Social Innovation in Industry 4.0
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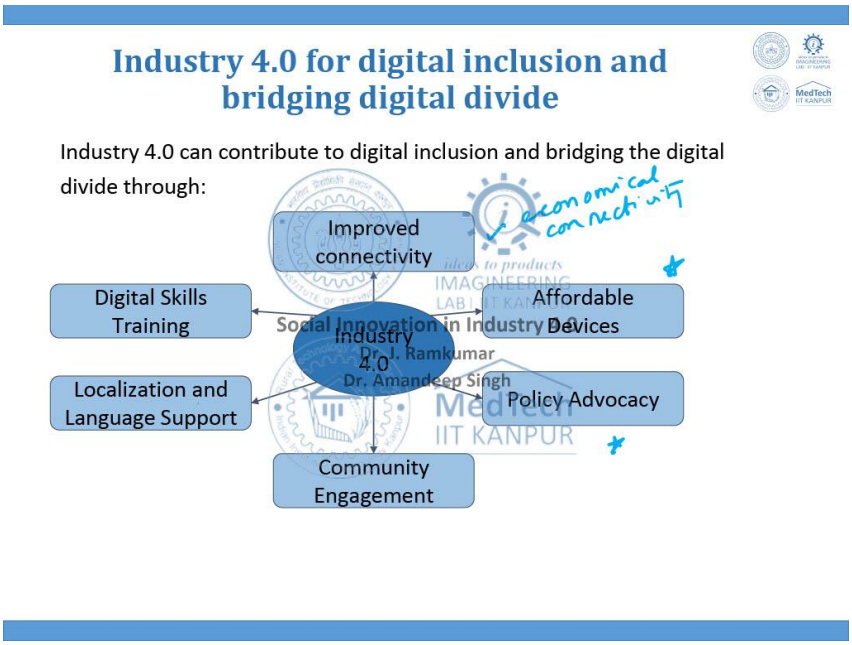
Lecture 05
Social Innovation and Industry 4.0: The Relation (Part-2)

Welcome, to the next lecture on Social Innovation and Industry 4.0: The Relation. So, this is what we will be covering in this lecture.



So, when we look at Industry 4.0 for digital inclusion and bridging digital divide, the Industry 4.0 can contribute to digital inclusion and bridging digital divide through Improved Connectivity, Affordable Devices very very important. Connectivity is also affordable, Economic Connectivity, using the data to connect in an economical manner.

Then, Affordable Devices, whatever sensors you are developing, whatever technology are developing, it has to be in an affordable range and reach for people. Policy Advocacy is also nowadays happening through Industry 4.0. Community Engagement is also part of 4.0, where in which we are trying to bridge. Localization and Language support is part of Industry 4.0, which helps in Social Innovation. Digital Skill Training is also part of it.

So, Industry 4.0 can contribute to digital inclusion and bridging the digital divide. through

Improved Connectivity, Affordable Device, Policy Advocacy, Community Engagement, Localization and Digital skills.

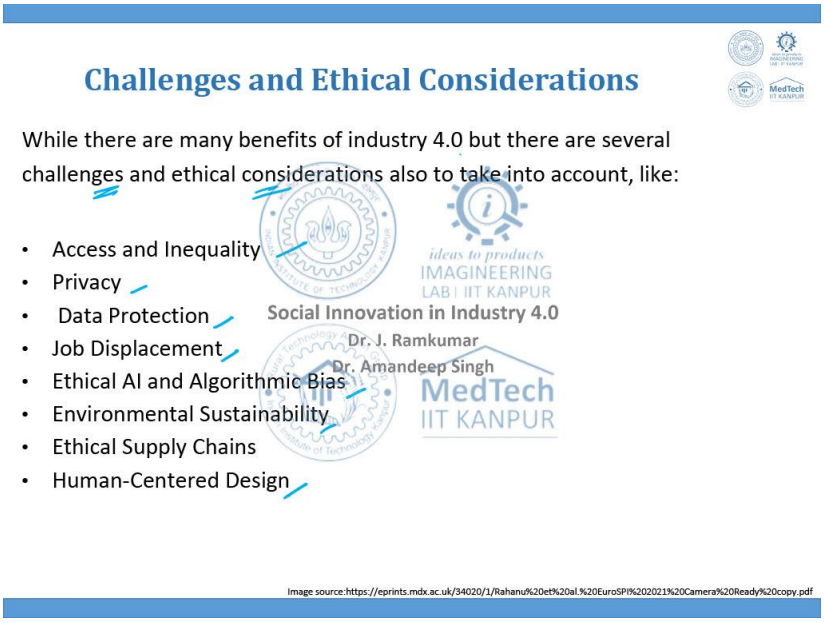
Though you might feel that Industry 4.0 does not play an important role, but today there is huge research, which is going on across the globe on Industry 4.0 and Circular Economy. In that Industry 4.0 plays a very very important role. So, Industry 4.0 for Circular Economy and Sustainable Production. The world is today talking about circular economy, where in which Social Innovation is one of the biggest drives which is hidden there or which is there.

So, Industry 4.0 technologies can significantly contribute to:

- Advancing in circular economy principles. The topic is very interesting, it is research, a 42 lecture of its own. So, I would request you to see some of the advancements which is happening in circular economic principles. I will give you as the assignment for this lecture.
- So, sustainable production practices are very important. In fact, going 24x7 shop, whatever is there available across the globe, is not economically viable for a common man. A 24x7 shop which runs though they make a business out of it, but it is not a Social Innovation. People do not try to plan prior, try to stock prior, they try to go as and when it is required. It is not a sustainable practice. Online delivery of food at one point of time was very lucrative. Today it has become very expensive or it is moving towards a higher cost. So, sustainable production practices can be thought of by using Industry 4.0 technologies.

Some of the key aspects of relationship are:

- Resource Efficiency
- Digitization and Traceability is part of circular economy. Digitization and Traceability, this is very important. You are trying to produce a part, can you try to trace the part till it is coffin, from the cradle birth to coffin? Can you try to trace what all is happening to a product and how all transformation happens? What is all people's behavior in accepting it, that is traceability. Digitalization and traceability is a key aspect of their relationship.
- Product Lifecycle Management is exhaustively controlled by using Industry 4.0 in terms of simulation and understanding.
- Collaboration and sharing, this is nothing but supply chain management, resource optimization for Social Innovation. So, if you see, the basics of Social Innovation talks about how effectively you will use the resources. Logistics management is also part of Social Innovation.
- The last one is Sustainable Innovations are some of the key aspects of their relationship between Industry 4.0 for Circular Economy and Sustainable Production.

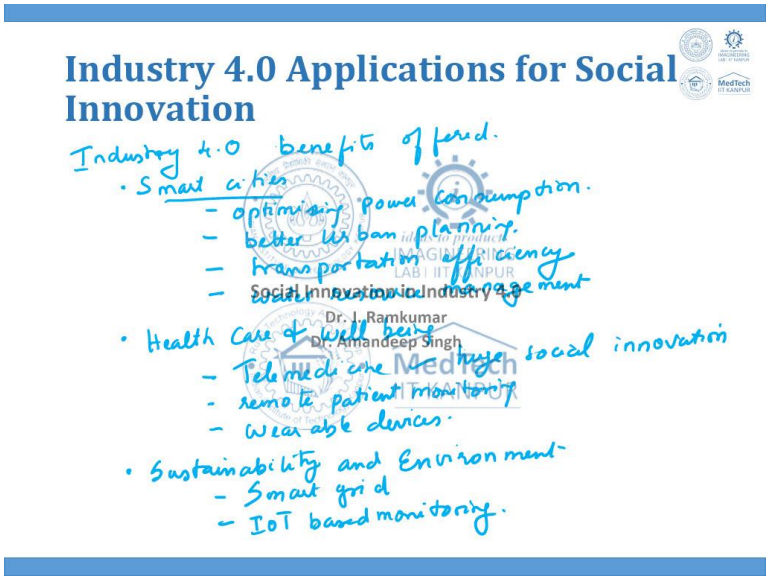


What are all the Challenges and Ethical Considerations which we have? While there are many benefits of Industry 4.0, but there are several Challenges and Ethical Considerations to be carried out.

- Access and Inequality is a challenge
- Privacy is a challenge, cyber security that is what we are talking about
- Data Protection is a challenge

- Job Displacement is a challenge, people move out of one place to the other for job, but it is not socially acceptable and it place a huge impact on the society. For example, all people move out, the younger youth move out from the rural to urban cities for their job. Now, the society which is there in rural is aged, they are looking for health care products, they are looking for societal solutions to their problems. So, job displacement is a very big challenge which is there.
- Ethical AI and Algorithmic Bias
- Environmental Sustainability
- Ethical Supply Chain
- Human-Centered Design

All these things are very major challenges which are in front of us, which has to be considered while integrating Industry 4.0 for Social Innovation.



In Industry 4.0 Applications for Social Innovation, let me give you some more information. So, in Industry 4.0 benefits offered.

- When we talk about Smart Cities, it is:
  - Optimizing power consumption
  - Better urban planning, everywhere Social Innovation comes. So, for example, pooling of people together. If I can run at ola, Uber does it, but can I pool people together? Can I use a public transport more? So, all these things are Social Innovation which can be thought of better urban planning.
  - Transportation efficiency.

- Water resource management.

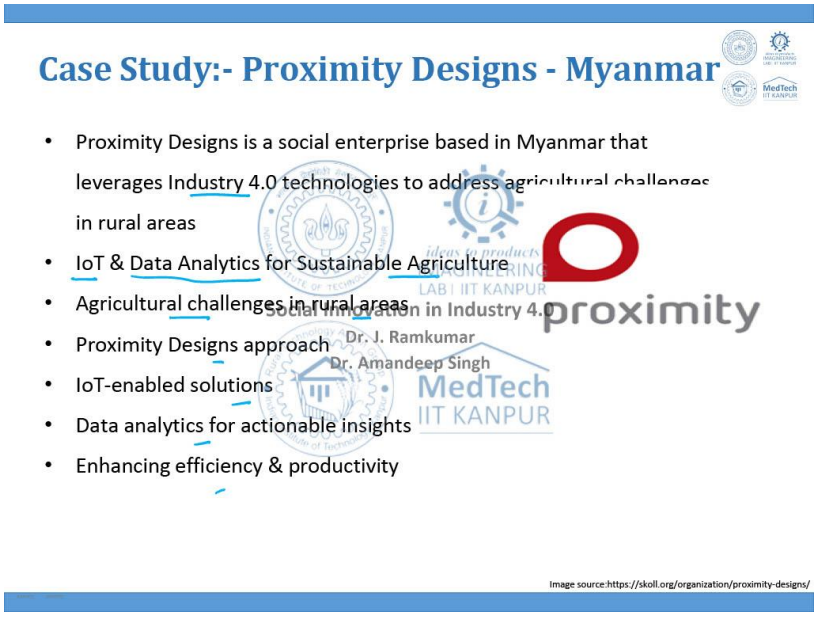
- The next one important point is Health care and well-being
  - Telemedicine which is a huge Social Innovation concept is there. There is lot of need also, more developments to happen.
  - Remote patient monitoring. Today we are not talking about hospital ICUs, we are talking about hospital at home. All the instruments will be moved to your home and the doctor will be sitting in a hospital, he will be monitoring all the devices and you will try to see the status of the patient.
  - Wearable devices, these are all part of Social Innovation, but where in which Industry 4.0 also plays a very important role, you can do many things to the society.
- The next one is Sustainability and Environment.
  - Smart grid where in which you try to use, and then you try to supply, and then you try to take also. So, the power is given to the house, what the house is generating power that is given back to the system and it has been smartly controlled
  - IoT based monitoring.

- The next one in this is, Agricultural and Food Systems.
  - Precision farming techniques are very much part of using Industry 4.0 for Social Innovation.
  - IoT based sensors for quality of water monitoring, quality of soil elements monitoring, the wetness of the soil, the gas evolving in the soil all these things.
  - Data Analytics

So, lot of things happen in the Social Innovation in this domain.

- The next part is going to be Education and Skill Development. Government of India has been investing a huge money in this project.
  - Virtual simulations, virtual classrooms. All these things are happening because of Industry 4.0.
  - Online platforms, people have been taught a single source is used to teach multiple counters or vending points, so that the information gets transformed in a unified manner.
- Then, the last one is going to be Social Entrepreneurship and Micro-enterprise.
  - Digital platform for agricultural benefits
  - E-commerce

So, all these things are happening because of IoT present or Industry 4.0 present, and all these things will add synergy for Social Innovation.

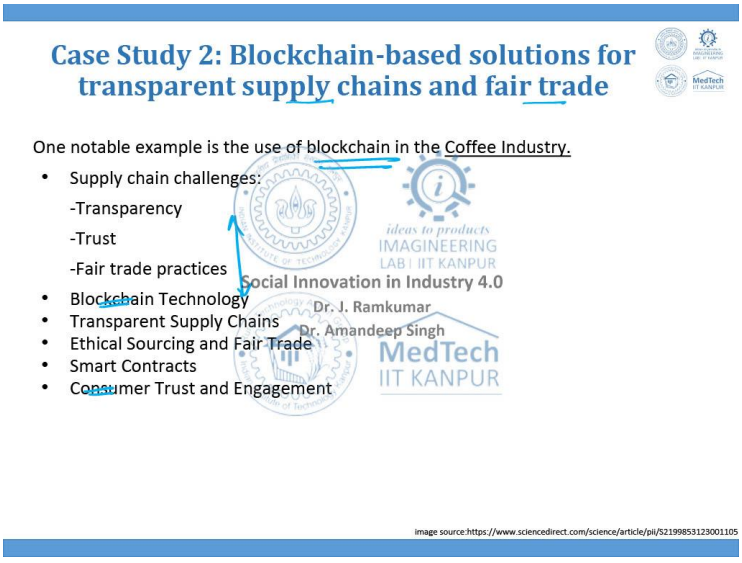


Let us take a few Case Studies in identifying and discussing little bit about Social Innovation which has happened. So, the first case study is going to be Proximity Designs which has happened in Myanmar.

- Proximity Designs is a social enterprise based in Myanmar that leverages Industry 4.0 technologies to address agricultural challenge in rural areas.
- It uses IoT and Data Analytics for Sustainable Agriculture. Sustainable agriculture means with minimum water, maximum productivity. The soil, we do not try to add

chemical to the soil, but use natural or biological waste in reviving, what is lost in producing.

- Next one is, Agricultural challenges in rural areas. The biggest challenge is production and transporting to the market. So, agricultural challenges are producing it, packing it and moving it. So, agricultural challenges in rural areas by using Industry 4.0, they were able to figure out where are the markets, where they will get a better price and how do they safely commute to it.
- Then, Proximity Designs approach.
- IoT-enabled solution.
- Data Analytics for actionable insights.
- Enhancing efficiency and productivity by using Industry 4.0 for Social Innovation or for Social Enterprise.



Let us take the other example of integrating Blockchain-based Solutions for Transparent Supply Chains and Fair Trade. Again, IoT used in Social Innovation or Social Enterprise.

One notable example is the use of Blockchain in the Coffee Industry.

- The Supply Chain challenges are going to be:
  - Transparency
  - Trust
  - Fair Trading Practice

So, this is, what is very important which is missing in certain place. So, some start-up companies or some social entrepreneurs came up and intervened, took the technology implemented it for the welfare of the society.

- So, the Blockchain technology was used.
- By using so, Transparency in Supply Chain improved.
- Ethical Sourcing and Fair Trading could come into existence.
- Smart Contracts were signed.
- The Customer Trust and Engagement have been improved.

So, you can see how a Blockchain can help in making a Fair Trade and Ethical Sourcing can be taken care.

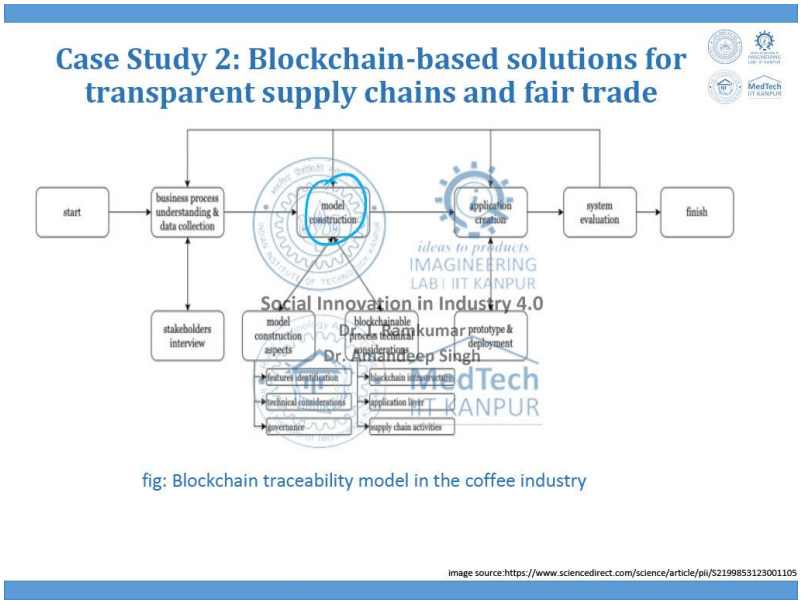


fig: Blockchain traceability model in the coffee industry

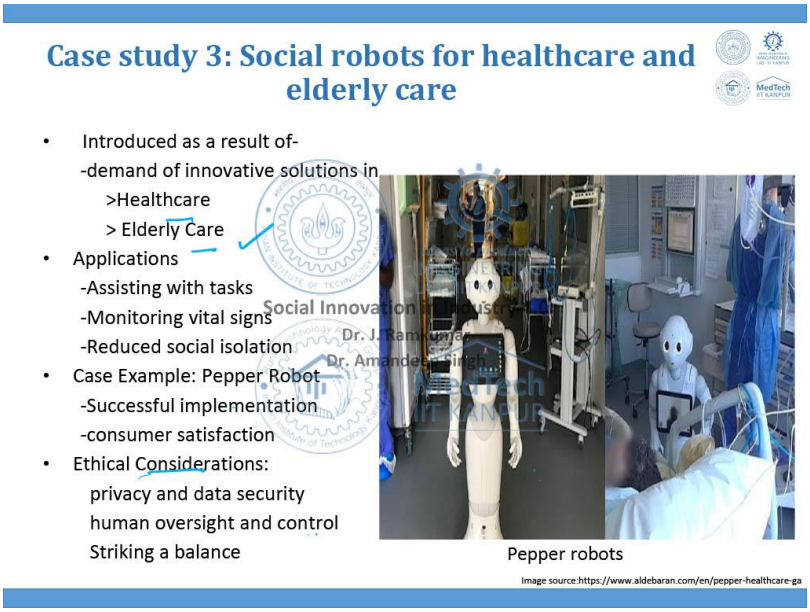
image source:https://www.sciencedirect.com/science/article/pii/S2199853123001105

So, this is, how the chain is. You will have start, business process, understanding and data collection. Stakeholder interview or data whatever it is data collection, data analytics that can happen here.

Then, model construction will be the next one. The model construction which has two steps. One is model construction aspect, then the other one is blockchain process technical consideration. So, you have these two which gets added to block model construction, then you will have application creation where in which we work on prototype and deployment, then the system evaluation and the last one is finish.

So, here in model construction aspect, you will have feature identification, then you will have technical consideration, then you have governance all these things. The data getting converted into a machine-readable form or into a mathematical form, so that the models can create and it can work.

When we talk about blockchain process technical consideration, one is blockchain infrastructure, then application layer, supply chain activity, this tries to get integrated. So, you try to create a model such that you have a fair trading.



The third case study is Social Robots for Healthcare and Elderly Care.

- It was introduced as a result of demand of innovative solutions in
  - Healthcare
  - Elderly Care. Elderly Care is a new area where in which we are looking for novel products and novel solutions.
- So, Application is,
  - Assist with task
  - Monitoring vital signs
  - Reduced social isolation

So, what is happening, age people said these robots are used for talking and other things. So, this will try to reduce the drudgery or the mental health, it will improve the mental health of the patient and thereby improving the society over there.

- So, the Case Example is Pepper Robots.
  - Successfully implemented
  - Customer satisfaction.
- Ethical Consideration of
  - Privacy and Data security
  - Human oversight, control

- Striking a balance

So, this is Pepper Robot, this is used for integrating Social Innovation through robotics.

The case study 4 is, Digital Platforms for Social Enterprise and Impact Investing.

- So, Digital Platform,
  - a catalyst
  - facilitate connection and collaboration.
- The Roles, there are two ones, one is called Kiva, the other one is Kickstarters. So, the roles are:
  - provided access to global network
  - efficient matching of capital
  - offer tools and resources
- Benefits social enterprise by investment:
  - Access to opportunities
  - enhance business growth
  - facilitate networking.

So, these are some of the things, Kickstarter and Kiva are two startups, which are working exact simply on Digital Platform and Social Entrepreneurship.

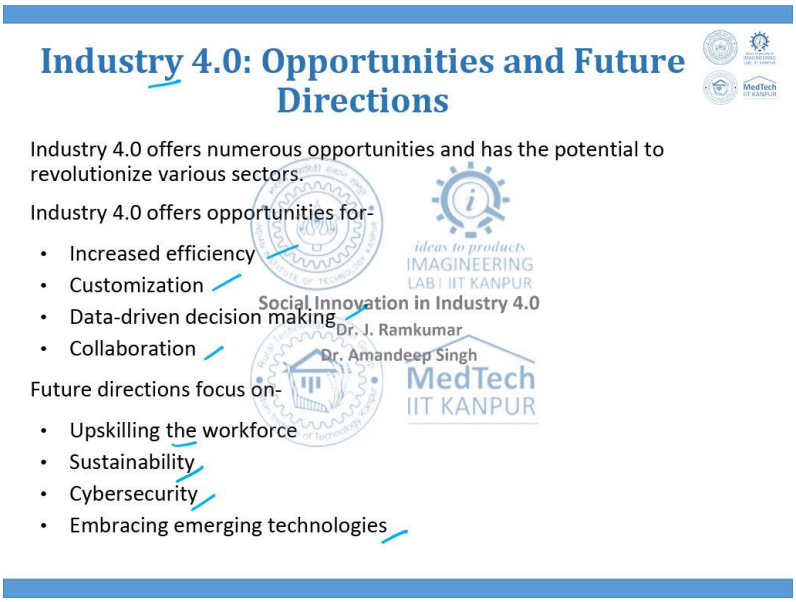
The Opportunities of 4.0 and the Future Directions, Industry 4.0 offers numerous opportunities.

- So, it tries to Improve Efficiency
- Mass Customization
- Data-driven Decision rather than single man, emotional based, gut based are removed and Data-driven decisions have been made.
- And, it looks for always Collaboration.

These are the Opportunities of integrating 4.0 with Social Innovation.

The Future Directions will be:

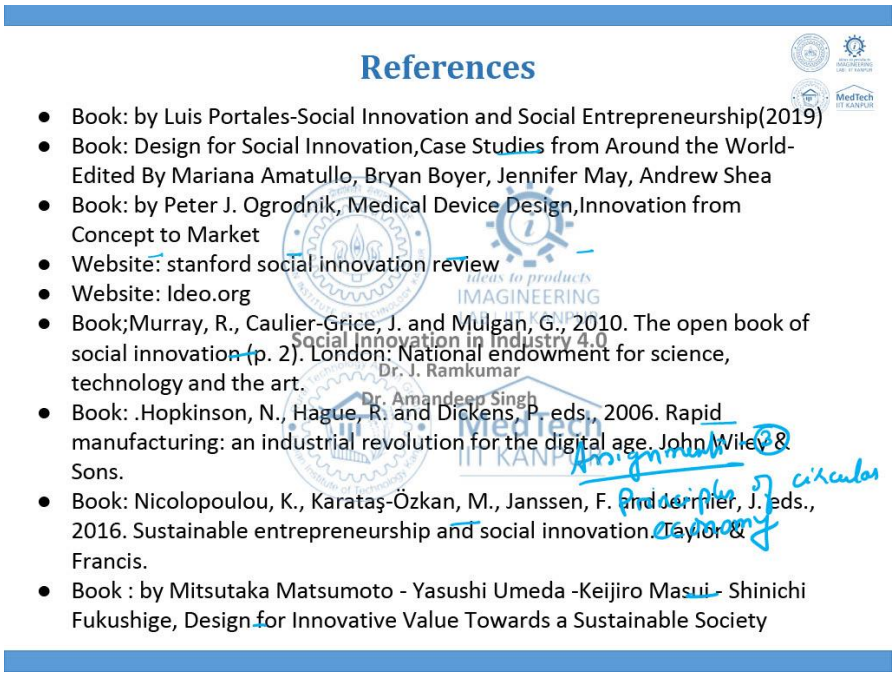
- Upskilling the force for using 4.0 in Social Innovation
- Sustainability
- Cybersecurity
- Embracing the Emerging Technologies



So, Industry 4.0 gives additional opportunities like

- Collaborating innovative ecosystem and platforms between companies, researchers and startup.
- Upskilling and re-skilling of digital workforce

- Policy and regulatory framework support for Social Innovation and Industry, such that better transparency can be done.
- So, promoting responsible innovation and human-centric design principles are very very important. Human-centric design principles we will try to cover later in our course.



In this lecture we have used several Reference materials.

- 'Industry 4.0' by Klaus
- Article 'Social Innovation and the Fourth Industrial Revolution Insight Opportunities and Challenges' by Rene.
- 'Social Innovation and Technological Innovation: A Literature Review' by Julia.
- Then, 'Industry 4.0 and the Transformation of Work' by Tobias.
- 'Industries of the Future' by Alec.
- 'Social Innovation: A Comparative Perspectives' edited by Helmut and Gorgi.

So, these are the references which we have used and all these references are worthwhile going through it once by yourself.

So, before we conclude, we will try to give you a simple problem or the assignment. The assignment, which is given here, will be more focused towards 'Principles of Circular Economy'. You should understand, you should read some of the principles, write down

these principles, and see, how relevant these principles are there with respect to Social Innovation.

This will be your third assignment which I am giving. I am sure when you will start doing every assignment, you will get more and more insight, it is like a case study, you will get more insight and you will start appreciating this course.

And friends, some of the questions in the examination might go around the assignments. So, please be careful, please be sincere. Thank you very much.