



STRATHMORE UNIVERSITY
SCHOOL OF COMPUTING & ENGINEERING SCIENCES
COURSE: Masters in Sustainable Energy Transitions
Final Examination
MSSET 8301: INNOVATION & ENTREPRENEURSHIP

DATE: Wednesday, August 21st, 2024

TIME: 18:00-20:30 Hours

Instructions

1. This is a supervised exam
2. Exam duration: 18.00 – 20.30 Hours
3. You are expected to work independently
4. Answer **Any Five** Questions

QUESTION 1: Global Innovation Index (GII) (20 Points)

The Global Innovation Index (GII) categorizes countries and regions according to their innovative capacity. **Table Q1** below presents countries in the top 10 in the Global Innovation Indexes for 2022 & 2023 with an indication of their income levels, high income (HI). From the ranking it is clear that all the countries in the top 10 are in the high income category and remain more or less the same over the two years.

Table Q1: Global Innovation Index (GII) (2022 & 2023)

Rank 2022	Country	Income Level	Rank 2023	Country	Income Level
1	Switzerland	HI	1	Switzerland	HI
2	USA	HI	2	Sweden	HI
3	Sweden	HI	3	USA	HI
4	UK	HI	4	UK	HI
5	Netherlands	HI	5	Singapore	HI
6	South Korea	HI	6	Finland	HI
7	Singapore	HI	7	Netherland	HI
8	Germany	HI	8	Germany	HI
9	Finland	HI	9	Denmark	HI
10	Denmark	HI	10	South Korea	HI

a) Explain the role governments can play in determining the innovation index for countries. From Table Q1 all the countries in the top 10 in the Global Innovation Index are also in the high income category. Can we then conclude that these countries are top innovators every year because they are rich and have money to spend on innovation activities? **(10 Points)**

b) Using the innovation indexes for 2022 & 2023 provided in **Table Q1**, it is clear that these top innovators are also rich countries. Discuss the consequences of poor innovation ranking for a country. **(10 Points)**

QUESTION 2: National Innovation Systems (20 Points)

The Kenya's national innovation system was created by the Science Technology and Innovation (ST&I) Act 2013. The Act created three institutions within the Ministry of Education, Science and Technology to make the innovation system. These institutions include the National Commission for Science, Technology and Innovation (NACOSTI), the Kenya National Innovation Agency (KENIA) and the National Research Fund (NRF).

a) Review the STI Act (2013) and discuss the role of national innovation systems in fostering successful innovations in Kenya. How does the national innovation system contribute Kenya's ranking on the Global Innovation Index? **(10 Points)**

b) One of the functions of Kenya National Innovation Agency (KENIA) in the STI Act (2013) is the initiation and creation of science and innovation parks and incubators. What is the role of business incubators? How do incubators enhance the process of innovation and entrepreneurship? What is the contribution of incubators to the national innovation system? **(10 Points)**

QUESTION 3: Innovation Process & Risk (20 Points)

The process of innovation may involve incremental, radical, or revolutionary changes in products, processes, organization structure or even thinking. The following is an excerpt regarding M-KOPA, a fintech platform that promises to make financing for everyday essentials accessible to everyone. Read the excerpt and respond to the questions that follow.

M-KOPA is a fintech platform that combines the power of digital micropayments with the Internet of Things (IoT) to provide customers with access to productive assets. With operations in Kenya, Uganda, Nigeria and Ghana, the company has expanded its model beyond solar products to include smartphones, electric motorbikes, cash loans and health insurance. Leveraging its advanced connected credit platform, M-KOPA has deployed over \$1 billion in products and credit to millions of underbanked customers in Africa.

a) Using the example of mobile phone technology, discuss what may be considered incremental, radical, or revolutionary innovations. Which category will you place the M-KOPA innovation and why? **(10 Points)**

b) Launching M-KOPA in 2012, the founders were putting a new innovation in the market with no idea whether it will succeed or not. Using this case of M-KOPA discuss the statement “entrepreneurship is about taking risk.” **(10 Points)**

QUESTION 4: Sources of Innovation (20 Points)

The overwhelming majority of innovations exploit, change. There are some innovations that in themselves constitute a major change, such as the Internet. But these are exceptions and fairly uncommon. Most successful innovations are far more ordinary and they exploit change. Thus, the discipline of innovation which is the knowledge base of entrepreneurship is a diagnostic discipline: a systematic examination of the areas of change that typically offer entrepreneurial opportunities.

a) As an external source of innovations, knowledge-based innovations are the super-stars of entrepreneurship and get the most publicity, money and attention. Examine in detail these types of innovations focusing on their characteristics and why they may be considered the most challenging. **(10 Points)**

b) Discuss in detail the “unexpected” and the “incongruity” as two of the most important sources of innovation that originate from within the enterprise. **(10 Points)**

QUESTION 5: Role of AI Innovations in Renewable Energy Transitions (20 Points)

The following is an excerpt from Forbes Magazine regarding the role of Artificial Intelligence (AI) in Renewable Energy Transitions. Read the excerpt and respond to the questions that follow.

***Artificial Intelligence: Accelerating Clean Energy Transformation, By Martin Hermann, Forbes, November 7, 2023.** There has been a global surge in the urgency to transition to clean, sustainable sources of power. However, designing, developing, optimizing and integrating these green energy sources into existing power infrastructure presents a unique set of challenges. As the share of renewable power increases in the electric grid, these challenges will continue to grow. Recent technological breakthroughs including artificial intelligence (AI) have brought us to a point where sustainable clean energy transitions are finally taking shape on a global basis. Indeed, recent hearings in the U.S. Congress have highlighted issues regarding rapid advance of AI across various industries. What has not received much attention, however, is this technology’s immense potential for enabling clean energy transition globally.*

a) Identify and discuss in detail the possible potential approaches through which artificial intelligence can be used in enabling the development, deployment and widespread adoption and use of renewable energies. **(10 Points)**

b) Considering the role of Artificial Intelligence (AI) in Renewable Energy Transitions explain why major innovations come from outsiders and not industry players whenever there is breakpoint in technology. For example, despite Kenya Power talking about using modern technologies including AI to address frequent power failures and blackouts, it is unlikely to come up with new approaches using these technologies to improve service to its customers. **(10 Points)**

QUESTION 6: Dynamics of Innovation – Electric Car Technology (20 Points)

Typically, the process of innovation follows the S-growth curve which moves from start-up phase to rapid growth and eventually to decline in the mature phase. During the start-up phase a great deal of change in the product takes place but the outcome is highly uncertain in term of production, process, firm leadership and structure, and management. The process changes from start-up to growth phase which marks the start of fast growth. The acceptance of the innovation is pretty much assured and the focus of firms starts to shift from inventor's workbench to the factory floor. The following is an excerpt regarding development in the electric vehicle technology. Read the excerpt and respond to the questions that follow.

Electric vehicle car (EV), battery electric vehicle (BEV) or all-electric vehicle (AEV) is an automobile that is propelled by one or more electric motors, using only energy stored in batteries. Compared to internal combustion engine (ICE) vehicles, electric vehicles are quieter, have no exhaust emissions, and lower emissions overall. Charging an electric car can be done at a variety of charging stations and these stations can be installed in both houses and public areas. Many countries have established government incentives for plug-in electric vehicles while others have legislated to phase-out sales of fossil fuel cars, to reduce air pollution and limit climate change. Together with other emerging automotive technologies such as autonomous driving, connected vehicles and shared mobility, electric cars form a future mobility vision called Autonomous, Connected, Electric and Shared (ACES) Mobility.

a) With the help of sketches, discuss the possible growth stages of the electric vehicle technology, from its initial stages, growth and eventual maturity. What is the current growth phase of the electric vehicle market? **(10 Points)**

b) Using the case of the automotive industry, discuss why changes in product and process become increasingly difficult as the innovation process moves through the growth to mature phase. What are the implications of the disruptive electric vehicle technology on the automotive industry? **(10 Points)**