is extremely intricate, difficult and challenging**

The Missing Link

Before the solutions, come the problems.

Manufacturers require Volumes:

EAU – Estimated Annual Units.

MOQ – Minimum Order Quantity

NRE – Non Recurring Engineering Fee - one-time cost/fee:

- required in most cases
- may be in tens of thousands of dollars
- in almost all cases, this amount is non-refundable
- very variable requirement and can have a strong impact

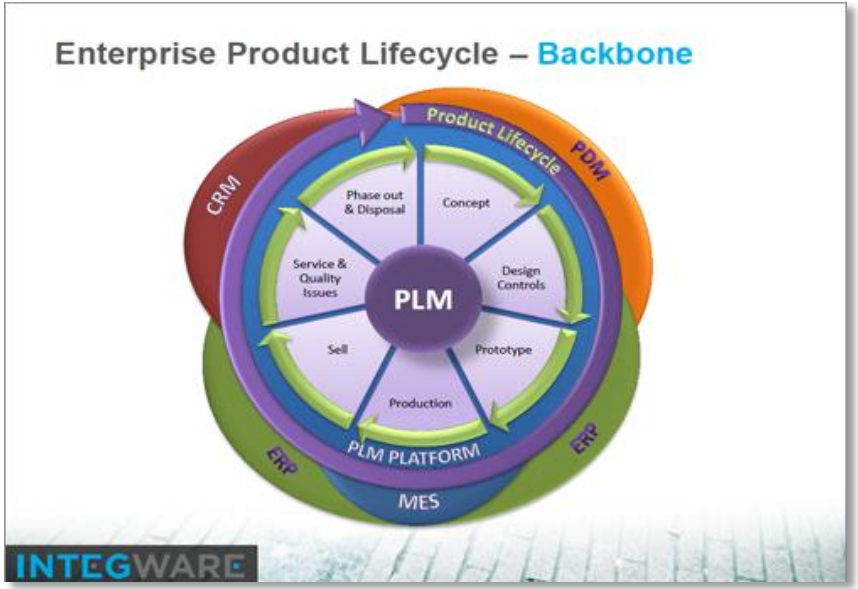
Product Lifecycle Management

However, these factors are nothing compared to the most vital aspect:

Product Lifecycle Management (PLM)

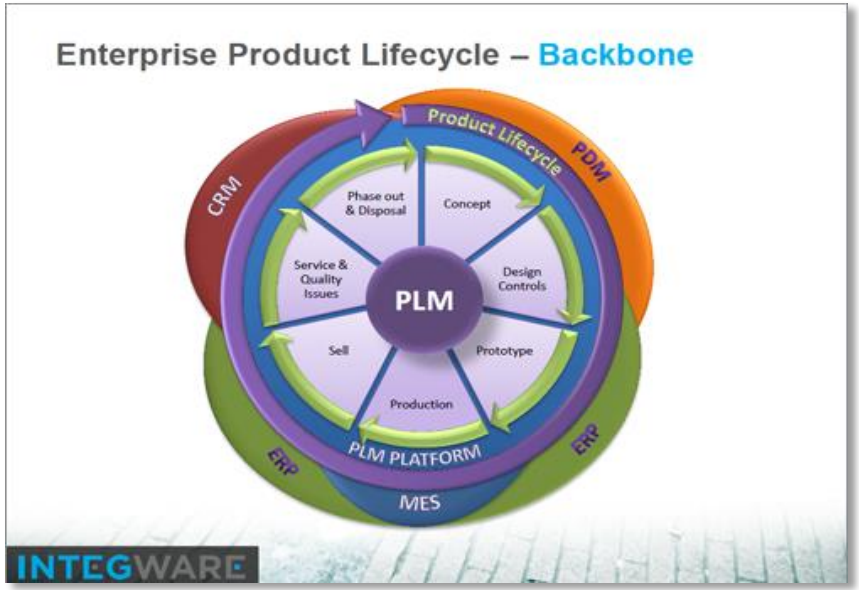
> *"PLM or Product Life cycle Management is a process or system used to manage the data and design process associated with the life of a product from its conception and envisioning through its manufacture, to its retirement and disposal."*

http://www.product-lifecycle-management.info/

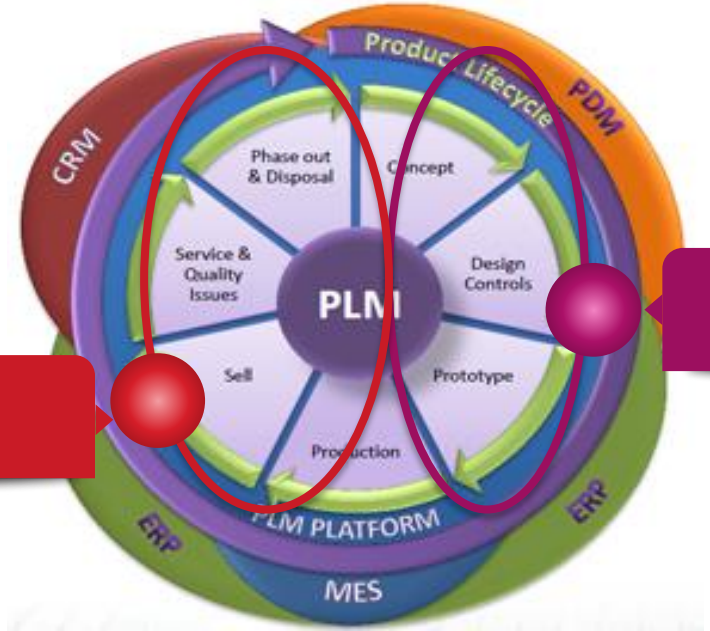


Product Lifecycle Management

- procedures play a crucial role in the success of company and product,
- especially in the hardware sector,
  - ➢ situations evolve very rapidly
  - ➢ with relatively short notice.
- **PLM covers pre- to post- production**
- Entails a series of steps and measures for proper management throughout entire lifetime



Product Lifecycle Management



Production

Proof of Concept

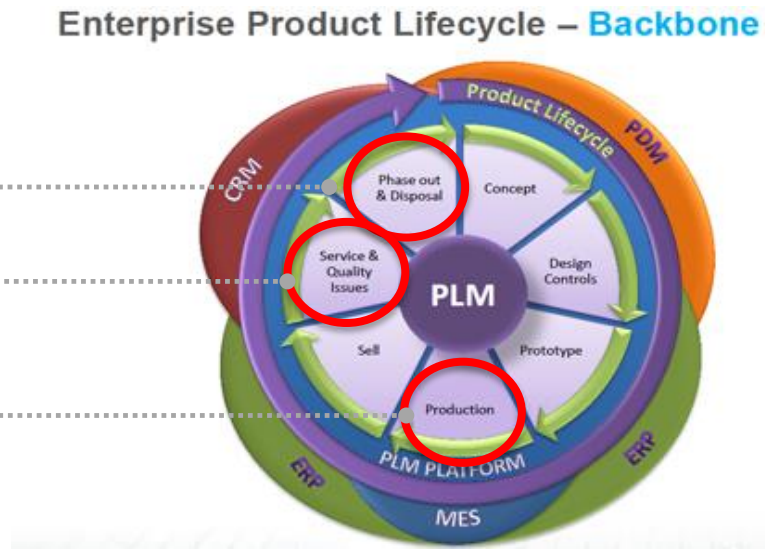
Product Lifecycle Management

PLM: impossible to give an exhaustive list.

Even more true with ***embedded manufacturing!***

4 vital tasks:

- **PROCUREMENT**
- **LTS**
- **ECN/PCN**
- **EOL**



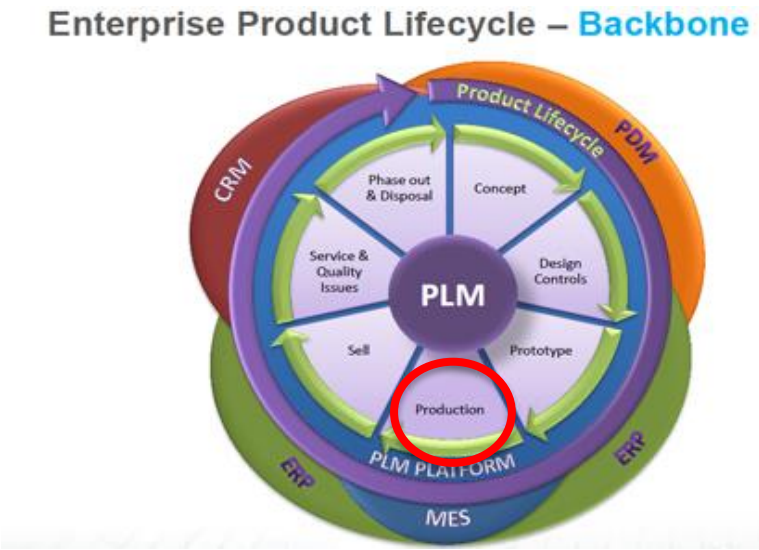
Product Lifecycle Management

PROCUREMENT

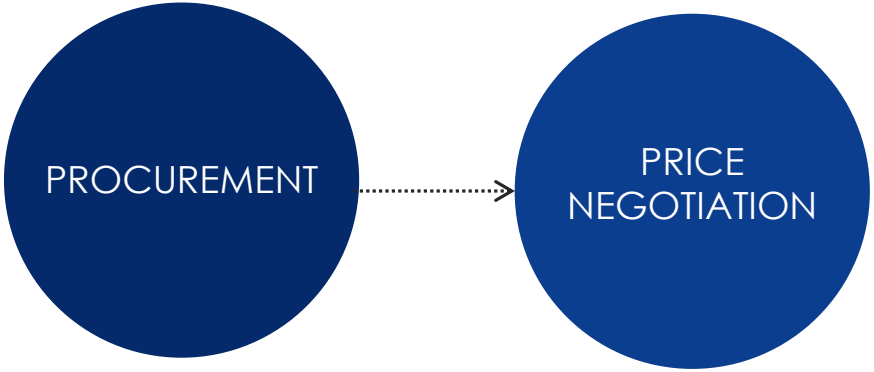
"The act of obtaining or buying goods and services. It ***<u>often</u>*** involves:

(1) purchase planning,
(2) standards determination,
(3) price negotiation,
(4) specifications development,
(5) supplier research and selection,

... And on and on!!"



Product Lifecycle Management



Volumes create leverage, and leverage creates a competitive price!!

90% of the times,
Maker products cost more
in production
that in prototyping!!

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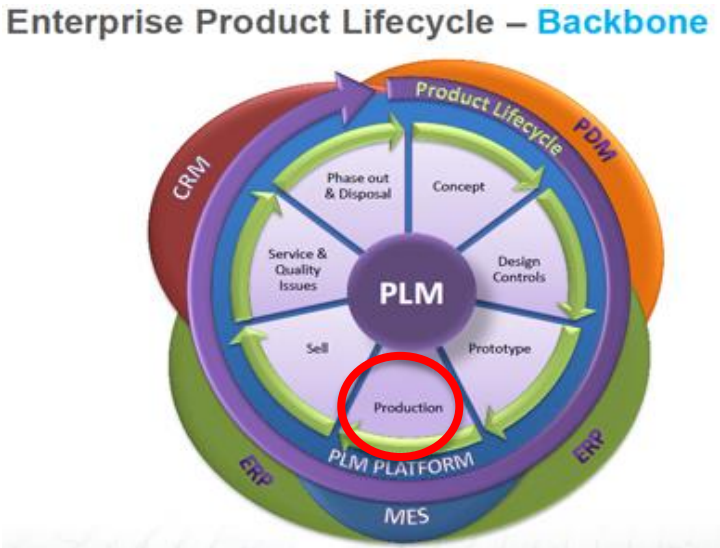
Product Lifecycle Management

LONG TERM SUPPORT – LTS

LTS (or Long Term Support) – The guarantee that the product will be available for a defined amount of time.

Requires:

- **managing** obsolete or discontinued components
- **guaranteeing** a lifetime of a product i.e. the processor for embedded products,
- ***Declaring a premature obsolescence can destroy a company's reliability and reputation.***



Product Lifecycle Management

ECN/PCN – Management of obsolescent component(s)

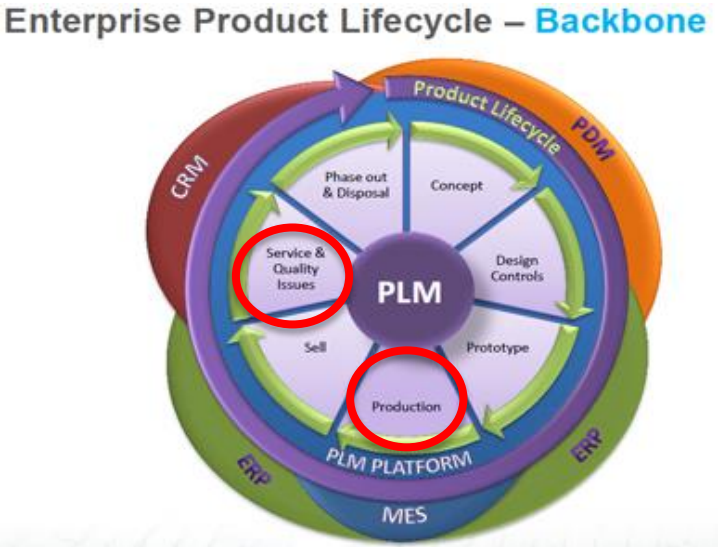
The manufacturer needs to find a replacement.

- **Simple**: finding a compatible drop-in component and validating the new board
- **Complex**: finding a new component and redesign of the board (re-spin or revision).

Requires a huge amount of effort (research, redesign, retesting and revalidation) and risk (it may not actually work).

Upon completion ***ECN*** (Engineering Change Notice) or ***PCN*** (Product Change Notice) is issued

- describes issue, steps taken and any repercussions on end customer.



Product Lifecycle Management

EOL – A manufacturer notification stating discontinuation

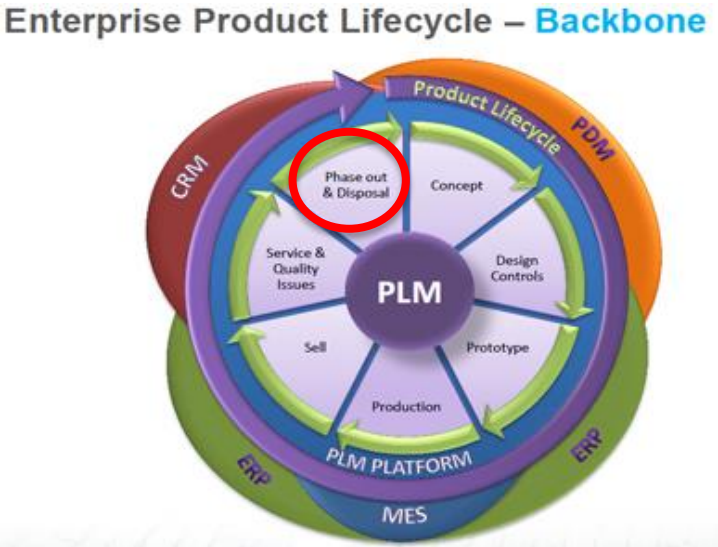
- Not typical for consumer markets
- Absolutely mandatory for industrial markets.

Contains three important dates:

- **EFFECTIVE EOL**
- **LAST TIME BUY**
- **LAST TIME SHIP**

EOL management

- **most critical aspect of the product lifecycle**
- **requires trust on the part of all parties**
- **may bankrupt a company, if not managed properly!**



Product Lifecycle Management

HARDWARE V. SOFTWARE: THE NEW ALLIANCE!!!

SOFTWARE:

If a specific software platform is not supported anymore, and there is no compatible solution, the entire project may have to be redesigned and validated!

=

HARDWARE:

If a component doesn't exist anymore, and there is no compatible solution, the entire hardware may have to be redesigned and validated!

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“R” before “D”

Exact steps to develop a ***manufacturing strategy***?

What are the steps from proof of concept onto *store shelves, company offices, cars or homes?*

First and foremost, the golden rules of production are:

Market Placement?

For how long?

- Consumer → 1-3 year lifetime
- Industrial → Typically 5-10 years
- Automotive → Typically 10 years
- Transportation → can be 30+ years

SHORT TERM MARKET

LONG TERM MARKETS

“R” before “D”

Timing of the questions becomes crucial

- After months of development time and money spent => too late.
- Fully functioning proof of concept but extremely difficult and costly to mass produce.

Manufacturing is cumbersome:

- Convincing VCs or companies becomes a useless effort.
- This research should be performed before even stepping into the lab

Thus R before D!!!

“R” before “D”

Once the Product placement is decided and for how long,
how do you go into manufacturing the product?

BUY vs BUILD or better **BUY vs BUILD vs HIRE**

There are typically three paths:

Self-Manufacturing

Using a Contract Manufacturer (CM)

Embedded manufacturer with Off-The-Shelf (OTS) Products

“R” before “D”

SELF – MANUFACTURING

- Ownership of all the necessary equipment and facilities

Contract Manufacturer

- A Manufacturer that is “**hired**” by a company to manufacture the product

Choice often depends on either CAPITAL or TIME factors!

“R” before “D”

Off-The-Shelf Embedded Manufacturer

An Embedded Board Manufacturer that sells easily accessible hardware

UDOO, Raspberry PI, ARDUINO, WANDBOARD…
and on and on!

- These boards are ready to buy, ready to use
- Come with specialized software, hardware and kits
- Enable fast prototyping.

Mass produced as standard products which allow development at many levels.

Certainly the fastest and cheapest way to create a proof of concept… but for manufacturing?

“R” before “D”

Off-The-Shelf Embedded Manufacturer

- Most do not offer manufacturing outside of their production schedule/pipeline.
- Products typically consumer based, therefore Industrial use limitations.

No LTS
LOW level of support
No PLM guarantee

Only a very limited few OTS solutions for mass production

“R” before “D”

Off-The-Shelf Embedded Manufacturer

Raspberry Pi

ELEMENT 14 agreement with RASPBERRY PI,
will enable the customization of the PI platform for commercial and industrial use, by adding/removing features, modifying the layout, etc.

(http://www.element14.com/community/docs/DOC-79064?ICID=rpimain-topban-customdoc)

“Customized boards will be suited for […] industrial […] devices, and can be ordered in quantities **starting** around **3,000-5,000 depending** …”

(http://embedded-computing.com/26496-raspberry-pi-goes-custom-for-industrial-commercial-applications/#).

“R” before “D”

Off-The-Shelf Embedded Manufacturer

Raspberry Pi

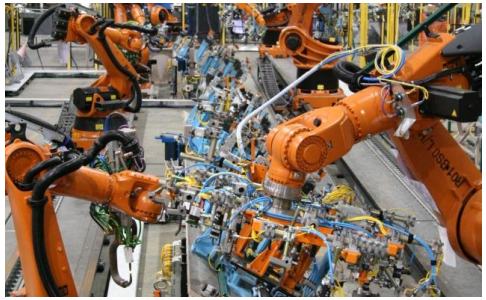
- Committing to Ks of boards?
- Is there an NRE?
- Will the ProMAker have equal priority in the pipeline?
- Can the PM migrate to higher performing products?

But more importantly:

- Life Cycle Management?
- Procurement, LTS, ECN/PCN?
- How is EOL managed and communicated?
- Will they hold stock for parts that are going EOL?

WHICH PATH???

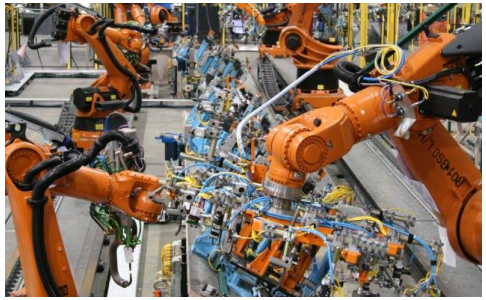
Keeping in mind…



What should PMs keep in mind when creating a manufacturing plan…

- Product desirable to investors and companies:
  no redesign/revalidation/rework
- To quickly get the item on the market (i.e. short **Time-to-Market** or **TTM**)
- To ensure that the product will last longer than the ROI window

Keeping in mind…

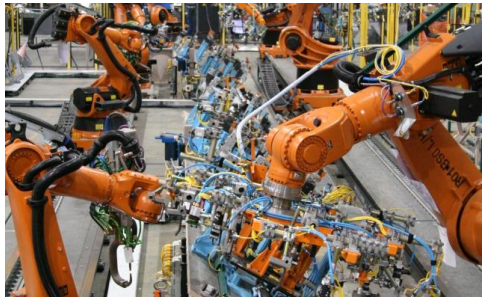


Also it wouldn't hurt if:

- The product is scalable/futureproof
- The parts are interoperable and can be "decoupled"
- The product is not 100% dependent on the partner(s)
- **REMINDER:**

Without Manufacturing considerations, the PMs are not pitching a product yet; they are pitching a concept!!

Keeping in mind…



In short, a **Manufacturing Strategy** should result in:

Support & Flexibility

- ***Support*** in managing the manufacturing requirements!
- ***Flexibility*** in waiving MOQs, NREs and other costs and offering future proofing capabilities as an added value!

A perfect solution from Concept to Product

Element 14 with Raspberry PI is **STARTING TO DO** what **SECO** has already been doing for almost 3 years!!

SECO has the solutions and a proven track record to **help makers go into manufacturing their proof of concept**

About SECO

Embedded with **passion** for over **35 years**

SECO is a world-leader in electronic embedded solutions

Spanning its 35+ years of experience, SECO has shown the ability to adapt its know-how to new, challenging customers' needs, and to provide cutting edge solutions to its partners.

Creativity and **innovation** with a strong R&D area

Partnership with the most important **technological players**

Collaboration with important **research institutes**

In house manufacturing and **System Integration Plants**

Worldwide presence

CREATIVITY & INNOVATION with a strong R&D area

SECO's human resources have grown constantly over the past years.

70% of total employees, **are qualified engineers and technicians!**

SECO works in close contact with its production unit, **PSM**. ensuring continuous monitoring of the entire **manufacturing process**,
from creation to mass production of innovate and highly integrated systems all in – house

PARTNERSHIP

WORLDWIDE TECHNOLOGICAL PARTNERS

Proven Partner

SECO is a **partner of the Microsoft® Windows® Embedded Program**

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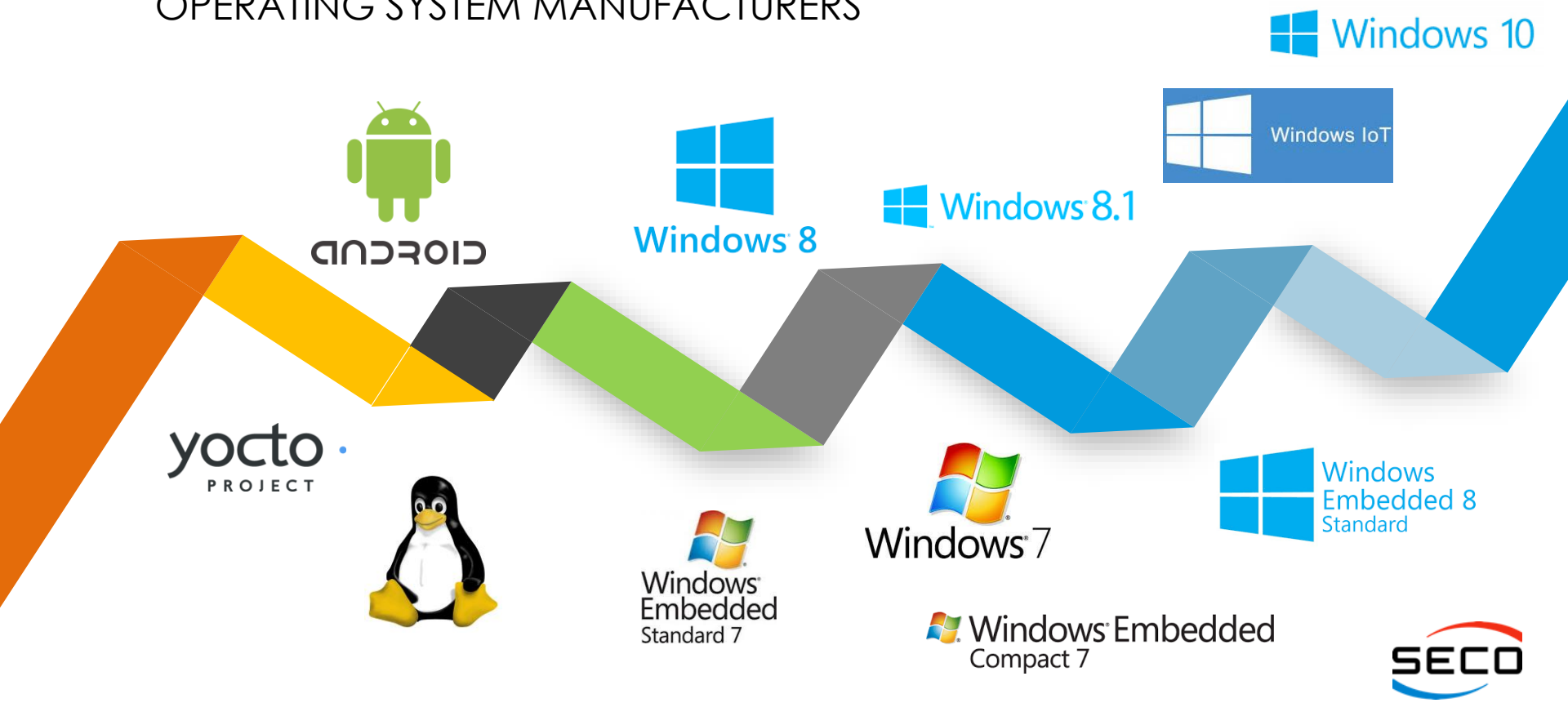
PARTNERSHIP

with the most important

OPERATING SYSTEM MANUFACTURERS



PSM Professional Surface Mounting

Manufacturing unit: PSM

MANUFACTURING AND SYSTEM INTEGRATION PLANTS

- **Founded in 1995**
- **100% Private Limited Liability Corporation**
- Based in Arezzo (Tuscany), Italy
- **Activity**: Productive unit
- 3 plants for a total of 6000 sq. mt.

- Flexible and fast prototyping
- Industrial Mass Production
- Functional, climatic and EMC test
- Burn-in and Run-in test
- **Assembly System**: 3 SMT lines + 1 fast prototyping line

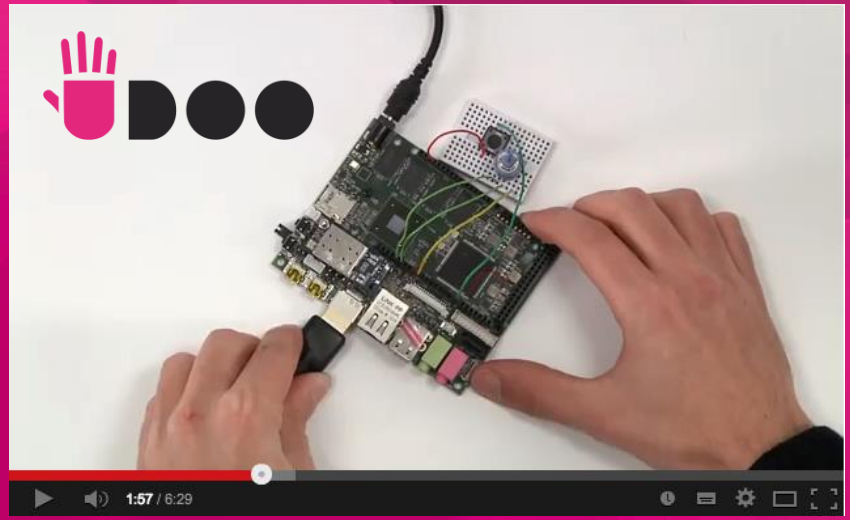
PROCUREMENT
INCOMING (TRACEABILITY)
KITTING
MANUFACTURING & SYSTEMS ASSEMBLING
TESTING
SHIPPING
QUALITY CONTROL

UDOO

2013

- open-source single board computer measuring 4.33" x 3.35" (11 cm x 8.5 cm).
- first product on the market to merge different computing worlds in one:
- **Runs either Android or Linux,**
- Embedded Arduino-compatible board

UDOO is a collective effort of a multidisciplinary team spread between North America and Europe, with expertise **in interaction design, embedded electronics and sensor networks.**



open source hardware

ACE AWARDS

Official and Community Software

C \ C++

Java

perl

LAMP
Linux Apache MySQL PHP,Perl,Python

node JS

pd~

python powered

Linaro

yocto PROJECT

debian

android 4.4 KitKat

VOLUMIO

ubuntustudio

xbmc MEDIA CENTER

archlinux

SECO

...and we answered back!!

FOR THE **UNIVERSITY** AND FOR **MAKERS**

2014

FOR THE **INDUSTRY**

Freescale i.MX6

Linux & Android

- High performance
- Flexible
- Energy-efficient
- IoT ready

SBC-A62-J

Low-cost Single Board Computer that exploits the potential of a **configurable expansion** connector for configuration flexibility needs.

Open hardware, low-cost computer equipped with a Freescale processor, alongside Arduino DUE's ARM on the same board.

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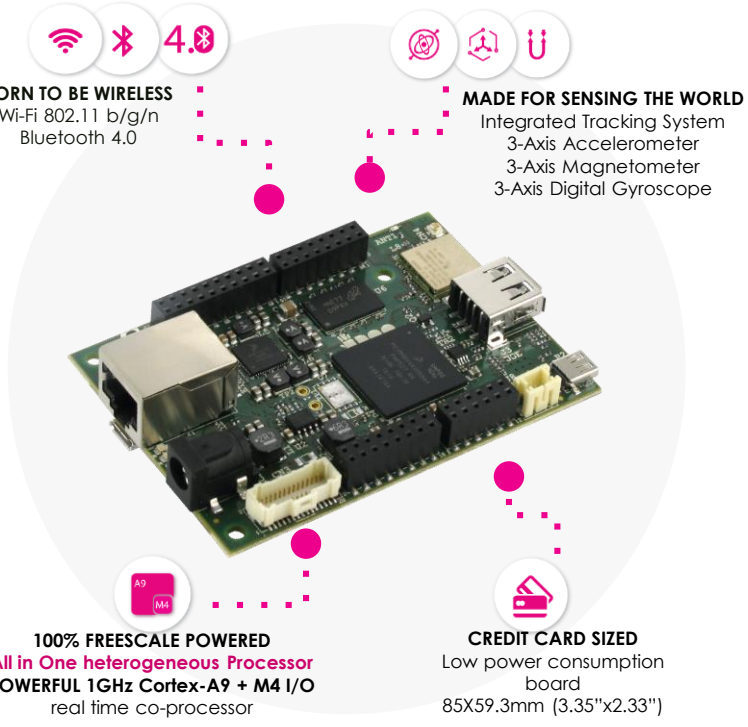
UDOO NEO: The New Internet Of Things

NEO

2015



Arduino, Linux & Android in your pocket. The wireless Internet of Things playground

1. LEARN
easily as with an Arduino

- Learn with Arduino tutorials and educational material
- Include Arduino sketches and Libraries
- Use Arduino shields

2.EXPLORE
the most flexible development environments

- C/C++
- Python
- Php/LAMP
- Java
- Android Programming
- Open CV
- PureData

3.INTERACT
with the physical world

- ROVER
- DRONES
- SMART APPLIANCES
- HOME AUTOMATION
- ROBOTS
- WIRELESS SENSORS
- ANDROID SMART OBJECTS

funded with KICK STARTER

UDOO Neo = Raspberry Pi + Arduino + Wi-Fi + BT 4.0 + Sensors

Funded on Kickstarter in just 80 minutes!

SECO

SBC-B08

2016

Industrial SBC IoT Solution
at lower than a Maker board price

- From the success of NEO, the SBC **born for industry**
- **NXP i.MX 6SoloX Processor** w/Real-time OS on the **Cortex®-M4 core**
- The ideal **building block** for any **IoT project**
- **Wireless** connectivity

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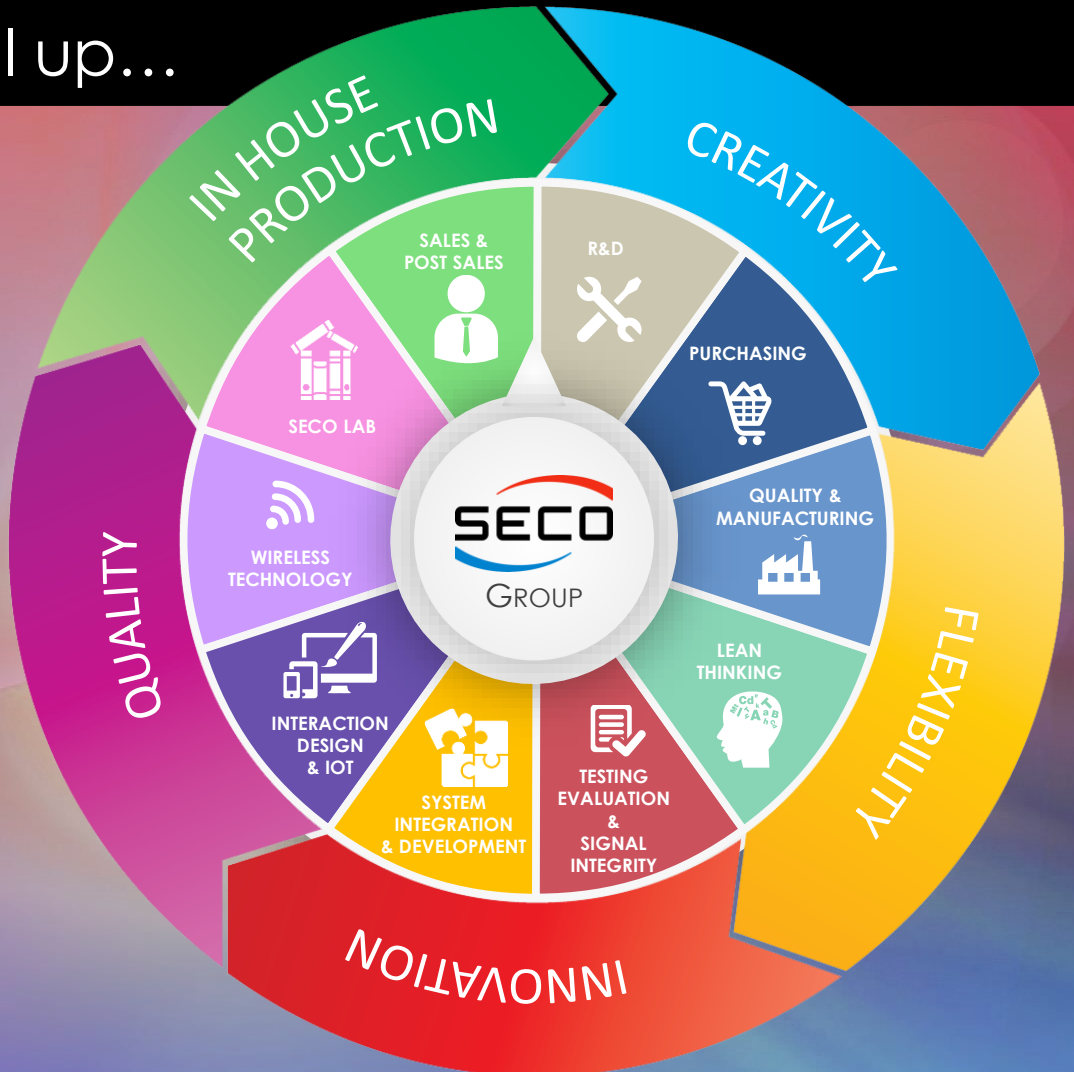
Summing it all up…



Thank you for attending!

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