European Lighting Vision

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Lighting industry quo vadis ?

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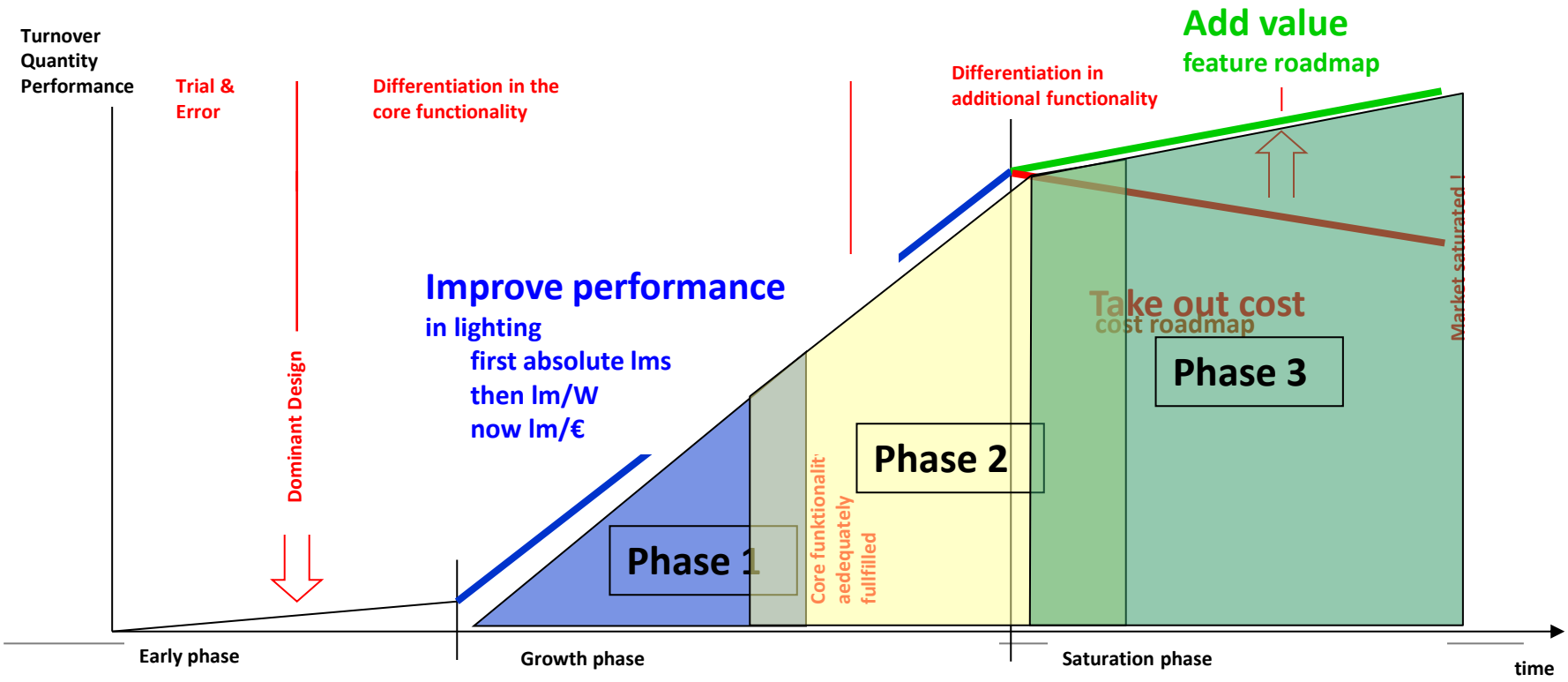
Starting point

Basic strategies: Improve performance, create differentiation, take out cost



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Starting point

3 overlapping phases of LED transition in lighting business

Phase 1

Technology is / will shortly be equivalent / competitive to existing technology

- Pioneers, small projects, learning phase
- „Bridge products“: Fluorescent luminaires with LED light sources
- Retrofit products (tubes, bulbs)

Phase 2

LED technology superior, cost decrease, interesting ROI

- Growing volumes @ decreasing costs
- Dedicated LED luminaires; still in old form factor & style
- Optimized LED luminaires & supply chain

Phase 3

New solutions, new features, marriage of Haitz & Moore

- New form factors, new lighting products
- Additional features; further integration; complete new systems
- New use-cases, new business models

Where are we ?

How do we get there ?

Phase	LED bulb	technologies	LED luminaires

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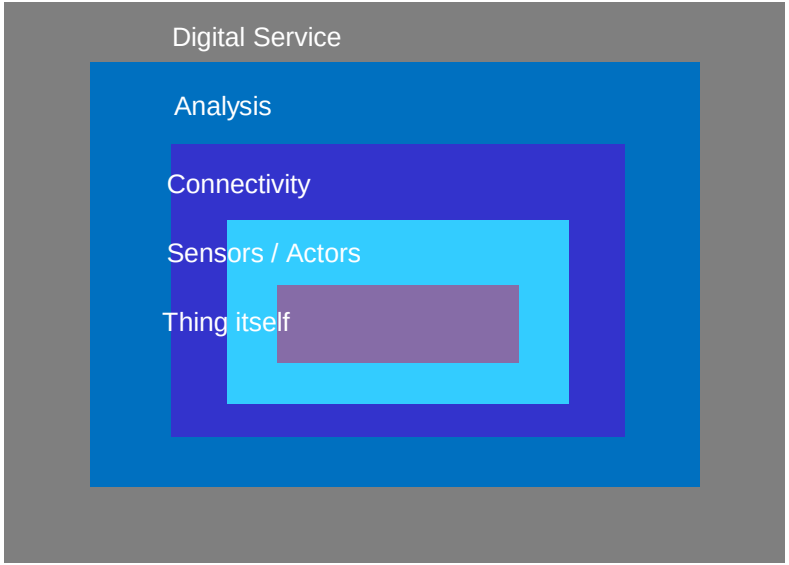
Value stack of IoT (Internet of Things)

From the connection of people to the connection of things

+ / PRO

The luminaire is the almost perfect thing:

- Luminaires generate the densest grid in indoor and outdoor
- Luminaires are electrically powered
- Luminaires are situated „above the action“ on poles or ceiling
- Even today a lot of luminaires already contain sensors



Source: Prof. Fleisch HSG

- / Con

Todays connectivity is old-fashioned and outdated – but serves the purpose:

- Most of todays luminaires have a wired connectivity (1-10V, DALI, DMX)
- Communication is mainly unidirectional (information to the luminaire; 1-10V) or very limited bidirectional (DALI; error statement)
- Communication speed and content is limited (small bandwith, low speed – but enough for slow daylight dimming)
- Ecosystem is missing

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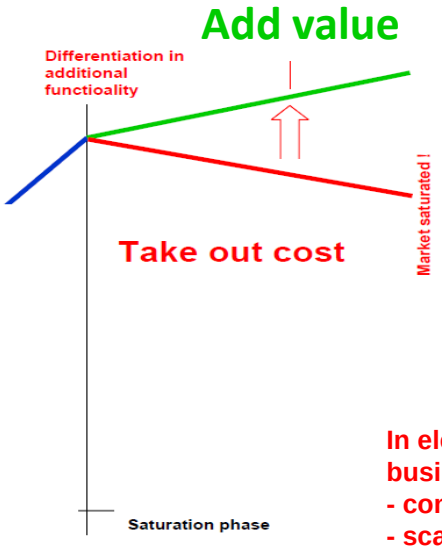
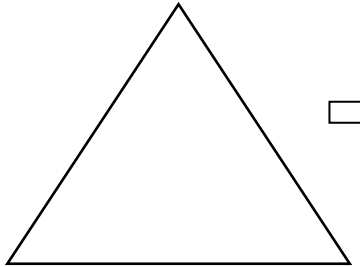
Change of market structure

Either value add or commodity – market pyramide becomes hourglass

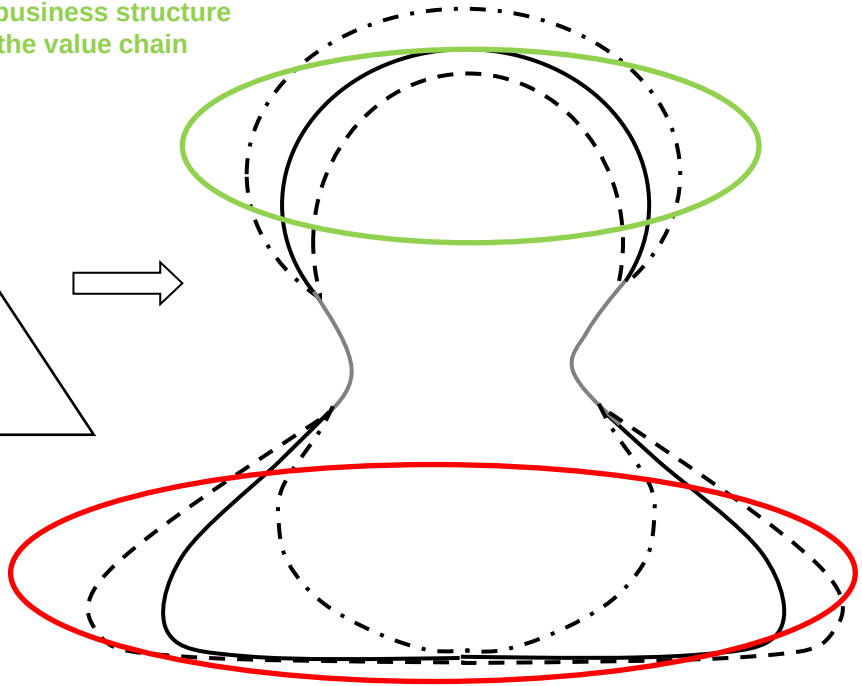
Growth ?

Depending on
- industry & business structure
- position in the value chain





Conventional



In electronics and semiconductor business always there due to:
- **commodity business**
- **scale effects**
- **permanent cost-out (Haitz/Moore)**

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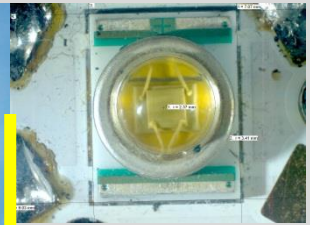
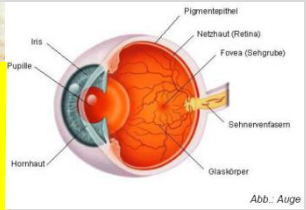
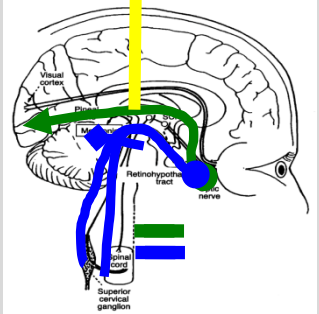
How light works !







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The mechanism of light and perception

Primary light sources:

Daylight

Artificial light sources

- Incandescent
- Fluorescent
- High pressure lamps
- LED‘s & OLED´s & Lasers & QD

Secundary light sources:

- Atmosphere, landscape
- Facade
- Reflectors, louvers of luminaires (= optics)
- Surfaces (Wall, ceiling, floor, furniture)

Perception of light and colour

Eye:

- Scotopic, photopic and mesoptic vision
- Accommodation
- Adaptation
- Presbyopia

Brain and hormons:

- Visual nerves
- Visual center
- Culture, Education
- Expectations, feelings

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The mechanism of light and perception

	Illumination	Brightness	Appearance
Basis of effect	**Viewing of structures**	**Sensing of brightness**	**Perception of light pattern**
We generate	**Illuminance**	**Brigth surfaces**	**Patterns of light**
With criterias like	**Illuminance level** **Glare ratings** **Contrast ratings** **Uniformity**	**Brightness** **Size** **Placement in the view**	**Aesthetics** **Fashion** **Functional message** **Design**
And achieve	**Vision** **Perception** **Recognition**	**Wellbeing** **Motivation** **Health**	**Positive look and feel** **Acceptance** **Life style**

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How are factors like these measured today ?

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The role of controls – conductor in the lighting orchestra

Systematic approach

MARKET PULL
Market need
Needs, customer requests

KNOWLEDGE & APPLICATION
Algorythms, Relations
Intelligence & Automatisation

TECHNOLOGY PUSH
Technology as enabler
Technical possibilities

Geography
Medicine
Application
Norms & Standards

ight
Daily routine / Time
Season / Calendar
Occupancy
€
Temperature
Heart Frequency
Incident / Event
Video
Weather
Traffic Frequency
Velocity
Information

Sensors

I / O
„System“

HMI
Human
Maschine
Interface

Information

Actors

Energy

Luminary

Blinds
Daylight redirect.
Curtains

T5 HF
L(t)
LD

LED
L(t)
LD (t)

L(t)
V(t)
Pixel

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Lighting Vision 2020 – close the loop !

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Artificial light sources

- LED‘s & OLED´s & Lasers & QD

Eye:

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Sensors, Software and Intelligence

Perception colour

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The End !