

**10th Conference on Grey Literature and Repositories**

19 October 2017, Prague

# Rethinking the Role of Grey Literature in the Fourth Industrial Revolution

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# Presentation at a glance

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# Introduction

## How **robots** could change the jobs market forever

CNBC - Aug 7, 2017

Analysis from management consultancy McKinsey earlier this year showed that 25 percent of a CEO's current job can be handled by **robots** and ...

## The new industrial revolution: **robots** are an opportunity, not a threat

The Conversation UK - 17 hours ago

These are the kind of words that have been bandied about in news headlines about **robotics** and artificial intelligence in the last few years.

## The latest innovation to hit the Las Vegas Strip: **Robot** bartenders

Los Angeles Times - 22 hours ago

They will make your drinks, but they won't listen to your problems. **Robot** bartenders have made their way to the Las Vegas Strip — evidence ...

## An artificial intelligence researcher reveals his greatest fears about ...

Quartz - Aug 7, 2017

And yet it is hard for me to look up from the evolutionary computer models I use to develop **AI**, to think about how the innocent virtual creatures ...

## The workplace of the future - which **jobs** will **disappear** and which ...

ChronicleLive - Jul 19, 2017

The workplace of the future - which **jobs** will **disappear** and which will ... New **jobs** will also be created, and it is likely that higher-skilled and ...

## **AI: Human Augmenter Or Destroyer?**

Forbes - 21 hours ago

The year 2016 saw artificial intelligence (**AI**) reach new heights and 2017 has even more exciting news in store for us. While many have faith in ...

## What jobs will be left in a **robotic** nation?

CBS News - Aug 6, 2017

Today, he's hauling 20,000 pounds of freight down the Florida turnpike in a self-driving, **robotic** truck. It's been retrofitted with a self-driving kit ...

## Real estate tech company aims to replace agents with **robots**, data

Newsday - Aug 6, 2017

A real estate technology company that aims to lower the cost of home-selling by using **robots** and "big data" instead of commission-based real ...

## Industrial Revolution: Are machines taking over?

ETMM Online - Jul 25, 2017

The greatest insecurity related to the topic of Industry **4.0** – besides data security – is probably the **fear** of jobs becoming obsolete. According to ...

## CogX 17: How **AI** is changing the way we live

DIGIT.FYI (blog) - Jul 14, 2017

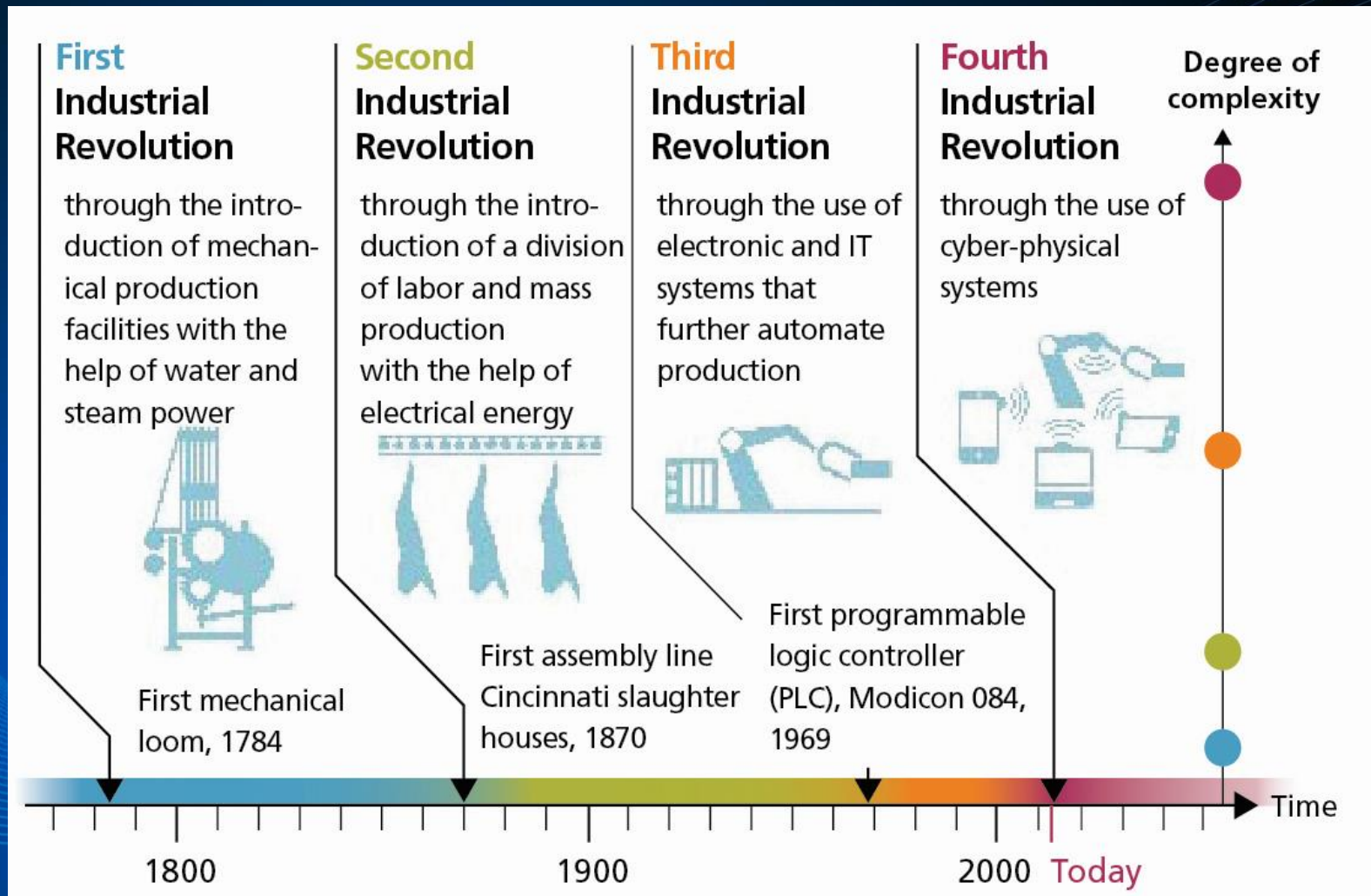
How is Industry **4.0** transforming manufacturing? ... because, he said, most jobs that would be **killed** off were miserable anyway. ... It's certainly an interesting analogy, comparing the current tech and AI revolution to the **Industrial Revolution**.

## Artificial Intelligence Will Widen The Gap Between Rich And Poor

Huffington Post Australia - Jul 19, 2017

These jobs are generally those held by the lower socio-economic sector of our community. Once these **jobs disappear**, what will become of that ...

# Historical context



Source: DFKI



# Historical context

## Industrial Revolution 1.0

Water and steam powered machines were deployed in factories to mechanize some of the work

## Industrial Revolution 2.0

Mass production using electric power; birth of assembly line and mass production

## Industrial Revolution 3.0

Advent of computer, Internet, robots and automation, where machines and humans were replaced with robots

## Industrial Revolution 4.0

Cyber physical systems monitor the physical process of the factory and make decentralized decisions

### Industry 4.0

Term originates from Germany's 2011 Hannover Fair. It was a project of the German government to promote the computerization and innovation of manufacturing, in particular the reorganization of the global value chains. Industry 4.0 is a modern and modular structured factory where physical processes are controlled by cyber physical systems which create a virtual world to make decentralized decisions.

### The Second Machine Age

Digital technologies (hardware, software, networks) are becoming more sophisticated and integrated and are transforming societies and the global economy. The world is at an inflection point where the effect of these digital technologies will manifest with 'full force' through automation and the making of 'unprecedented things'. (Erik Brynjolfsson & Andrew McAfee 2014).

### The Fourth Industrial Revolution

Characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human. (Klaus Schwab 2016).



### Smart factory

An environment where machinery and equipment are able to improve processes through automation and self-optimization. 'Smart' because of the combination of production, information, communication technologies, sensors, motors and robotics. Connects the 'shop floor' to the 'top floor'!

### Industry X.0

Cyber-physical production systems that combine communications, IT, data and physical elements. Machines "talk" to products and other machines, objects deliver decision-critical data, and information is processed and distributed in real time resulting in profound changes to the entire industrial ecosystem. (Accenture)

### Digital workplace

Enables new, more effective ways of working; raises employee engagement and agility; and exploits consumer-oriented styles and technologies. (Gartner)



**Machines are learning to think!**



### On the way we manufacture products

- Reduced manual labor
- Increased use of robots, sensors, AI and machine learning
- Automated supply chain management
- Reduced level of stock
- Stronger link between customer demands and production
- Individualized products

### On the way we manage processes and companies

- Horizontal and vertical integration
- Removal of silos, insistence on teams, building the 'system of systems'
- Real-time planning
- Introduction of Lean concepts (eliminating anything useless)
- Fast response to change and quick delivery using Agile
- From reactive to predictive mode of operation

### On the way we run our personal lives

- Internet of Things (households)
- Smart phones (constant communication, spying)
- Threats to our private lives (security cameras)
- Unpredictable growth of poor, as well as the rich parts of society
- Shopping (drones)
- Work (remote/mobile work)
- Education (MOOCs, jobs vs. skills)
- Open access movement (open science)

*"The challenges are as daunting as the opportunities are compelling. We must have a comprehensive and globally shared understanding of how technology is changing our lives and that of future generations, transforming the economic, social, ecological and cultural contexts in which we live."*

Klaus Schwab



## Definition

Grey literature stands for manifold **document types** produced on all levels of government, academics, business and industry in print and electronic formats that are protected by **intellectual property rights**, of **sufficient quality** to be collected and **preserved by** library holdings or institutional repositories, but not controlled by **commercial publishers** i.e., where publishing is not the **primary activity** of the producing body. (*"Prague Definition" 2010*)

The diverse and heterogeneous body of material that is made public outside, and not subject to, traditional academic peer-review processes. (*Adams at al. 2016*)

*Easier to describe than to define!*

ScienceDirect

"grey literature"

7,459 results

Refine by:

Years

- ☐ 2018 (2)
- ☐ 2017 (1,092)
- ☐ 2016 (1,177)
- ☐ 2015 (989)
- ☐ 2014 (729)
- ☐ 2013 (563)
- ☐ 2012 (431)
- ☐ 2011 (381)
- ☐ 2010 (390)
- ☐ 2009 (253)

### Definition challenges

Due to originators, volume, type and speed of GL creation, the focus of GL definition needs to shift to quality, intellectual property, curation and sustainability. It risks becoming obsolete due to its inability to differentiate GL from other documents.



### New definition

*GL is any recorded, referable and sustainable data or information resource of current or future value, made publically available without a traditional peer-review process.*





## Multiple shades of grey

Bibliographies	Rejected manuscripts	Publications from NGOs and consulting firms
Discussion papers	Un-submitted manuscripts	Videos
Newsletters	Conference abstracts	Wiki articles
PowerPoint presentations	Book chapters	Emails
Program evaluation reports	Personal correspondence	Blogs and social media
Technical notes	Newsletters	<b>Data sets</b>
Publications from governmental agencies	Informal communications	Committee reports
Reports to funding agencies	Census data	Working papers
Unpublished reports	Pre-prints	Company reports
Dissertations	Standards	Catalogues
Policy documents	Patents	Speeches
	Webinars	Reports on websites

## Data sets

Internet of Everything (IoE)  
Internet of Things (IoT)  
Industrial Internet of Things (IIoT)  
Machine to Machine communication (M2M)  
Self-driven cars  
Robots, Sensors, Security systems

Estimates for the number of connected devices vary in billions. Gartner says some 20 billion by 2020. Allied Business Intelligence says more than 30 billion, Nelson Research says 100 billion, Intel says 200 billion, and International Data Co. says 212 billion.

**40 ZETTABYTES**  
(43 Trillion Gigabytes)  
of data will be created by  
2020, a 300X Increase  
from 2005

It's estimated  
that **2.5**  
**QUINTILLION**  
**BYTES**  
(2.3 Trillion Gigabytes)  
of data are created each day

## Volume

data in rest

Most companies in  
the U.S. have at least  
**100 TERABYTES**  
(100,000 Gigabytes)  
of stored data

**6 BILLION**  
**PEOPLE**  
have cell  
phones

**420 MILLION**  
**WEARABLE,**  
**WIRELESS**  
**HEALTH MONITORS**  
are expected  
to be in use  
in 2014

**30 BILLION**  
**PIECES OF**  
**CONTENT**  
are shared on  
Facebook every month

## Variety

data in many  
forms

**150 EXABYTES**  
(161 Billion Gigabytes)  
The estimated size of  
healthcare data globally  
in 2011

**4 BILLION+**  
**HOURS OF**  
**VIDEO**  
are watched on  
YouTube each  
month

The New York Stock  
Exchange captures  
**1 TB OF TRADE**  
**INFORMATION**  
each trading session

It is projected  
there will be  
**18.9 BILLION**  
**NETWORK**  
**CONNECTIONS**  
by 2016

## Velocity

data in motion

Close to  
**100 SENSORS**  
monitor items  
such as fuel level  
and tire pressure  
in modern cars

**1 IN 3 BUSINESS LEADERS**  
don't trust the information they  
use to make decisions

Poor data  
quality  
costs  
the US  
economy  
around  
**\$3.1 TRILLION**  
**A YEAR**

## Veracity

data in doubt

**27% OF**  
**RESPONDENTS**  
in one survey  
were unsure  
how much of  
their data was  
inaccurate

Source: Wayne Balta, IBM



*"The ability to be maintained at a certain rate or level."*

*"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Brundland Report for the World Commission on Environment and Development (1992)*

## Environmental/technical

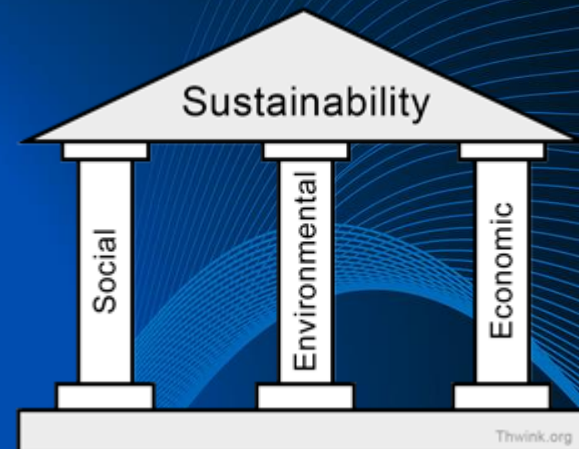
- Long-term preservation
- Organization & management
- Operability

## Economic/Financial

- Level and duration of support
- Return on Investment
- Future value

## Social/Organizational

- Audience
- Information ownership & governance
- Freedom of access to information



## Tools for analysis

- Old vs. new tools and technology
- Different software functionality, concepts, expectations
- Dynamic vs. static information and documents

## Visualization

- 2-D & 3-D
- Virtual and augmented reality
- Requirement levels and technical skills

## Intellectual property

- Over protectionism
- Open access and open science
- Doubts about IP helping development, health, innovation

## Privacy

- Protection of sensitive personal information
- CCTV cameras in public
- Social media photos



# Conclusions

## Future

- GL will not disappear
- Volume of GL will experience exponential growth
- Number of GL formats will increase

## New definition

- Take into consideration volume and speed of GL creation
- Refocus on quality, intellectual property, curation and sustainability
- Differentiate GL from other documents

## Increase knowledge, visibility and relevance of GL

- Work on theoretical research and practical applications
- Develop training courses and tutorials
- Establish cooperation with data and information specialists, librarians and archivists
- Invest in promotion
- Demonstrate value of properly managed GL collections

***Invention is the most important product  
of man's creative brain***

*Nikola Tesla*

***Thank you!***