



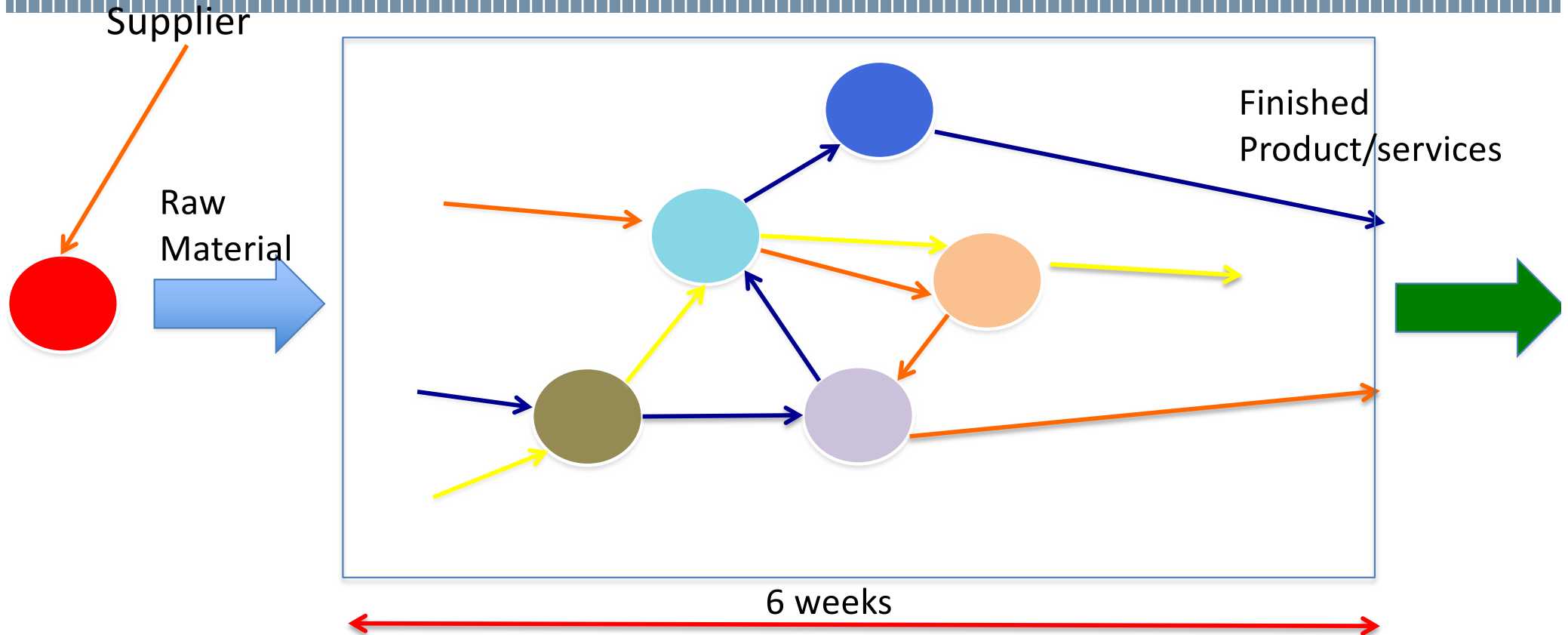
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OPEX & INDUSTRY 4.0 Part 2

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This material and what the Professors say in class are intended for didactical use only and cannot be used outside such context, nor to imply professors' specific beliefs or opinion

Case study: AdEC advanced electronics company



Competence centers are identified by different colors

Long response time; unreliable due dates; no idea of the advancement status of customer orders

Frequent delay in suppliers delivery of purchase orders

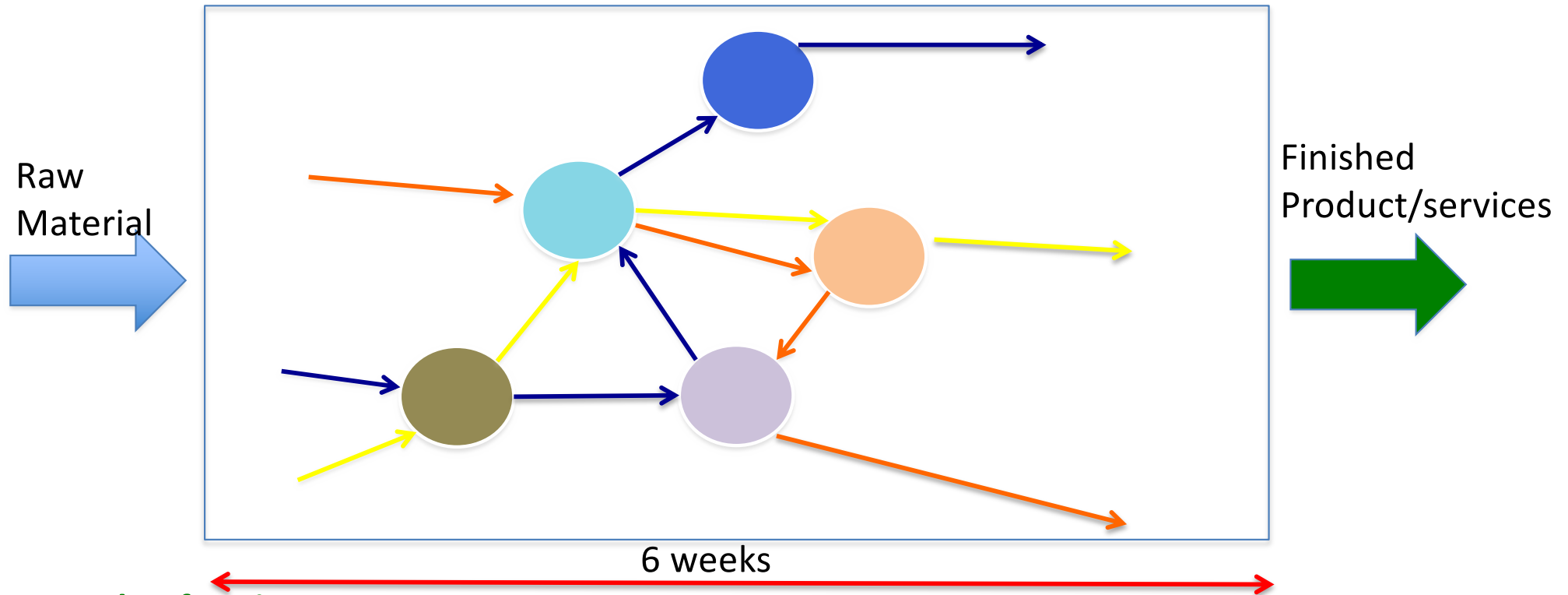
Which investment in INDUSTRY 4.0 technologies would you do to improve AdEC performances. With particular focus on:

- Delivery speed
- Delivery reliability
- Supply Chain efficiency (coordination with the supplier)

Why?

AdEC advanced electronics company

Where to invest?



Example of Actions

- Real time advancement control; real time priorities management;
- Real time scheduling; real time alternative routings;
- Real time update on expected completion date; quick response recovering plans; etc.
- Supplier visibility on forecasts, orders, and stocks
- Integrated scheduling system with the supplier



Many different ideas: everything and nothing

Difficulties in identifying areas not influenced by digitalization

Need for a **map** and a **compass**

Lean as a guide for Industry 4.0

Lean principles are vital to successfully implement Industry 4.0 related projects.

Identify Value

Map the Value Stream

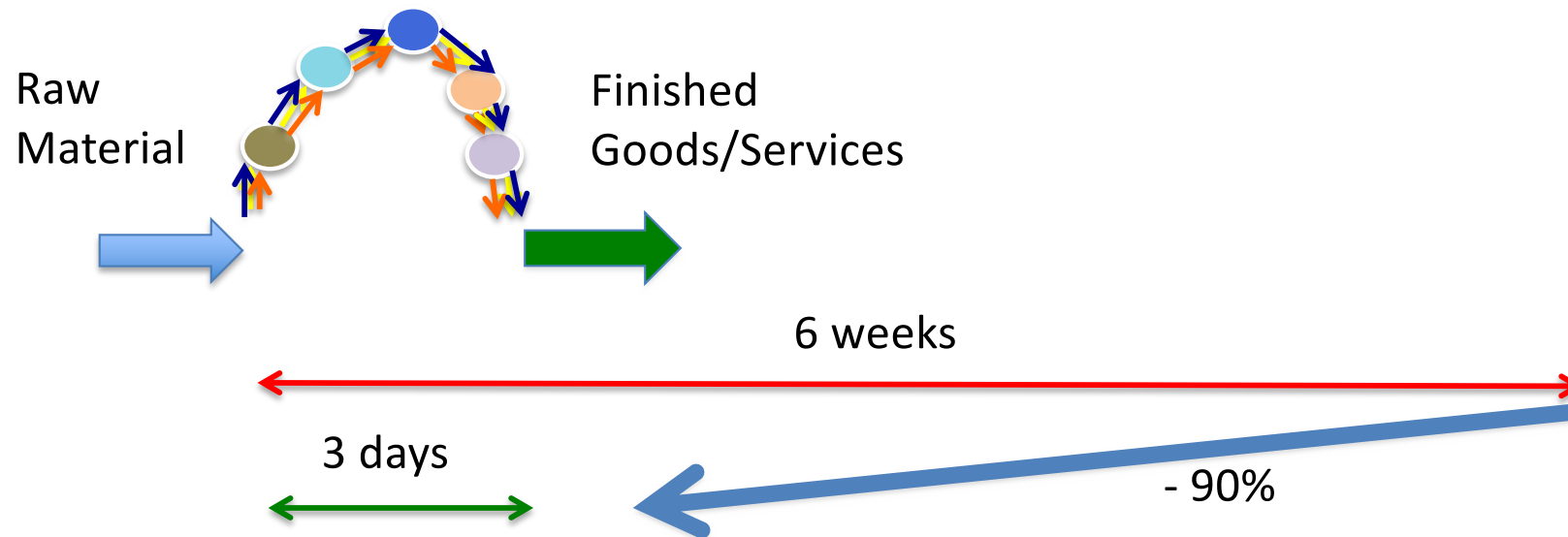
Create Flow

Establish Pull

Seek Perfection

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Lean as a guide for Industry 4.0 – Map & Compass



Actions

- Increase flexibility (Electronic setting and adjusting->Zero setup time);
- Multi skilled operators (organisational chng. Training. Performance measurement system, etc.)
- Man Machine interface (making easier for the same person to run differen type of resources)
- Different Management approach
- Technology supporting the people, rather than substituting or controlling

Two totally different investments

Lean as a guide for Industry 4.0 – Map & Compass: Organization, Processes, People

To rely only on technological change brings limited benefits:
**transformation must involve technological aspects, but also
Organization, Processes and People.**

Industry 4.0 is an **opportunity to change** OPP,
LEAN is the approach to **lead the change**

Overall view, but gradual changing :

- Fragmented implementations bring limited advantages;
- Learning is the key element: Industry 4.0, as LEAN, involve a huge number of people. The effect is unpredictable and difficulties are many and unknown.
- Pilot project and then a roll-out is the best way to success. Scheduling technological implementation, alongside with the development of competences and attitude.

Lean as a guide for Industry 4.0 – Map & Compass: Organization, Processes, People

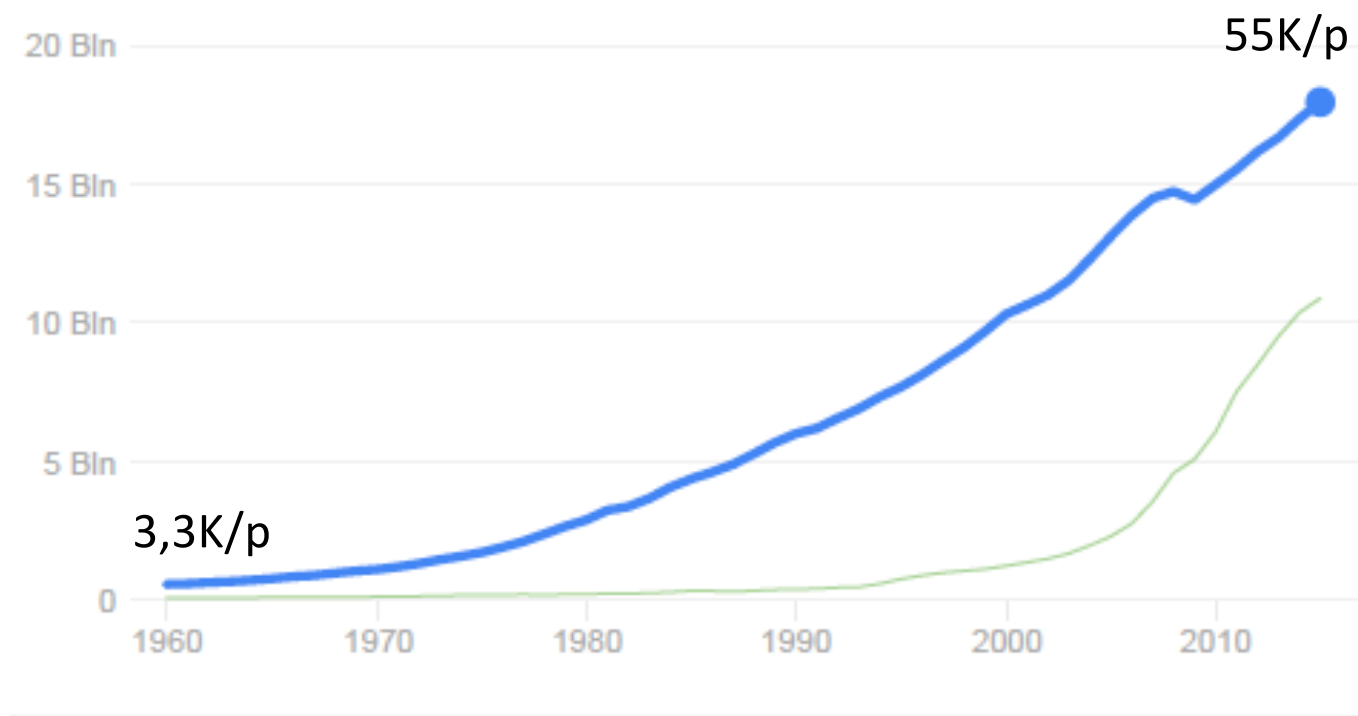


Lean/TPS invests in people
Thinking People System

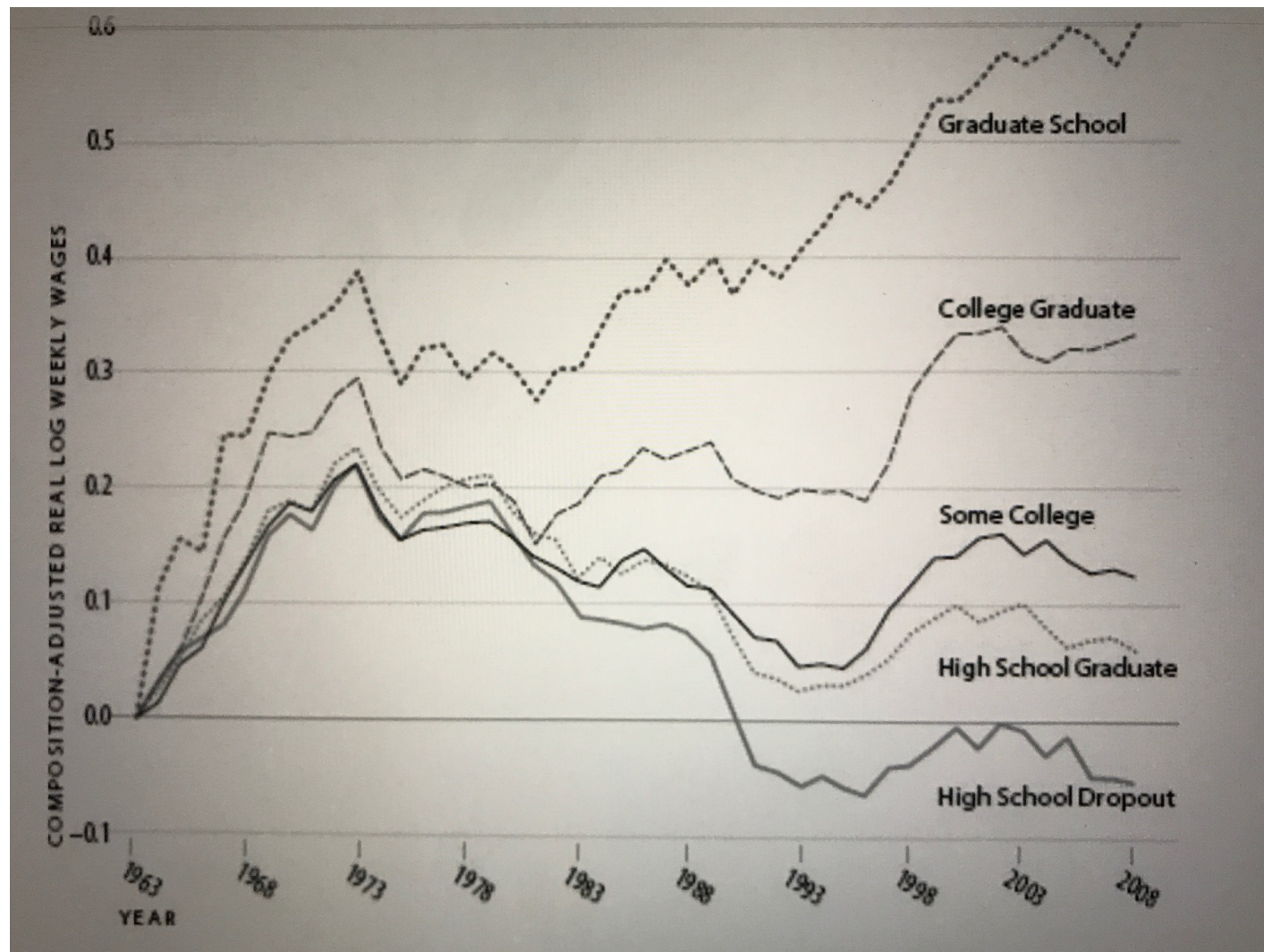
Most companies invest
very little in training hours
dedicated to their human
resources (and the main
reasons are not related to
financial issues)

Economic development

PIL USA Trend (Nominal)



Trend of Workers' purchasing power (in real terms)



Fonte: The second machine age

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Lean as support of Industry 4.0 – Map & Compass: Organization, Processes, People



Technology complements people, support them, help them.
It does not substitute them, nor guide them.

Technology is a tool. Value is in people.

**Someday machines will be able to solve all problems, but
they will not be able to pose one (Albert Einstein)**

Lean as support of Industry 4.0: Map & Compass

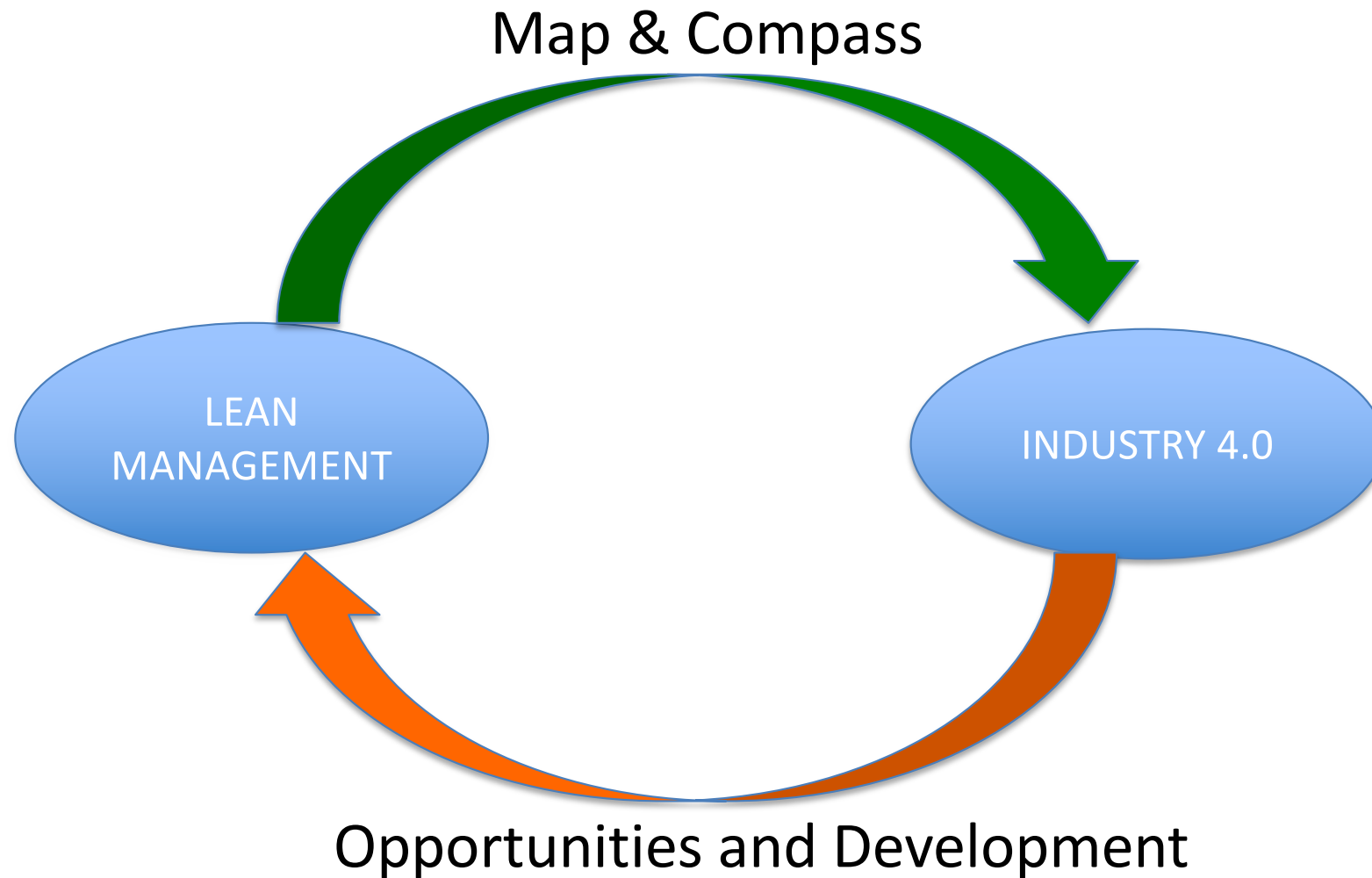
Second half of the board

When we are aware that it is required...it is too late

Lead changes, not be led by them (...or overwhelmed)

Jack Welch

Develop Yourself, Develop People it is a WIN-WIN



Technological facilitation

e-KANBAN

Dynamic variation of # of Kanbans based on demand variations

Digital adjustments of machines: quicker setup

E-spaghetti chart

E-Value Stream Mapping

Human-Machine Interface: easier work on technological different machines

Sensors, Big Data, Machine learning: Predictive Maintenance

Further links to digital tools

VSM 4.0: <https://www.youtube.com/watch?v=5N96x9VaWyo>
<https://www.youtube.com/watch?v=mGOCOgipFpw>

E-Kanban: <https://www.youtube.com/watch?v=ZmaxWGW64oU>
<https://www.youtube.com/watch?v=cXzWOSYkrzQ>

AGV: <https://www.youtube.com/watch?v=EUOz-csu6gE>
<https://www.youtube.com/watch?v=jwu9SX3YPSk>

Collaborative robots: <https://www.youtube.com/watch?v=ArBxq3mOt2s>
<https://www.youtube.com/watch?v=GN7RKRFtZiQ>

Development and evolution

The heart of LEAN is Problem Solving and Learning

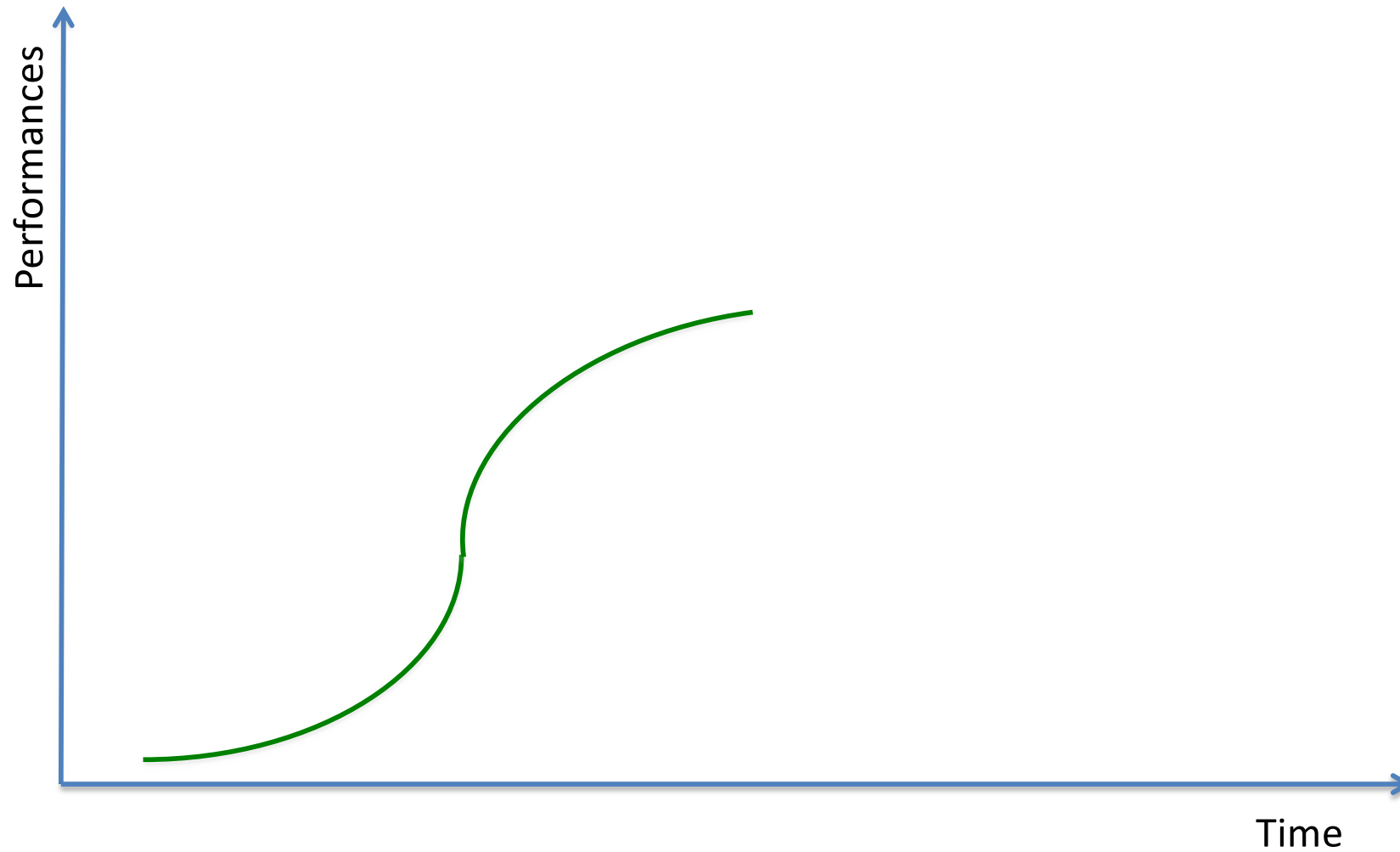
Greater opportunities for diagnosis

Quicker identification of problems

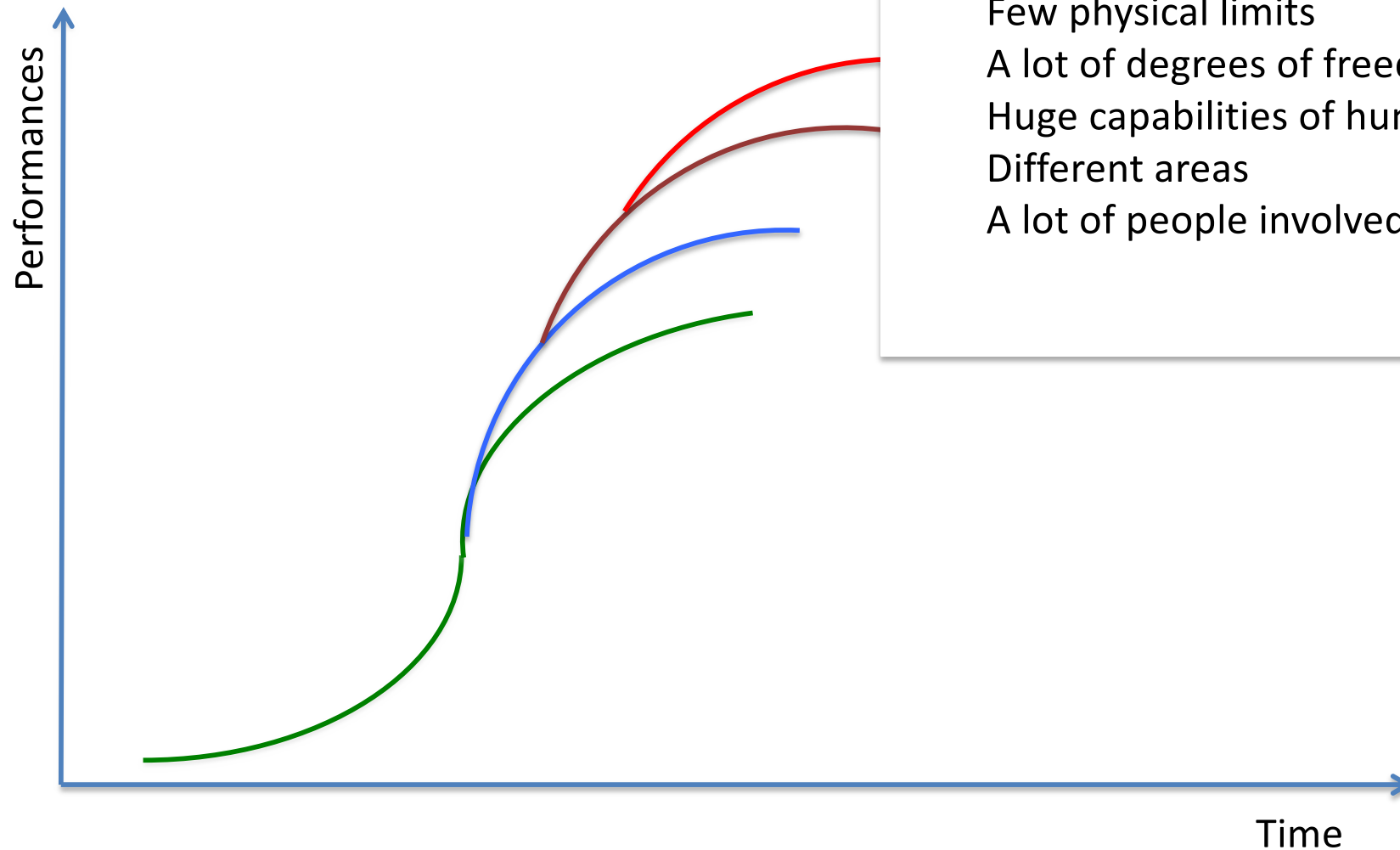
Quicker identification of root causes

Greater interventions' areas

Industry 4.0: Opportunity and development for LEAN



Industry 4.0: Opportunity and development for LEAN





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