

MATERI SEMINAR NASIONAL TEKNOLOGI INFORMASI DAN KOMUNIKASI

(SENATIK 2020)

Oleh Pemateri 2

Anny Kartika Sari

Departement of Computer Science and Electronics
Universitas Gadjah Mada



NEW NORMAL ERA: OPPORTUNITIES FOR RESEARCH AND INNOVATIONS WITHIN INDUSTRY 4.0 PERSPECTIVES



ANNY KARTIKA SARI
DEPARTMENT OF COMPUTER SCIENCE AND ELECTRONICS
UNIVERSITAS GADJAH MADA

INDUSTRY 4.0

- **Industry 1.0** occurred around 1784 when the steam engine was invented (**industrial revolution**).
- Mechanization where the production evolved from physical strength to machine power.
- **Industry 2.0** came around 1879 when electrical technology was developed and used in production (**technological revolution**).
- The machines were further advanced and the production capacity was increased greatly.
- **Industry 3.0** was marked by the use of electronics and IT to further automation in production (**digital revolution**).
- Computer dominated our lives and further use of electronics and IT assisted the production automation and reduced human-power in life.
- **Industry 4.0** occurs where the machines manage themselves into production process (**automation revolution**).
- The machines are integrated into the computer, communicating with each other with intelligent connectivity that enables intelligent decision.
- **Industry 5.0??**

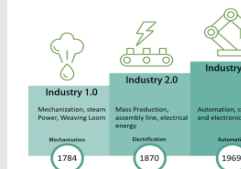


Image source: <https://mira.medium.com/1TFAYveEa2w9UqwJA.png>

SENATIK 2020

INDUSTRY 4.0: THE DIGITAL TECHNOLOGY TRANSFORMATION

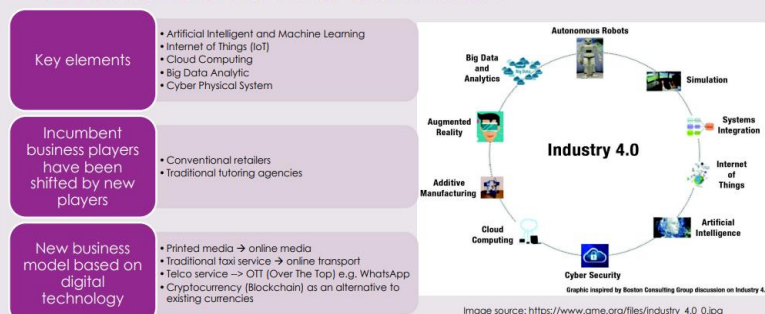


Image source: https://www.ame.org/files/industry_4.0_0.jpg

SENATIK 2020

Activate W

DISRUPTIVE INNOVATION

- Disruptive innovation describes a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors (<https://claytonchristensen.com/key-concepts/>).
- True disruptive innovators:
 - Low-cost and highly accessible.
 - Lower gross margins than the incumbent.
 - Serving a smaller low-end target market at first, before expanding to a vast market due to their accessibility.
 - Hard to see coming and are not taken seriously.

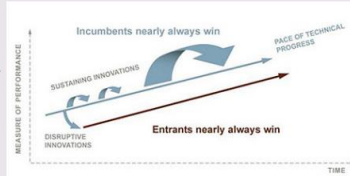


Image source <https://claytonchristensen.com/wp-content/uploads/2012/07/graph1.jpg>

SENATIK 2020

Activate W

DISRUPTIVE INNOVATION: EXAMPLES

True disruptive innovations	Non-disruptive innovations
<ul style="list-style-type: none"> • Transistor radios • Personal computers • Cellular phones • Video streaming • Online shopping 	<ul style="list-style-type: none"> • Ride sharing • Electric vehicles



Future possible disruptors

- Voice technology
- 3D printing
- Autonomous mobility
- Real deep fake
- Augmented reality
- Internet of Robotic Things
- Biotech

- Artificial Intelligent
- Internet of Things (IoT)
- Cloud Computing
- Big Data Analytic
- Cyber Physical System

Image source: <https://specials-images.forbesimg.com/imageserve/5f1a62d742a6387efb759310/960x0.jpg?fit=scale>

SENATIK 2020

Acti
Go to

COVID-19 OUTBREAK

- Economy
- Society
- Culture and entertainment
- Politics
- Others

Coronavirus impact matrix - Tourism & travel, airlines and retail will be badly hit on both liquidity and profitability fronts

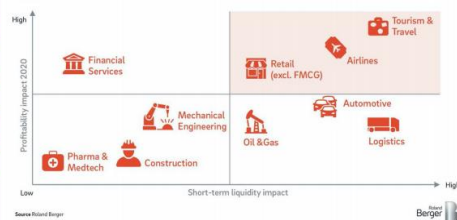


Image source: https://img.rolandberger.com/content_assets/content_images/captions/rb_dig_20_001_03_art_316_corona_update_gf_01_eng_image_caption_w1280.jpg

SENATIK 2020

Activa
Call

WHAT IS THE NEW NORMAL?

We do not know yet when the pandemic will be over

- More people are infected
- Proven working vaccine is yet to be produced

Life must go on

- We have to continue our lives
- We must adapt with the situation

We must be accustomed to new rules and habits

- Work/study from home
- Physical distancing
- Wearing face mask
- Routine handwashing
- Safe grocery shopping

SENATIK 2020

Acti
Call

NEW NORMAL: THREAT VS OPPORTUNITY

Limitations

- Inability to work and meet with all parties
- Uncomfortable to go shopping
- Unable to go to restaurant
- Unable to go to school

Solutions

- Video conference, file sharing/collaborations
- Online shopping
- Online food ordering
- Online education learning process both synchronous and asynchronous

SENATIK 2020

Activate

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO ROBOTICS

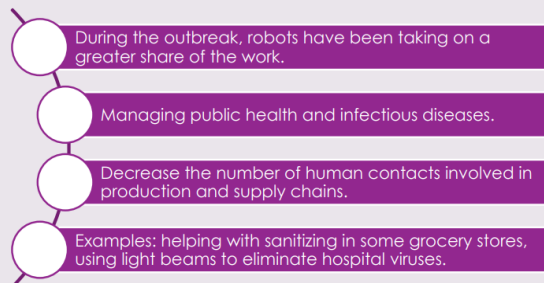


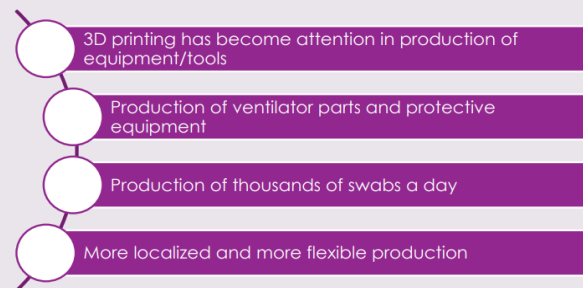
Image source:
<https://london-speaker-bureau.com/wp-content/uploads/2018/09/Keynote-speaker-Sophia-the-Robot-2.jpg>

<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020

Activate V

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO 3D PRINTINGS

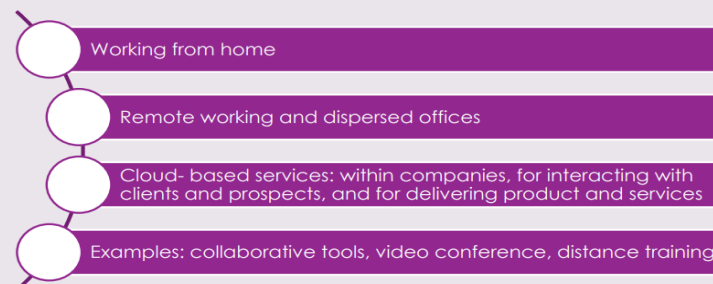


<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020

Δr

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO CLOUD COMPUTING



<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO INTERNET OF THINGS

- 1 Networks of CCTV cameras and smart connected sensors to reduce human involvement to meet physical distancing protocols
- 2 IoT-and GPS-enabled apps to track and, when necessary, to enforce self-quarantine measures
- 3 Smart thermostats, smart doorbells, smart speaker

<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020

Active
Go to S

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO HEALTHCARE

- 1 Simulations, bots, and software tools
- 2 Example of use: tracing people who came into contact with Covid-19 patients, dealing with medical emergencies, working on potential vaccines or effective drug treatments
- 3 Amazon and Microsoft joined the Covid-19 High Performance Computing Consortium, whose key objective is to make world-class supercomputers more accessible to COVID-19 researchers
- 4 Clara, an automated chatbot which can teach people about the underlying symptoms of Covid-19
- 5 Smartphones' cameras and sensors for medical diagnosis - without attending a medical centre

<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020



<https://www.dsinfo.com/techvisory/files/2020/04/Clara-chatbot-for-Covid-19.jpg>

Activate
Go to Setting

POST PANDEMIC DISRUPTIVE INNOVATION RELATED TO RETAILERS

- 1 Cashless merchants
- 2 Contactless payments via smartphones and contactless cards
- 3 Increase of digital transfer
- 4 Online shopping

<https://www.msci.com/documents/1296102/18941732/ThematicIndex-Disruptive-Technology-Post-COVID-cbr-en.pdf/751346b5-6505-0bc5-e141-15c631846341>

SENATIK 2020

Activate
Go to Setting

RESEARCH EXAMPLE: BLOCKCHAIN-BASED E-VOTING SYSTEMS

ELECTRONIC VOTING

Conventional elections are inefficient as they consume a lot of time, paper, manual labour, and other resources.

E-voting combined with the current widespread computer literacy could solve this.

(Wang et al., 2018)

SENATIK 2020

Activat
Go to Set

ADVANTAGES OF E-VOTING

- Less cost (papers, labours, transportations, etc.)
- Harder to manipulate votes than paper ballots
- More honest as it involves less humans in the process
- Minimal chance of errors (human errors)

(Wang et. Al.,2018)

However, if the election authority is compromised, manipulating the entire election would be easier. Hence, the system security must be put in mind.

SENATIK 2020

Activ
Go to :

SOLUTION: BLOCKCHAIN-BASED E-VOTING SYSTEMS

The best usage of blockchain technologies are in industries that are controlled by huge and corrupt organizations which renders the industries inefficient.

(Casado-Vara et al., 2018)

According to www.transparency.org, Indonesia has a corruption perceptions index of 38 out of 100, lower means more likely to be corrupt.

SENATIK 2020

Activ
Go to 5

RESEARCH OBJECTIVES

1. Implement an e-voting system based on the blockchain architecture with a decentralized application and verifiable results.
2. Utilize smart contracts to eliminate the need of a common third-party centralized trust provider.
3. Experiment using the various sample of voters and candidates as a sample the real world e-voting.

BLOCKCHAIN-BASED E-VOTING SYSTEMS

Centralization is a weakness when it comes to elections.

Blockchain may be the solution for a more democratic election. It could provide a trustable decentralized system

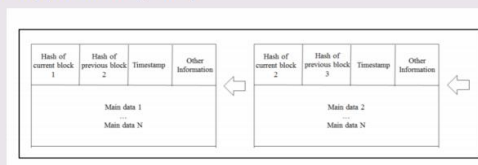
(Casado-Vara et al., 2018)

SENATIK 2020

Activ
Go to S

BLOCKCHAIN

First proposed by Nakamoto (2009)



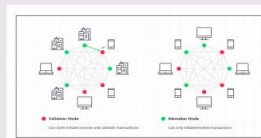
Blockchain allows people to know something has been done by someone without seeing the result.

SENATIK 2020

Activ
Go to S

BLOCKCHAIN NETWORKS

In a blockchain network, all devices that are connected to the network acts as a node.



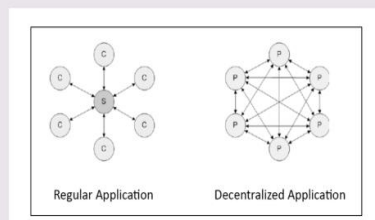
Every node in the network have to agree to a single blockchain, and it is the job of the consensus algorithm to keep it that way (Lin et al., 2017)

SENATIK 2020

Activate
Go to Sett

DECENTRALIZED APPLICATIONS

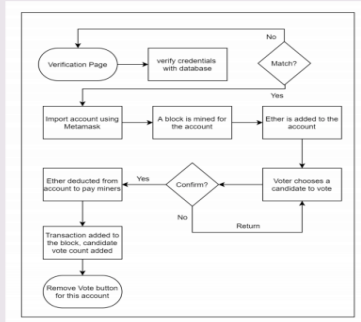
- The proposed system will be a web application with a decentralized network architecture.



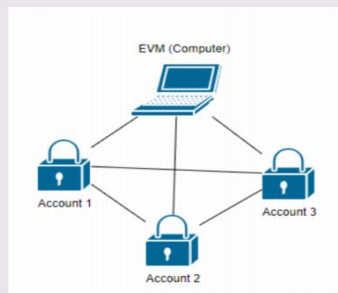
SENATIK 2020

Activa
Go to S

ELECTION PROCESS: SIMULATION USING THE SYSTEM



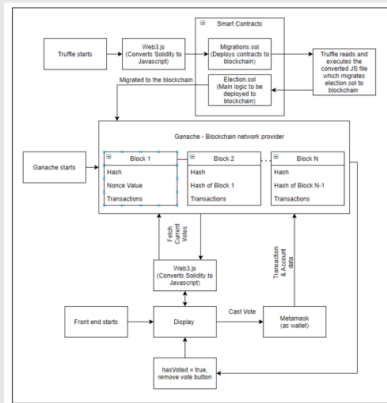
SIMULATION SCENARIO



SENATIK 2020

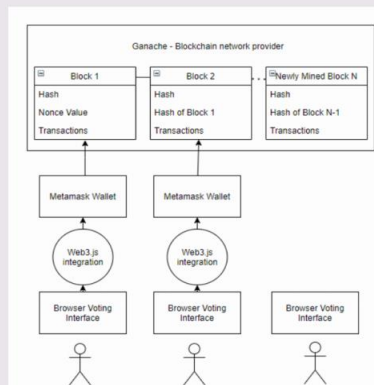
SIMULATION ENVIRONMENT

1. **User** – The citizens or the voters that are going to cast their votes using the web application
2. **Front-end** – A web application programmed using HTML, CSS, and Javascript.
3. **Back-end** – Made possible by the Web3.js library, a Javascript library made specifically for Ethereum integration.
4. **Ethereum Virtual Machine** – The backbone of the system that provides the Ethereum blockchain network, allowing us to create and use smart contracts using the Solidity language
5. **Blockchain** – The chain of blocks that are each linked to the previous blocks using hashes located inside the Ethereum Virtual Machine



Activate V

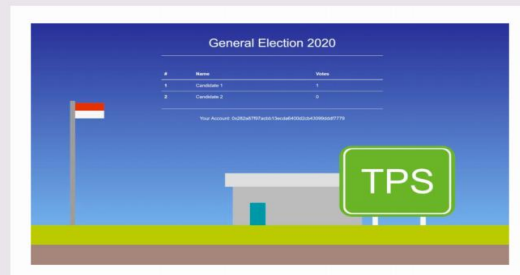
SYSTEM ARCHITECTURE FROM USERS' PERSPECTIVE



SENATIK 2020

Activate Go to Sett

USER INTERFACE



SENATIK 2020

Activ
Growth

ADVANTAGES OF ETHEREUM VS. SERVER-BASED VOTING SYSTEM

1. **Transparency on the voter registration and voting history, capable of reducing abstain votes.**
2. **Smart contract is immutable and cannot be tampered after being deployed.**
3. **After deploying the contract, the whole process is automated and does not require human intervention, minimizing the chance of fraud.**

RESEARCH EXAMPLE:
SENTIMENT ANALYSIS AND EMOTION CLASSIFICATION FOR TWEETS RELATED TO GOVERNMENT POLICIES CONCERNING COVID-19

BACKGROUND

- **Corona Virus Disease 19 (COVID-19) outbreak**
- **More than 135 thousand Indonesians are infected**
- **Government policy**
 - Pembatasan Sosial Berskala Besar (PSBB)
 - Work From Home
 - Stay at home
- **How Indonesians view the policy**

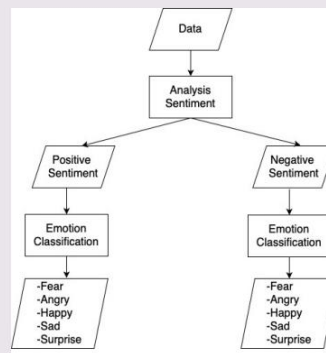
RESEARCH OBJECTIVE

- To build a classification model for sentiment analysis and emotion classification for tweets related to government policies concerning COVID-19

DATA COLLECTION

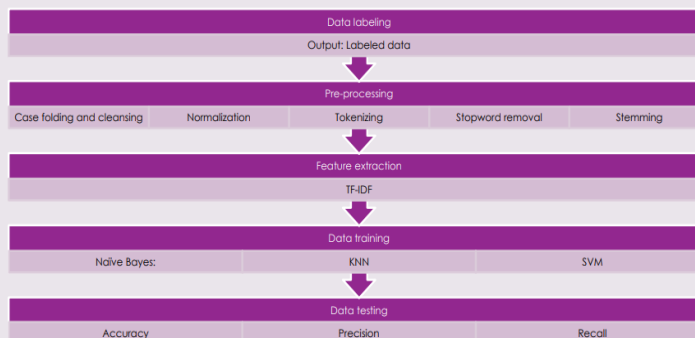
- **Crawling Twitter API using library twint**
 - Sentiment analysis : positive and negative
 - Emotion classification: fear, angry, happy, sad, surprise
- **Dataset using hashtag #stayathome #dirumahsaja #dirumahaja #WFH #workfromhome #PSBB**
- **Dataset: tweets in Indonesian**

CLASSIFICATION SCHEME



SENATIK 2020

PROCESS: ON-GOING



SENATIK 2020

CONCLUSION



- Covid-19 has altered the way people interact and conduct things.
- It offers potential opportunities for disruptive innovations and technologies
- Key elements of Industry 4.0, such as AI, cloud computing, IoT, robotics, etc. will be the keys to direct the future innovations

ARE WE READY FOR THE CHALLENGE?

SENATIK 2020

Acti

THANK YOU

SENATIK 2020