Why Industrie 4.0 Demands New Business Models

@masscustom (Frank T. Piller)
Note:
This slide set is for private use only.

It is similar to the one shown by Prof. Piller during the event.

It lacks some slides and most pictures, but should provide you the opportunity to review the messages delivered during the presentation.
Short Introduction: Frank Piller

Today’s positions

- Head of RWTH Technology & Innovation Management Group and full (tenured) professor of management at TIME Research Area at RWTH Aachen University
- Academic Director of RWTH Executive MBA, offered by RWTH Aachen & Fraunhofer Gesellschaft
- Co-Founder and Co-Director of the MIT Smart Customization Group, MIT Media Lab, Massachusetts Institute of Technology, Cambridge, MA

Past positions

- Assistant / Associate Professor in Management and Habilitation on Customer Co-Creation at TUM Business School, Munich (1999-2004)
- Ph.D. in Operations Management with focus on Mass Customization, University of Wuerzburg (1995-1999)

Current Research Interests and Expertise

- Strategies for Customer-Centric Value Creation, like mass customization, innovation co-creation, additive manufacturing, managing the frontend of innovation
- Open Innovation, i.e. technology transfer, R&D partnership models, crowdsourcing
- Managing Disruptive Business Model Innovation and supporting organizational structures and cultures (especially facilitated by Industrie 4.0 and Digital Transformation)

Entrepreneurial Activities

- Co-Founder, Investor, and/or Member of Board of Directors of several companies, including Competivation (innovation consultancy), ThinkConsult (process management and concept testing), MVM.com (personalization and virtual models), Hyve AG (customer co-creation), Dialego AG (innovative online market research), Corpus-e AG (low-cost high-quality 3D body scanning and “best fit” solutions for eCommerce), DOOB AG (3D printing and 3D modelling)

- Real life achievements: Only German in “Top50 Profs on Twitter” list; Kloutscore >60; Google Scholar Citations >8500

More info: frankpiller.com
Follow me on Twitter: @masscustom
“Digitization in manufacturing will have a disruptive effect every bit as big as in other industries that have gone digital, such as office equipment, telecoms, photography, music, publishing and films.”

—The Economist, 4/21/12
What do these people have in common?

The Innovation manager of an Investment Bank
The head of sales at Deutsche Bahn
A business developer of Yellow Strom
The head of R&D of a machine tool manufacturer
A consultant
The head of service innovation of BSH
A business innovation manager at Daimler
The all gave the same response on a discussion question in an executive training offered by our department:

“Image your worst possible competitor. How would it look alike?”

* RWTH Zertifikatskurs „Business Model Innovation“, bmi.rwth-aachen.de
Based on an idea by Marshall van Alstyne (2015), MIT.
Platforms (business ecosystems) beat products every single time.
Zuverlässig
Die Gillette-Box ist über eine GSM Anbindung mit uns verbunden. Für die zuverlässige Anbindung haben wir mit der Deutschen Telekom einen starken Partner gefunden, der mit seinem ausgezeichneten Netz eine nahezu lückenlose Verbindung gewährleistet.

powered by T

Langlebig
Die Box ist für minimalen Stromverbrauch ausgelegt. Sie schaltet sich nur auf Knopfdruck ein, sendet die Bestellung und schaltet sich wieder komplett ab. Kein unnötiger Stromverbrauch und minimale Sendestrahlung.

Sicher
Um versehentliche Bestellungen zu vermeiden, bekommst Du nach dem Bestellen eine Bestätigungsmail, in der Du Deinen Kauf noch einmal kurz bestätigen musst. Du kaufst nichts, was Du nicht willst.

"Das Gerät sendet nur auf Knopfdruck für wenige Sekunden, vergleichbar mit dem Senden einer SMS durch ein Mobiltelefon.

02 - NUR EIN KNOPFDRUCK für neue Klinge
Registriere Dein Gerät zunächst mit Lieferanschrift im Shop von Perfect Shave. Drücke den Order-Button, bis der blaue Ring um den Knopf anfängt langsam zu blinken. Der Knopf muss ca. drei Sekunden gedrückt werden.
Why will one win and the other loose?

An integrated, isolated product

A service („App“) as part of an existing platform
Platforms (business ecosystems) beat products every single time.
Exactly this development is challenging manufacturing companies today
“Digitalization”

“Digital Transformation”

“Industrie 4.0 (I40)”

“The (Industrial) Internet of Things (IoT)”
All this is based on a well-known effect
Digitalization etc. is still very much driven by Moore's Law

“Reduced cost is one of the big attractions of integrated electronics, and the cost advantage continues to increase as the technology evolves toward the production of larger and larger circuit functions on a single semiconductor substrate.”
Electronics, Volume 38, Number 8, April 19, 1965
“Idea of exponential growth — in the computing power of machines, in the amount of digital information that is being created and in the number of relatively cheap devices that are continually talking to each other.

When these numbers doubled every year or two in the early days of the computer revolution, the results, while impressive, were still within our ability to imagine.

But now that the numbers are so staggeringly large, [so] that machines can finally do things once considered possible only in the realm of science fiction.”
And what do we do with all this capacity?
Pacif-i™ Smart Pacifier

WORLD’S FIRST BLUETOOTH™ SMART BABY PACIFIER

Blue Maestro are the inventors of the world’s first Bluetooth™ Smart baby pacifier - Pacif-i™. Pacif-i™ is unique in that it records a baby’s temperature and passes it to a parent’s smartphone where it can be tracked and medication recorded. The ability to plot the effect medication has on temperature is particularly useful, no more scrambling for a pen and paper or trying to remember in your head. With useful reminders and alerts it becomes a peace of mind at stressful times. Comes with a range of other useful features, such as the ability to find the pacifier with your smartphone as well as a proximity feature that alerts your smartphone if the pacifier moves away from you.

From £25.00 / $39.00 / €30.00
What is the „job“ of this innovation? (Do we really need this?)
At the same time, the pacifier becomes an open platform … expect 100s of baby apps!
A framework to map Industrie 4.0
Different “technologies” are behind the current digital transformation of manufacturing. BCG, for example, differentiates these “nine pillars of technological advancement”
A Major IoT Application is ...

Industry 4.0 consists of smart, connected “Things” and relies on their data.
(1) The technological infrastructure (Digitalization)
(2) The Application Dimension: Smart Solutions in Form of Smart Products and Services
The Defining Characteristics of Smart Products

**Aware**

Smart Products are equipped with sensor technology giving access to condition information regarding the product and its environment.

**Connected**

Smart Products are equipped with a M2M communication device that enables interaction and data exchange with other cyber-physical systems.

**Intelligent**

Smart Products are equipped with computing power that enables autonomous decision-making and self-learning processes based on defined algorithms.

**Responsive**

Smart Products are equipped with control technology that enables autonomous product adaptation based on internal or external commands.

Source: Bechtold et al., 2015 / CapGemini Consulting Framework
(3) The Innovation Dimension: Digitalization enables new dimensions of open innovation in business ecosystems along the entire lifecycle.
Digitalization also enhances today’s notion of “open innovation” into an extended innovation system in open ecosystems.

Source: Bechtold et al., 2015 / CapGemini Consulting Framework
(4) The Smart Factory: Digitalization enables data-driven, resilient and decentralized factories, which become part of a connected supply chain.
The Smart Factory: Digitalization enables data-driven, resilient and decentralized factories, which become part of a connected supply chain.
(5) While smart solutions drive market growths, the smart factory enables operational efficiency – but also mass customization and new business models.
The challenge of finding a new business model
A business model is a management hypothesis about what customers want, how they want it and how an enterprise can meet those needs and get paid for doing so.  
(David Teece, UC Berkeley)
The challenge: Business model innovation demands to build and manage assumptions

Source: M.W. Johnson: Seizing the White Space, 2010
(1) Iterative „Design Thinking“ approach:
- Agile process with continuous iterations and strong user focus
- Open, collaborative task in responsibility of every product manager
- Early use of many BM prototypes (Primotypes)
- BM Canvas as a communication tool: Ability to map BM alternatives
- Intuitive approach, at the same time systematically
- Today, often company-specific canvas

* more information: bmi.rwth-aachen.de
The Idea of the Business Model Canvas

- To analyze the status quo, clarify the processes underlying them,
- To overcome barriers (confusion and complexity) and to discover alternative business models, …
- which then allows us to run “experiments” considering alternate combinations of the processes.
- And this in an interactive process!
THE AACHEN BUSINESS MODEL INNOVATION (BMI) APPROACH*

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(2) BM patterns for systematic search for new BM:
- Successful BM are based on recurring patterns
- Derivation of general and company specific libraries of BM patterns
- Systematic problem solving based on TRIZ approach

* more information: bmi.rwth-aachen.de
In the world of business models, there is not much that is actually new – but many powerful adaptations!

Patterns of business models can serve as an inspiration when innovations of business models are considered.

*E.g. Solution Provider:* Deliver carefree package of comprehensive solution of integrated product and service offerings

*E.g. Experience Selling:* Deliver emotional sensation apart from the functionality of the tangible product in saturated market

→ Recombine existing concepts to break outside of the box and generate ideas for new business models

Building on: Gassmann & Frankenberger, Univ St Gallen, 2014
1970 Invention of nespresso system (coffee machine usable with coffee capsules)

1986 Market entry
(Razor and Blade)
(Lock-in)

1987 Nespresso almost failed due to nonperforming business model

1991 Jean-Paul Gaillard takes over activities of Nespresso
(Razor and Blade)
(Lock-in)
(Solution provider)
(Experience)
(Direct selling)
(Ultimate luxury)

Nespresso business model initially almost failed. It only became successful when Jean-Paul Gaillard adapted the business model by additional „patterns“.

Nestlé is catching up with several new businesses like Babyness and Special T.
We can see this competition also differently:

An ambitious and brave business experiment (from prototype or perish to deploy or die)

„Business as usual“
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(3) Rapid experimentation and validation in field
- BMI means to develop alternatives – and to test assumptions
- Ability to generate quick and cheap experiments (e.g., 5x5x5x5x5 logic by Schrage)
- Experimentation template

* more information: bmi.rwth-aachen.de
Digital Corporate Mindset
Skills, Leadership, and Culture

Digital Business Model
Value Propositions, Offerings, and Markets

Digital Performance Structure
Governance, Processes, and Organizational Design

Growth Drivers
(Connected, „Smart“ Everything, IoT)

Industrial Efficiency Drivers
(Industrial Internet of Things, I4.0)

Smart Solutions
Open Innovation in Business Ecosystems
Connected Lifecycle and Cloud-based PLM
Smart Services
Smart Products

Smart Innovation
Agile Networks for Collaboration
Connected & Resilient Supply Chains

Smart Supply Chains
System Integration
Augmented Reality

Smart Factory
Decentralized Production Control
Data-Driven Operational Excellence

Technological Infrastructure and Enablers
Cloud
Big Data
Simulation
IoT (CPS)
Cyber Security
System Integration
Augmented Reality
3D Printing (Additive M.)
Autonomous Robots

Source: Based on Bichold et al., 2015 / CapGemini I40 Framework.
“Success factors” for BMI

- Questioning attitude
- Rewards success and failure, punishes inaction
- Tolerates mistakes
- Slack is welcomed
- Supports risk taking and change
- Supports teamwork and collaboration

- Diversity  (internal and external)
  - Collaboration
  - Educated in regard to the strategy and skills needed

- Shield creative teams from distractions and pressure
  - Appreciate distinctiveness in people and their thinking
  - Welcome change
  - Ask itself what it does to promote or inhibit innovation and how to get rid of these obstacles.

- Guide the process in a participative and fair way
- Clearly communicate reasons, and expectations
- Educate employees

- Fast and flat
  - Small units
  - Encourages collaboration
  - Autonomous teams at the front line

The BMI organization

Culture

People

Leadership

Structure

Processes

Systems

- Support the process of strategic innovation
- Enable collaboration
- Enable the use and creation of knowledge
- Reward risk taking and action
- Used to create relationships with customers
- Metrics & rewards support innovation

- Fast and un-bureaucratic
- Decentralized decision making
- Support idea generation, experimentation and execution

Building on Marc Sniukas 2011
But perhaps we don’t need to build “supermodel companies” anyway – as we don’t need companies at all any longer …
The other side of Industrie 4.0
Open Design was developed as my MA thesis and became the core of my creative work. I first published Open Designs for download in 2005. This is from the Open Design Manifesto I wrote:

A revolution in product development, production and distribution is imminent due to the Internet’s disruptive nature and the easy access to CNC machines. Open Design is a proposal to make this happen. It’s aim is to shift Industrial Design to become relevant in a globally networked information society.

In Open Design a design is CAD information published online under a Creative Commons license to be downloaded, copied and modified, and is produced directly from file by CNC machines and without special tooling.
Welcome to the Thingiverse.

This is a place to share digital designs that can be made into real, physical objects. Let's create a better universe, together!

Newest Things

Unicorn Logo
By: langfordw 2 hours ago

Maker Bot Sound Library
By: sepulchra 3 hours ago

Aluminum Mk4 Idler
By: colorbroken 5 hours ago

Featured Things

view more

view more

Popular Tags
3D makerbot reprap useful makeentry openscad toy experiment model laser cut
View All Tags

Popular Tools
3D Printer Knife Laser Cutter Screwdriver Soldering Iron Scissors Saw Hex Keys Wire Cutters Hot Glue Gun

Thingiverse Blog
Recent Posts
Share and Share Alike
Marty's Thingiverse WordPress Plugin is available for download here.
What is Google SketchUp 6?

Google SketchUp is a deceptively simple, amazingly powerful tool for creating, viewing, and modifying 3D ideas quickly and easily. Google SketchUp was developed to combine the elegance and spontaneity of pencil sketching with the speed and flexibility of today's digital media.

Developed for the concept that sketching allows for quick and easy design exploration, Google SketchUp combines the simplicity of traditional pencil and paper sketching with the ease and power of a digital environment.

3D for Everyone

Design software has been incredibly useful, but for something has been missing. It's been hard to hand-in-hand with the design work. To fill in the gap, we created Google SketchUp.

Google SketchUp bridges the gap between ourselves and our users. We know you've heard it a thousand times: 'Design software is a piece of cake to use' or 'I don't have to take your word for it - fire it up and give it a spin.'

But nevermind what we tell you - try it for yourself. It's quick and easy.

- Communication tool
- Problem-solving tool
- Productivity tool
- Creativity tool

Ronen Kadushin

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Manufacturing as a service
xaas*

*everything as a service
xaasfaou

*everything as a service for all of us
An industry already that already has been disrupted by a very similar development is the publishing industry.
2D Digital Printing
Digitalization enables rapid innovation (in ecosystems)
Consider access to industrial-grade additive manufacturing (3D printing) for everyone via 3D printing platforms
i.materialise is a 3D printing service for everybody with an eye for design and a head full of ideas.

We want you to focus on the creation of designs—made by you—that add value to people’s lives, while we do the manufacturing.

We want to be the power behind your design. With our unparalleled depth and breadth of knowledge with 3D printing and 3D printing software we want to offer you the highest-quality result.

3D print lab

The most complete 3D print lab in the world to bring your unique designs to life.

Creation corner

Design tools that allow you to explore your own 3D creativity.
Digitalization mandates faster decision making
An announcement for the Nokia Lumia 820

Nokia backs 3D printing for mobile phone cases

Nokia is releasing design files that will let owners use 3D printers to make their own cases for its Lumia phones.

Files containing mechanical drawings, case measurements and recommended materials have already been released by the phone maker.

Those using the files will be able to create a custom-designed case for the flagship Lumia 820 handset.

The project makes Nokia one of the first big electronics firms to seriously back 3D printing.

In a blogpost, John Kneeland, one of Nokia’s community managers, revealed the Finnish phone maker’s decision to release the 3D drawings.
6 days from file (product) to product ecosystem
But digitalization of manufacturing not just enables *access as a service*, but also its continuous development by users.
While being traditionally a field of large companies (EOS, 3D Systems …), AM hardware is one of the areas where user-generated hardware is becoming an alternative:

**Consumerization of Manufacturing Hardware**

*(similar to present status quo in IT!)*
Recent research by Joel West et al. (2014) identified more than 100 commercial iterations of the RepRap (open hardware) design.
This creates news challenges
Our world is structured in domination. The global governmental paradigm is emergency power and totalization. Defense Distributed (DD) is a non-profit software developer and publisher dedicated to striking the roots of all statist monopolism. DD broke unexpected ground in digital manufacturing with its gun files, and continues to develop other Internet and 3DP technologies while confronting cutting-edge issues in free speech, privacy, innovation, and intellectual property. Unlike a political lobby or an impotent think tank, DD champions the public interest through action and open-source innovation.

Employing political philosophy, activism, and technology, DD works to subvert the physical and digital architecture of oppression on behalf of the general public. DD fights for freedom primarily outside of court and government, writing and releasing software to aid in the disintermediation of state governments and large, collusive corporations. By mobilizing our
This demands new technology and IP policies on the government level …
... but especially **new business models** to capture value in a company

*(Think about it like this: “What is the ‘concert’ of a manufacturing company?”)*
“Digitization in manufacturing will have a disruptive effect every bit as big as in other industries that have gone digital, such as office equipment, telecoms, photography, music, publishing and films.”

—The Economist, 4/21/12
Plenty of things to discuss …
Our platform for continuous interaction: The RWTH Aachen Invention Center
http://www.invention-center.de

EXPERIENCE INNOVATION – CREATE MARKETS

Das INVENTION CENTER (INC)

INVENTION CENTER – WARUM?

Das Technologie- und Innovationsmanagement (TIM) in Unternehmen steht vor großen Herausforderungen. Neben der kontinuierlichen Entwicklung, Verbesserung und Einführung neuer Technologien und Produkte entscheidet heute auch die Differenzierung über neue Geschäftsmodelle über den Markterfolg. Mit dem Invention Center (INC) schaffen wir einen Ort, an dem sich Industriepartner gemeinsam mit uns den Herausforderungen des TIM stellen können.

DIE VISION

- Den Nutzen neuer Ideen maximieren.
- Die Dauer der Produktentwicklung bis zur Platzierung des Produkts am Markt auf 25% reduzieren.
- Die Entwicklungskosten auf 10% reduzieren.
- Entwicklung eines Pionier- und Vorreiterverständnisses in Bezug auf anspruchsvolle Fragestellungen im TIM.
- Partizipieren an DER Meinungsführerschaft im Technologie- und Innovationsmanagement.
- Technologie- und Innovationsmanagement in einer Erlebniswelt erfahrbar machen.
- Mitarbeiter zu Experten im Technologie- und Innovationsmanagement weiterbilden.
RWTH Zertifikatskurs für Führungskräfte: Business Model Innovation

5 Tage in zwei Teilen, plus unternehmensbezogene Projektarbeit

Dieser Kurs ist auch als individueller Inhouse-Kurs zu flexiblen Terminen möglich!

Zertifikatskurs „Business Modell Innovation“
Termine in 2016 unter bmi.rwth-aachen.de
Berufsbegleitender EMBA Studiengang an der RWTH Aachen und Univ. St. Gallen mit Fokus auf Innovation, Technologie und Leadership

Start des 13. Durchgangs im Sept. 2016 | Studienleitung: Prof. Dr. Frank T. Piller
emba.rwth-aachen.de
Open for interaction

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