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## Contents

Life Cycle Assessment of Building Materials by Bibliometric Analysis Method: Case of Brick .....	3
A Conceptual Framework for Retrofitting of Prison Facilities in the Context of Nearly Zero-energy Target .....	4
A Comparative Analysis of Responses to Refugee Crises After 2011 .....	5
Atlas of Productive Synergies: an open platform to visualize French industrial know-how and support the construction of a sustainable production system .....	6
The Expectations and Realities of Hosting a ‘Mega-Event’ such as the FIFA World Cup Tournament in Qatar 2022 .....	7
Factors determining Agricultural Land Conversion in the EU.....	8
Early Detection and Prevention of Cardiovascular Disease Based on Artificial Intelligence .....	9
French Endowment Fund, a CSR Tool for French Firms .....	10
Chemical Constituent of Isochrysis galbana Microalga Extract and Its Cytotoxic Activities on Leukemic Cell Lines .....	11
Combined Antimicrobial Activity of Tea Tree Oil and Various Antibiotics.....	12
Transformation of the Global Political Order: Relativistic-Quantum Noology and Doctrine of Optimatism as a New Paradigm .....	13
Security Compass and the New European Security.....	14
The European Union and Its Stance Against Russia-Ukraine Conflict .....	15
Adaptation of 3D Printing Technology to the Construction Industry in Terms of Efficiency: Rebuild or Retrofit?.....	16
Bank Master Ledger vs ESG .....	17
International Factors Influencing the National Security Strategy of the South Caucasus .....	22
The Impact of Social Media Sentiment and Economic Policy Uncertainty on Digital Currency Volatility.....	26
Evaluation of LEED-certified Office Buildings in Turkey in Terms of Water Efficiency.....	36
How Artificial Intelligence is acting as an Enabler to achieve Sustainable Development? .....	37

# Life Cycle Assessment of Building Materials by Bibliometric Analysis Method: Case of Brick

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## Abstract

Production of building materials causes several environmental impacts such as greenhouse gas emissions, global warming, biodiversity loss, ecosystem degradation, nature occupation, respiratory inorganics and organics, aquatic eutrophication, terrestrial eutrophication, acidification, and mineral extraction. Therefore, it is important to determine such impacts by inquiring about every process of production deeply, to set forth associated impacts of several processes, and develop innovative solutions to reduce them. Brick is one of the most widely used building materials, generally utilized for walls to separate indoor spaces, and more importantly to isolate the building from outside atmospheric conditions.

The purpose of this study is to review existing literature data available on the life cycle assessment (LCA) methodology applied to brick. The LCA methodology is an effective tool to determine the environmental impacts of any materials, processes, or services. It is convenient to use the LCA methodology to determine a brick's carbon footprint from cradle to grave, including all production processes from the clay mineral extraction to disposal of the waste bricks or re-use of the recycled bricks. Within the scope of this study, the bibliometric analysis method was used to examine literature about the LCA of bricks, research gaps were investigated, and bibliometric mapping was done using several cooccurrences such as authorship, publication years, countries, and keywords. Bibliometric data was gathered from Web of Science (WOS) and Scopus databases. The results of the study showed that it is an emerging research topic mostly studied in the context of environmental sciences, energy, and engineering that involves several research gaps, especially in Turkey. Mostly, authors were focused on cement or concrete when applying LCA methodology to building materials, therefore, studying the LCA of brick will significantly contribute to the literature.

**Keywords:** Life Cycle Assessment, Building Materials, Brick, Bibliometric Analysis, Bibliometric Mapping.

# **A Conceptual Framework for Retrofitting of Prison Facilities in the Context of Nearly Zero-energy Target**

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## **Abstract**

Public institutions start the construction of dozens of buildings every year in line with their needs. More than the allowance needed for the construction of the building is required during the operation phase. One of the most important items in operating costs is energy costs. Among the public buildings, the building group operation with the highest energy consumption is the full-time buildings. In this context, one of the building groups that consume the most energy in its operation is the prison facilities under the Ministry of Justice in Turkey. Statistics show that with the increasing population, the need for prison facilities will increase day by day. With the increasing number of convicts, prison facilities over their capacity cause compromising user comfort and a decrease in the heating and cooling performance of the buildings within the borders of the Penitentiary Institutions, both in terms of energy and cost. In order to solve this problem, the existing prison facilities in Turkey should be retrofitted in energy and cost-effective way with the target of 'nearly zero energy'. Within the scope of the same target, the prison facilities to be built should be designed in a way to reach the highest energy performance in the most economical way, in accordance with optimum comfort conditions. The main aim of this study is to present a guiding conceptual framework for the energy-efficient improvement of prison facilities within economic limits to retrofit. In the context of this aim, the nearly zero energy building performance parameters stipulated by the European Union Revised Energy Performance in Buildings Directive (EU EPBD Recast) are examined specific to prison facilities. In addition, possible energy and cost-effective retrofitting parameters are presented for the existing prison facilities stock in Turkey and these parameters are discussed specific to prison facilities. By the discussion results, the retrofitting alternatives with the highest energy performance within economic limits are suggested in accordance with the optimum comfort conditions.

**Keywords:** Building Energy Performance, Nearly Zero Energy Buildings, Retrofitting, Prison Facilities.

# **A Comparative Analysis of Responses to Refugee Crises After 2011**

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## **Abstract**

An unorthodox international order has appeared following the construction of nation-states under the power of law. Nation-states existed to protect legal terms such as border, citizenship, and territory. The transition between countries has become a legal subject. Although the migration phenomenon has already occurred throughout history, it has turned into a permanent issue of international law yet. The international system was required to define new concepts and organizations for legal procedures. Regional and global crises have caused distinct outcomes such as refugees, asylum, and irregular migration. This situation has brought along theoretical and practical problems. One of the concerns is to set obvious definitions for these terms to avoid nested concepts. As these are legal and international terms, it is crucial to distinguish them clearly to reach proper provisions. Another significant concern is the waves of public movements that significantly ascended after 2011. After all, these matters have become crisis scenarios in their own right. Various dynamics have brought different approaches to these crises. In this context, this study aims to examine how Asian powers respond to refugee crises.

**Keywords:** refugees, asylum, migration, UNHCR.

# **Atlas of Productive Synergies: an open platform to visualize French industrial know-how and support the construction of a sustainable production system**

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*Sustainable production • COVID19 and Economy • Supply chain management • Econometric modeling*

## **Abstract**

The recent health and geopolitical crises highlighted the fragility of our European industrial policies. The current awareness opens the way to a model of sustainable re-industrialization that combines resilience, societal and environmental commitment, and economic performance.

Open data, associated with Artificial Intelligence (AI) offers new perspectives for building a twin of the French productive system bringing together both macro-economic data and real observations on companies. This offers a powerful tool to identify industrial know-how and Global Value Chains (GVC).

We will present our open platform called "Atlas of Productive Synergies" on which we conduct our experiments: <https://atlas.productive-synergies.com>.

In this talk, we present how data can lead local authorities and companies towards development strategies that are consistent with sustainable industry. We will show that the work can be applied at a European or international level.

# **The Expectations and Realities of Hosting a ‘Mega-Event’ such as the FIFA World Cup Tournament in Qatar 2022**

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## **Abstract**

The FIFA World Cup tournament is the ‘talk of the town’ here in Doha the capital and across the whole country of Qatar. It is also generating comments and interest from media and interest groups around the world. By applying for and being awarded the right to hold the tournament Qatar has put itself under the world’s spotlight. The country has various reasons for wanting to hold this ‘Mega-Event’ as Buhler (2022) refers to such occasions. The government wish to raise the profile of the country and to put it in the minds of potential investors, tourists, international governments and organizations. The event also gives the country the opportunity of developing infrastructure such as the newly built Qatar Rail, and a network of new roads and highways and hotel accommodation. Seven stadia have been freshly constructed or undergone extensive upgrading to make them worthy of a prestigious world sporting event. Dr Nicola Ritter (a German legal and financial advisor) has estimated that Qatar could spend up to 220 billion USD in the build up to the event. Forty-eight billion dollars will be spent on airconditioned stadia, \$77bn on facilities for soccer fans and players, \$45bn on developing Lusail City and \$50bn on upgrading its transport infrastructure.

Qatar has a diverse population demographic. Out of a total population of 2.5 million, only 10% are Qatari nationals. The rest of the population is mainly made up of immigrant workers who are employed in the construction industry, and the service sector (banking, education, retail etc.). I intend to conduct research prior to the tournament to ascertain people’s views on the event. I want to find out whether there are differences in expectations between the various nationality groups, genders and age groups. Are intend to employ a longitudinal approach, to find out whether expectations were fulfilled, thus I will conduct further questioning after the tournament has finished.

The tournament does appear to divide opinion – with the western media are keen to point out the social issues involved (for example human rights issues), whereas the locals are keen to stress the positive aspects of hosting such a tournament. Many local commentators believe that there will be a noticeable clash of cultures surrounding the behavior of football fans in a highly traditional and religious country. However, there are a significant number of Qatari nationals who have expressed a desire to be out of the country when the event takes place.

## **Factors determining Agricultural Land Conversion in the EU**

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### **Abstract**

The rapid expansion of urban areas due to population and economic growth is associated with an increasing demand on limited land resources and has led to changes in land use. Changing land use patterns are the result of complex interaction between the human, physical environment and policy settings and critical for land use policy and environmental management process. Therefore, the information on the pattern of land use/cover change and its drivers is fundamental to support planning and land management decisions. The objective of this study was to quantify the agricultural land use changes to urban uses in the studied 25 European Union (EU) countries and identify geo-physical characteristics, location, policy-related factors and socio-economic elements to explain the changes. The dynamics of agricultural land from 2000 to 2006 was quantified using the European Corine Land Cover maps developed by the European Environment Agency (EEA). Other European sources were used to obtain socio-economic, geo-physical, climate and policy related data. A Seemingly Unrelated Regression (SUR) method was adopted to quantify the heterogeneous drivers of agricultural land conversion to residential, industrial/commercial and recreation uses. The results showed that a combination of socio-economic drivers, policy-related factors, geo-physical characteristics and location explain agricultural land conversion processes in European countries. Through quantifying the dynamics of agricultural land uses and drivers of their changes, the study provides a solid foundation for land cover/use change analysis and modelling.

**Keywords:** Agricultural land conversion, Urban land uses, Drivers of land use change, EU-25 Countries, Seemingly Unrelated Regression.

# Early Detection and Prevention of Cardiovascular Disease Based on Artificial Intelligence

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## Abstract

Nowadays, Cardiovascular disease is spread worldwide and is the leading cause of death after cancer. Therefore, timely detection and prevention of cardiovascular disease based on the clinical data and behavioral lifestyle is significant, as well as predicting and assessing the pressure over the next few days. In the age of technological advancement to solve similar problems, machine learning, symbolic reasoning methods, or algorithms are used independently, but confidence in the results is still low. Distrust is caused by the lack of explanation of the results.

To solve the indicated problems, we are working on a framework that combines the machine learning paradigm, symbolic reasoning, and optimization methods. The intelligent assistant "HIDA" must be created under the framework, which will be responsible for the detection of anomalies (diseases).

The framework consists of the following components:

- The knowledge base with high-order categorical logic and abductive reasoning
- The machine learning module consists of two-level (robust and accurate) multivariate DML models with a combination of static and dynamic characteristics
- The optimization module provides planning and management of the whole process using machine learning mechanisms

The process of "HIDA" includes the following phases:

- Data collection and preprocessing
- Frequency of raw data, rough clustering using the KNN method
- The last phase involves these steps:
  - Data enrichment- Generation of new training data through the adversarial neural network
  - The output data calculated by deep neural network (LSTM)
  - If the result is satisfactory, must be chosen the best result to complete the process. Otherwise, the models and settings will be re-selected

The part of the solution has been successfully implemented and integrated into the BiteriumAI's WEB application [app.biterium.ge](http://app.biterium.ge), where customers are patients as well as doctors.

## **French Endowment Fund, a CSR Tool for French Firms**

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### **Abstract**

A modern definition of corporate social responsibility (CSR) was given in the 1980s. It consists of 4 main principles: Be profitable, be law-abiding, be ethical, and improve quality of life of the community. Firms that apply this business model have experienced 51% to 81% higher profits. Willard's researches aim to show how CSR reduces risks but also increases productivity of work. This can be done by developing sustainable supply chains or avoiding scandals in public opinion by observing moral rules to manage certain risks and improving company's reputation by communicating philanthropic endowments. These actions permit to attract new partners and customers. Also, by giving meaning to the work of employees it leads to reduce turnover and increase engagement. Since 2017, publication of an additional financial report is mandatory for French companies and thus, CSR issues are becoming more often present in country's business environment. In 2008, the French concept of the endowment fund appeared and gave to companies a tool to finance non-profit initiatives by collecting and managing funds with flexibility, that allows them to manage projects with ethical rather than financial goals. In this presentation, we will first recall the CSR's definition and the effect of this business model, then we will define what is the French conception of an endowment fund, and how it helps to achieve the CSR policy in a company. Finally, we will conclude by showing how endowment fund is a growth lever for French companies.

## Chemical Constituent of *Isochrysis galbana* Microalgae Extract and Its Cytotoxic Activities on Leukemic Cell Lines

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### Abstract

Algae, which can live in a wide variety of environments from tree trunks to fresh and salty waters, are used in various fields from nutritional supplement to biofuel production due to their high carbohydrate, protein and lipid content.

They are classified as macro algae and micro algae according to their cellular sizes. *Isochrysis galbana*, one of the microalgae with more than 500,000 species is, a marine flagellated microalgae, have high levels of soluble and insoluble polysaccharides and proteins, as well as high amounts of polyunsaturated fatty acids.

Today, studies are carried out with the use of natural sources as an alternative to drugs in the treatment of various diseases, and the number of these studies is increasing day by day. Cancer is one of these diseases. Because the drugs used in cancer treatment do not have selectivity to cancer cells, negatively affect healthy cells, and have high side effects.

In this study, we aimed to determine chemical constituent of *Isochrysis galbana* microalgae extract with chromatography-mass spectrometry (GC-MS). Then, we determined to cytotoxic activities of *Isochrysis galbana* on leukemic cell lines (HL60, K562, U937, MOLT-4, Raji and ECV304 (as a control)).

According to the results of GC-MS analysis of *Isochrysis galbana* microalgae extract, the most intense molecules in the content are Dodecanoic acid, 3-hydroxy- (CAS) Beta-Hydroxy Dodecanoic Acid and Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-isonide. The investigation of the effect of these molecules specifically against Raji cells is important to determine the possible anti-leukemic molecules and their combinations that show cytotoxicity against this cell line.

**Keywords:** Algae, GC-MS, cytotoxicity, leukemic cell.

## Combined Antimicrobial Activity of Tea Tree Oil and Various Antibiotics

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### Abstract

Tea tree oil (TTO) is an essential oil obtained by steam distillation of the end branches' and leaves' of the Australian endemic plant, *Melaleuca alternifolia*. TTO largely used for its anti-microbial properties, and is also included as a major ingredient in many formulations used to treat skin infections. Studies showing the antibacterial and anti-fungal effects of TTO were conducted between 1940 and 1980 in the literature. It is widely available in the Australian, European, and North American markets and it is marketed as a medicine for a variety of ailments.

In this research, the aim was to investigate the combined effect of TTO and several antibiotics on different bacteria species. *Escherichia coli*, *Bacillus subtilis* and *Micrococcus luteus* bacteria specieses were chosen and the antimicrobial activity of TTO with and without antibiotics was observed. To each bacteria species; Penicillin, Ampicillin and Clarithromycin antibiotics were applied as two experiment groups; with and without TTO. In 4 and 24 hours periods OD<sub>600</sub> values were measured from each sample. GraphPad Prism was used for statistical analysis. According to the significant results, even the TTO it self is an anti-microbial oil, there was a decrease in the antibacterial activity when it is combined with the antibiotics in some spesific concentrations.

Our study has shown that TTO can reduce the effect of antibiotics when applied together at certain concentrations. For this reason, it is necessary to pay attention to the TTO concentrations to be used in antibiotic topical cream formulations. Despite the antimicrobial effect of both antibiotics and TTO, the fact that the antimicrobial effect decreased when TTO and antibiotic were applied to bacterial cells together is an important result of our study.

**Keywords:** Antibacterial activity, antibiotics, bacteria, TTO.

# **Transformation of the Global Political Order: Relativistic-Quantum Noology and Doctrine of Optimalism as a New Paradigm**

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## **Abstract**

The end of XX and the beginning of the XXI century marked the starting point of the next stage of globalization. Previously, there could be some doubts about the success of the globalization process. However, the collapse of the Soviet Union and the end of the Cold War left no doubt: 'the end of history' and globalization are moving forward rapidly.

Ever since the 2008 world crisis, the situation has changed dramatically. The concept of 'nation-state' gained momentum, and this tendency has only intensified over time. In the light of current crises, it has become more apparent that the explanations based on conventional theoretical frameworks cannot unravel the complete picture of the current global condition. It is purely one-sided as far as it relies on one theoretical foundation. We have observed that these theories are one-sided and are not able to provide a comprehensive explanation of global and local matters. This theoretical crisis underlines the necessity of a new paradigm and a new theory that can objectively explain global processes and allow us to make future projections thereof.

A new theory Relativistic-Quantum Noology (Noology), developed by Georgian scientist Emzar Khvichia, is a response to this need. Through his theoretical apparatus, Khvichia was able to make long-term predictions on the prospects of global political developments, such as strengthening nationalist tendencies and nationalist forces on regional and international political level from 2007 that do not share liberal values and principles, Brexit, etc. All of these were materialized. The Doctrine of Optimalism, a concept developed based on Noology, offers a new formation of the world order. In my research, I will discuss the basic principles of the Doctrine of Optimalism and analyze the theory in comparison with other leading theories and schools of IR, such as Realism, Liberalism and Constructivism.

**Keywords:** Global Political Order, Doctrine of Optimalism, Paradigm Shift, Relativistic-Quantum Noology, Noology, Realism, Constructivism, Liberalism.

## **Security Compass and the New European Security**

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### **Abstract**

Since the establishment of NATO, European powers discussed the possibility of creating an all-European defence structure. However, many countries that were both EEC [later EU] members were also NATO members, so NATO was seen as a protective cover for Western Europe. The OSCE focused more on cooperation than security, the Common European Defence and Security Concept and European Defence Agency did not go far to make European states secure against aggression, and no-one believed there would be a classic style war in European soil, either. However, with the Russian – Ukrainian conflict that started on 20<sup>th</sup> of February 2022, this perspective changed. European Union members developed a strategy titled Security Compass. The adoption of the Strategic Compass is a strong sign of unity, that the EU Member States have for the first time agreed on a shared vision with detailed objectives of what they want to achieve in security and defence, and that the Strategic Compass demonstrates their firm determination to make the EU a more capable actor in security and defence. Apart from working towards better strategic planning in security issues, the Strategic Compass document also foresees production of necessary weapons systems in Europe, hence attempting at breaking away from United States and NATO dictated weapons and ammunition development. Consequently, these developments will on the one hand serve Europe as a centre for military research and development and on the other will lead European Union to become a further isolated regional power.

# **The European Union and Its Stance Against Russia-Ukraine Conflict**

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## **Abstract**

The European Union has been a sui generis political and economic union since it was formed. The deficiency in Common Foreign and Security Policy has made it disabled to act as a strong political actor in international relations. During the Russian operation, the EU for the first time made a proactive step to make its voice heard within the conflict. This article intends to showcase the reasons behind the changing EU attitude towards the conflict resolution and the motives compelling the EU to reshape her priorities, policies and decision-making mechanisms. It aims to shed light to the fact that there will be changes in the dynamics of international relations in terms of bilateral and multilateral relations.

**Keywords:** The European Union, Common Foreign and Security Policy, Russian-Ukrainian Conflict, International Relations.

## **Adaptation of 3D Printing Technology to the Construction Industry in Terms of Efficiency: Rebuild or Retrofit?**

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### **Abstract**

3D printing technology is an alternative building construction method that introduces a new construction process instead of improving existing construction systems and aims to make the construction process more efficient in various aspects. The change of an established conventional method is not a case that the construction industry can immediately accept and keep up with. This case can only be overcome with the advantage and efficiency data to be obtained from the new building construction method. Within the scope of this study, first of all, the point of 3D printing technology in the construction industry in terms of literature and practice will be examined. The performance of the buildings constructed with 3D printing technology in the context of quality, cost, time, and environmental conditions will be evaluated compared to the buildings constructed with conventional building construction methods. Thus, the advantages and disadvantages arising from the change in construction method will be analysed. The problem to be addressed in the study is to determine how and at what point 3D printing technology should be utilized when the data obtained after the literature review and the last point of 3D printing technology are evaluated together. In this context, this study aims to choose the most suitable one for short and long-term planning among the alternatives of retrofitting or rebuilding millions of existing buildings with 3D printing technology.

**Keywords:** 3D Printing Technology, Retrofitting, Rebuilding.

## **Bank Master Ledger vs ESG**

Mr. Omar Monzeglio, Financial Senior Expert Witness, CFA

### **Abstract**

The importance of a very high quality of bank DataMart becomes essential, especially the Bank Master Ledger's data and the corresponding journalism activities of data processing, recording and managing. This must be the primary target for the banking stability, to prevent the default risks. Otherwise, we could front a new "ENRON scandal" but extensive and, this time, potentially triggered by ESG transition.

### **Introduction**

We live in harrowing times. During last weeks, we have been experiencing shattering events that impose us to rethink certain essential junctures of our individual and collective behavior. Among them, perhaps not in the first place but certainly not at the last, energy strategies, of which current events are showing the political and security implications, in addition to those more properly environmental. The sharp and sudden price increases of the last few weeks have begun to jeopardize equity in access. In recent days, the outbreak of war in Europe, in addition to dismay at the human costs it is causing and for questioning key values of international coexistence, has put before our eyes the centrality of energy security, that maybe we took for granted. Markets have so far reacted measurably to geopolitical developments. Central banks remain ready to play their part in ensuring monetary and financial stability, but it is good not to forget that in the long run, the sustainability of energy models is a necessary requirement to ensure the livability of the planet, and with it our well-being and especially the generations that will follow us. Hence, the most important role of prudential regulation in the context of climate change is to ensure that, by using the portfolio of resources entrusted to them, intermediaries assess and manage the related risks in a conscious manner. Therefore, the importance of a correct management of the bank Master Ledger and its entries in all its sections and sectionals becomes the fulcrum of the economic stability.

### **Financial Risk Management and ESG**

Risk Management in its purest form is the process by which risks in an investment we identify, we assess, we measure and we manage in order to create a return, or economic value given to the risks. Therefore, the key to the success for a financial institution should be a comprehensive strategy that combines well-designed technology architecture with a suite of analytical applications to support risk-aware decision-making. During the last few years, it has become evident, that correctly, qualifying and quantifying risks – credit, counterparty credit, market, and liquidity, operational – can be very challenging and, consequently, regulators are attempting to refine and change the financial services landscape in order to make financial institutions and the global banking system more resilient. For example, the adoption of Basel III and Dodd-Frank to deliver this mandate is bringing challenges to CFOs and/or CROs. Regulators are requiring financial institutions to:

- a) Hold more and better quality capital;
- b) Meet minimum standards for short and long term liquidity in the form of the:  Liquidity Coverage Ratio (LCR);  
 Net Stable Funding Ratio (NSFR)
- c) Meet minimum standards for leverage to act as a backstop to balance sheet growth;
- d) Improve risk management governance and make senior management/board members accountable;

e) Introduce restrictions on variable remuneration.

These refinements require the CFO/CRO to build the firm’s strategy and plans. The CFO/CRO will bear the responsibility to quantify the strategy results and feasibility under the regulatory rules of more expensive, higher quality capital, as well as liquidity and leverage constraints. The quality of the solution supporting this effort will directly influence the contribution of the CFO/CRO to strategic decisions. It is an ongoing concern to improve the risk management process and increase profitability with minimum exposure to risks, reduce manual interventions and automate processes and controls, especially during ESG start-up that has these aspects:

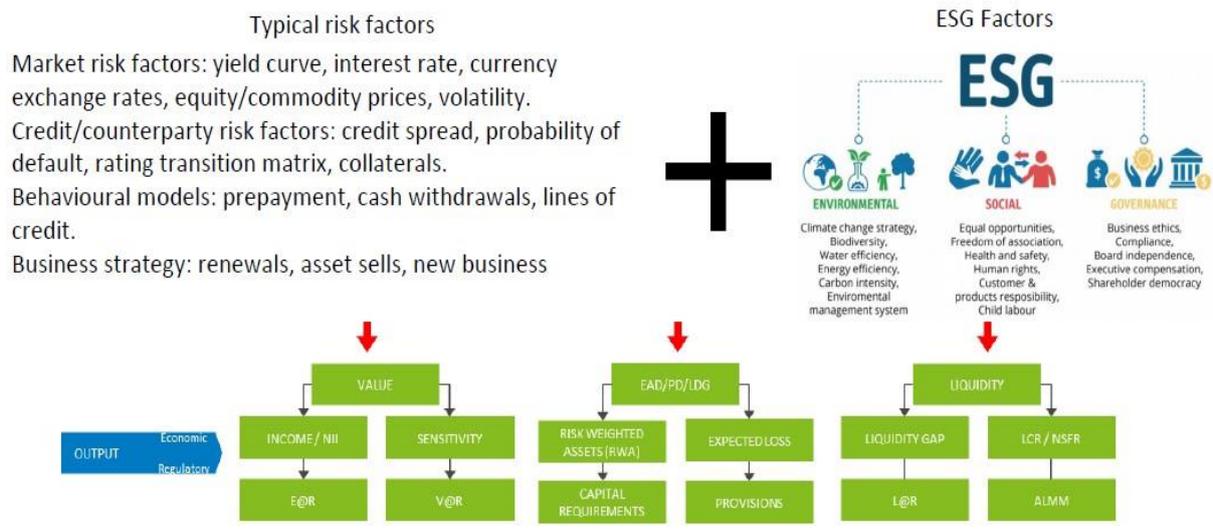


(Source: Wolters Kluwer’s webinar, third of March 2022)

These ESG “ingredients” impose to turn climate and environmental risks into financial risks as a complex contribution of different risk factors, like the following:



Hence, to afford this transition, we must implement a new kind of stress testing architecture to ensure that this framework could operatively works out, *i.e.*, as follow:

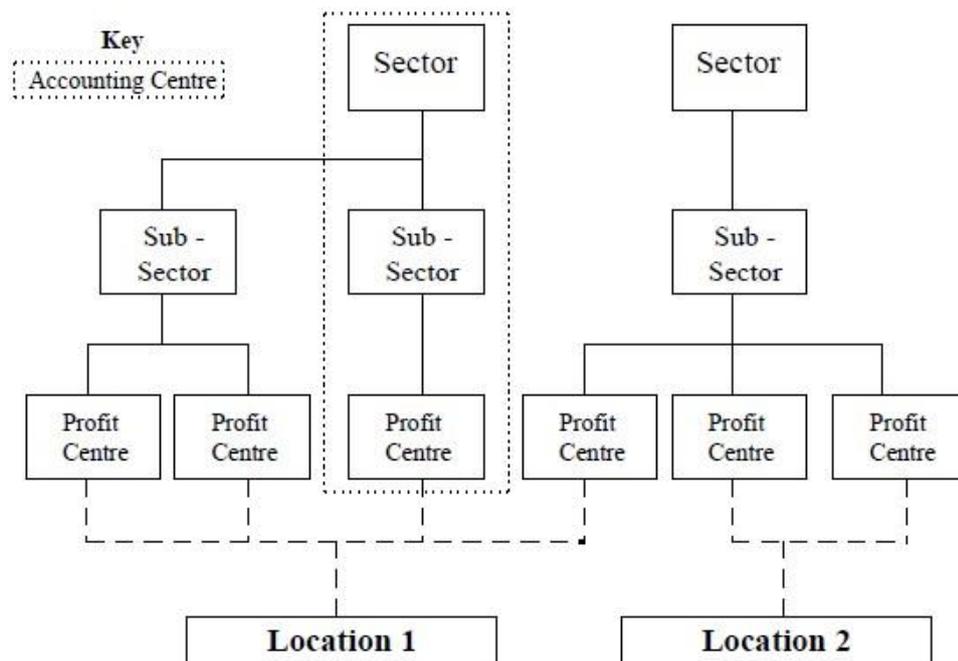


This general scheme is a demonstration that the CFOs and the CROs in a bank must tightly cooperate to front the ESG transition connecting financial and risk functions.

This said, it looks fundamental for a bank the availability of correct and updated high quality of internal data storage, to better execute resiliency. Surely, the main contribution silo for this need is the bank Master Ledger.

### The Bank Master Ledger, but, in Italy, it seems inexistent

The master ledger is the principal book of accounts that records similar transactions relating to a particular person, property, revenue, or expense, even from ESG; in other words, the master ledger is a set of accounts. The main function of the master ledger is to classify or sort out all the items appearing in the journal or the other subsidiary books under their appropriate accounts, so that at the end of the accounting period each account will contain the entire information of all the transactions relating to it in a summarised or condensed form. Banks have their master ledger as well as any other companies, but due to their extremely complexity, a bank master ledger cannot be really compared to any others as we commonly are used to check. Firmly keeping in mind that every banks are free to decide how to be internally organised, normally, the bank master ledger follows a structure accordingly to a four-tier hierarchy that uses to represent a multi-branch or multi-company environment. The following diagram shows the relationships between elements in the structure. Each element represents a level within the organisation.



The structure of an organisation forms one operating unit. The basic operating unit is the accounting centre, comprising of a sector, sub-sector and profit centre. Each accounting centre connects itself to one location, which can be any location. This means that sectors and sub-sectors can relate to various locations; however, each profit centre is only related to one location. Most activities in the system are undertaken at accounting centre level, and even though this also defines a location for the activity, the location is not seen. Every transaction is attributable to an accounting centre. Every user belongs to an accounting centre and all their transactions automatically contribute to it (this can be overridden at transaction level). In turn, each accounting centre and each user also belong to a location and all their transactions automatically contribute to it. An example of how these four definitions can interact to define an institution:

- *Sector* - Could define the head office (e.g. in France);
- *Sub Sector* - Could define branches in different countries (e.g. in China, Japan, America and Germany);
- *Profit Centre* - Could define dealers in the branches;
- *Location* - Could define geographical regions for consolidation of information (e.g. Europe, Asia and North America).

However, dealers from the China branch, working in Britain could come under either the Europe or Asia location. This is why, normally, the bank general ledger has different account numbers each of the appearing on the income statement or balance sheet following the kind of posting made on them by the users.

Therefore, especially if considering ESG, the economic sustainability crosses the banking system through the risk management and, with it, the quality of Bank DataMart.

Under this aspect, unfortunately, in Italy, it seems that the bank general master ledgers and, with them, the single bank journals and ledgers not always appear correct, or, worse, even existing. Everything sorted out from one of my personal initiatives activated through the Italian Courts in different Italian cities by 2018. Starting by a specific mortgage case, and then developing the same process and scheme to other loans, I asked for the internal bank accountancy that every banks should keep in their master ledgers to check from where the money lent by the Italian banks comes from. Another my query was about from which funds and deposits the money lent were registered, and

where the money repaid by the borrowers went, after the repayments. Furthermore, I asked the banks how they accounted these sums, if correctly or not, and to control the whole process of electronic transferring of this money, internally and externally of the banks, with the Authorities and Government offices, under the fiscal and tax aspects and *ex SID DWH*.

The result of this activity is that almost no banks answered to the Italian Courts about these specific requests, opening a formal dark chasm. For example, a bank declared that it could not show its master ledger to the Court because this bank did not find it. In another case, a bank declared that with over 12 millions of customers, and each of them having more than one financial instrument with it (e.g., mortgages, checking accounts), it is not possible to record each financial transaction of the customers. This bank even declared that all the money given and received goes recorded into a general and unspecific account, per macro entries, and it is not possible to retrieve which customer paid and for what he paid.

Another bank declared that no master ledger exists, but it is just able to find and produce the checking account statements. In other words, this bank declared that it is possible to extract some data, but not able to show the raw data from which it is possible operating this extraction. Another bank declared that has not any master ledgers and has not any historical records of the interest rate parameters for the adjustable-rate mortgages.

An Italian Judge ordered to access to the General Archive of a bank with two bailiffs to check what physically and effectively this bank was keeping as master ledger. After the first access, the bank officers declared that they did not know which software was actually in use by the bank, that many of the data were offline and not at the bank disposal. These officers declared that the bank owns just one master ledger with only two sectionals: one for Italy and one for the all the other Countries in the world where operate. Even more, these bank officers declared that the most part of the DataMart was offline, and kept outside the bank, so that almost nothing was available in the bank ledger.

## **Conclusion**

ESG transition calls for resiliency, especially during this period where uncertainty rules, and not only under economic and financial aspects. The importance of the quality of data prevails over the existence itself of the mandatory DataMart where these data must be. ENRON “lesson” seems not learned, at least in Italy. In fact, after several Italian judicial orders against the main local banks, not necessary Italian, to show their master ledgers and how they manage them, but it seems that none of them operates a correct journalism. Actually, the Italian Courts condemned almost all the banks operating in Italy for having applied a different interest rate on loans from the correct ones. Since, mandatory, banks record all the transactions, even these ones, the bank master ledgers must show them, correct or incorrect they could be. Another aspect is the quality of data: in fact, if a bank records a contract but if the revenue, from it, is different, this impossible conciliation would mislead the governance of the bank and, with it, the ESG transition model and all the other silos of contribution data for the bank.

The fact that, apparently, at this stage, no Italian banks is able to show their master ledgers, evidences the high probability of a new ENRON scandal, at higher level, regarding, this time, the Italian banks and not just a single Too-Big.-To-Fail company, like ENRON.

# International Factors Influencing the National Security Strategy of the South Caucasus

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## Abstract

Discussion of the situation for the countries of the South Caucasus region is very relevant. As you know, the reason for this lies in the existing unresolved conflicts, which hinder the joint efforts of Armenia, Azerbaijan and Georgia.

It should be noted that if the countries of the South Caucasus fail to develop a national security sector, they will lose much of their support from the international community. This, in turn, will lead to a significant decrease in the international commitment to resolve the conflicts in Nagorno-Karabakh, Abkhazia and the Tskhinvali region.

Therefore, the three countries of the South Caucasus region need to develop a new agenda that will help them build a stable democracy. The main efforts for this should be made by Armenians, Azerbaijanis and Georgians. However, the international community, and especially the US, the European Union and Russia must join their political forces to promote the development of free societies in these three countries, which we will discuss in more detail in this article.

Using the method of comparative analysis, I will try to identify international factors influencing the national security strategy of the South Caucasus. The article will be considered through the prism of the basic concepts of international relations.

**Keywords:** Regional Security, Stability, South Caucasus, Georgia, Armenia, Azerbaijan.

## Introduction

In the last decade, the foreign policy of all three countries of the South Caucasus has been much more dependent on regional security than it is now. As you know, despite the similarities in history, size, location and political systems, due to their involvement in interstate and intrastate military conflicts, the three states of the South Caucasus have chosen different paths of a foreign political union. Their multi-vector foreign policy strategies have strengthened the positions of non-regional actors. They are witnessing increasingly tense relations between Russia and the West in foreign policy.

The small and essentially weak states of the South Caucasus, experiencing protracted ethno-territorial conflicts with a sense of insecurity about their larger neighbours, are looking for allies with external regional actors to ensure their survival and security.

B. Buzan and O. Wæver define the regional security complex as a set of actors whose securitization and de-securitization are so intertwined that their security problems cannot reasonably be analyzed independently of each other<sup>1</sup>.

A closer examination shows that the South Caucasus does not have the general characteristics that would qualify it as such. Although the South Caucasus does not have many of the attributes of a region, there is one major common denominator - the interconnected security risks. The main security threats perceived by these states come from the region, even from its immediate vicinity. Any security dynamic that significantly affects one of the three countries has a clear impact on the other two. Thus, the South Caucasus qualifies as a separate regional security complex.

B. Buzan and O. Wæver also talk about the South Caucasus as a separate security division<sup>1</sup>. Svante Cornell, one of the leading researchers of the South Caucasus, also argues that without the "variable security" the South Caucasus can hardly be called a full-fledged region<sup>2</sup>.

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<sup>1</sup> Barry Buzan & Ole Wæver (2003), *Regions and Powers: The Structure of International Security*, Cambridge University Press, p. 44

The South Caucasus is very rich in deep historical enmity and friendship, such as the Armenian-Azerbaijani conflict, the military actions of Armenia against Turkey, the Georgian separatist conflict with national minorities, and the friendship of Azerbaijan and Armenia with Turkey and Russia, respectively. The roots of this enmity and friendship date back to the early 1900s, especially during the period of independence of 1918-20, which was characterized by wars and massacres - the inevitable result of the sharp intersection of territorial claims and hopeless mixing of the population. This short historical period, outside of direct Russian imperial rule, "now occupies a place of honour in the nationalist narratives of all the peoples of the South Caucasus as a hotbed of resentment and identity"<sup>3</sup>. Speaking of the European factor, we can start with the EU project in 1993, when the Europe-Caucasus-Asia (TRACECA) transport corridor project was launched. It is important to note that the purpose of this project was to connect Europe with the South Caucasus and Asia, bypassing the territory of Russia. Subsequently, the EU established the Eastern Partnership to deepen relations with Armenia, Georgia, Azerbaijan and other countries.

In addition to EU-led projects, the Black Sea Economic Cooperation (BSEC) - the organization's three-member countries - is also seen as a common framework for bridging economic gaps and working together to bring stability to the region<sup>4</sup>.

As in the CIS, GUUAM is perceived as a subgroup of the Black Sea Economic Cooperation (BSEC)<sup>5</sup> subgroup, and the regional interests of powerful member states (Russia, Turkey and Greece) often conflict with each other, hindering the success of cooperation<sup>6</sup>.

It is noteworthy that the EU is interested in cooperation with Azerbaijan on natural resources, as it sees Azerbaijan's oil and gas as an alternative to Russian energy sources. At the same time, Georgia's main foreign policy priority is accession to the European Union. In June 2014, Georgia signed an Association Agreement with the European Union, which provided for the creation of a deep and comprehensive free trade area between them. Armenia also seeks to strengthen cooperation with the EU and signed an Enhanced Partnership Agreement in 2017.

As for the influence of the United States, after the collapse of the USSR, they developed relations with the countries of the South Caucasus and strengthened their positions in the region. The United States has established a strategic partnership with Georgia, whose concept of national security includes membership in the North Atlantic Treaty Organization (NATO). All this is contrary to the interests of Russia, which is trying to contain the expansion of NATO along its borders. Russia sees this as a challenge to national security.

The fact is that Georgia paid dearly for cooperation with the United States, losing control over Abkhazia and the Tskhinvali region because Moscow recognized them as independent states, in response to the recognition of Kosovo's independence. As for Armenia and Azerbaijan, the US established relations with them in 1992. It should be noted that Armenia is a military ally of Russia, so the agenda of relations between Armenia and the United States is limited. It is noteworthy that the American company invested in oil and gas production facilities in the country, and the US military used Azerbaijan as a springboard for operations in Afghanistan.

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<sup>1</sup> Barry Buzan, *People, State and Fear; The National Security Problem in International Relations*, (Brighton: Wheatsheaf, 1983), p. 106

<sup>2</sup> Svante Cornel (2001), *Small Nations and Great Powers: A Study of Ethnopolitical Conflict in the Caucasus*, RoutledgeCurzon, p. 383

<sup>3</sup> Kevork Oskanian (September 2010) "Weaving Webs of Insecurity: Fear, Weakness and Power in the Post-Soviet South Caucasus", PhD dissertation, London School of Economics, p. 25

<sup>4</sup> A. Rondeli, "The Reflections of Globalization on the Security and Strategies of the Caucasus", op cit., p.246

<sup>5</sup> W. Schneider-Deters, "GUUAM: The Need for a Raison d'être", *Insight Turkey*, 3/4, 2001, p.115.

<sup>6</sup> T. Pataria and D. Darchiashvili, op cit, p.159

Interestingly, Russia still sees the South Caucasus in its sphere of influence. Armenia is a military ally of Russia, and Moscow has a military base in Gyumri, Armenia's second-largest city, and an airfield in the capital, Yerevan. Armenia is a member of the Russian-led Eurasian Economic Union (EEU) and the Collective Security Treaty Organization (CSTO). Armenia needs Russia to protect its western borders with Azerbaijan's main ally, Turkey, while Russia needs Armenia as a buffer to thwart the plans of some Turkish politicians to create a pan-Turkish state that includes Turkey, Azerbaijan, Central Asia and Xinjiang.

In light of current events, Turkey has gained strong political, economic, and military influence in the South Caucasus. It will remain tied to Azerbaijan for a long time due to its special relationship and growing influence. After the restoration of independence, Georgia established good relations with Turkey. The two countries have signed a free trade agreement and Turkey is Georgia's main trading partner.

After the collapse of the Soviet Union, Turkey and Azerbaijan came together to cooperate in the political, military, economic and energy fields. Both states share a common language and culture. Turkey's influence in Azerbaijan is enormous, as Ankara strongly supports Baku in its conflict with Armenia, unilaterally closing the Turkish-Armenian border. Turkey's participation in the 44-day war for Artsakh was crucial as Turkish military intelligence and air power helped Azerbaijan defeat the Artsakh-backed Armenian army, which was largely equipped with old weapons.

It is also important that China seeks to develop relations with Armenia, Georgia and Azerbaijan within the framework of its Global Infrastructure Exhibition "One Belt, One Road" (OBOR). China has invested hundreds of millions of dollars in Georgia and Azerbaijan, which are members of the Beijing-led Asian Infrastructure Investment Bank (AIIB). Azerbaijan received a \$600 million loan to build a trans-Anatolian gas pipeline, while Georgia received a \$114 million loan to build a bypass road.

Given the growing economic influence of China in the South Caucasus and its neighbours, the countries of the region are very interested in implementing the Belt and Road Initiative (OBOR). This seems to highlight how time is working for China, and Beijing's growing economic presence will also give it more political influence shortly.

## **Conclusion**

In conclusion, we can say that from the point of view of cooperation, the South Caucasus is ideally located. The region includes small countries that can provide significant assistance to each other. They have the opportunity to economically strengthen each other in terms of security and defend themselves against the aggression of other states. On the contrary, the South Caucasus has experienced many separatist conflicts and interstate wars.

Due to internal regional conflicts and inherent weaknesses of the state, the region is subject to the influence of larger neighbours, which plays an important role in shaping the dynamics of regional security. The fact is that membership or orientation towards conflict unions intensifies intra-regional disagreements, which further reduces the chances for a peaceful resolution of conflicts in the South Caucasus.

The fact is that the EU has long supported the countries of the South Caucasus in their efforts to implement economic and social justice and public administration reforms. In particular, organizations and institutions have emerged in Armenia and Georgia that protect human rights and freedom of speech, link the two countries with the values of the EU and democratically transform them.

The US continues to fund and support political parties in the region, helping to weaken Russia's influence and bring countries into the camp of the West. The countries of the South Caucasus continue to develop ties with the United States to maintain a balance of power in the region.

## **Bibliography**

- Buzan B., & Wæver O., (2003), *Regions and Powers: The Structure of International Security*, Cambridge University Press
- Buzan B., (1983) *People, State and Fear; The National Security Problem in International Relations*, (Brighton: Wheatsheaf)
- Cornel S., (2001), *Small Nations and Great Powers: A Study of Ethnopolitical Conflict in the Caucasus*, RoutledgeCurzon
- Oskanian K., (2010) "Weaving Webs of Insecurity: Fear, Weakness and Power in the Post-Soviet South Caucasus", PhD dissertation, London School of Economics
- Pataria T., and Darchiashvili D., (2003) "Security Regime Building in the South Caucasus", in Graeme P. Herd and Jennifer D.P. Moroney (eds.), "Security Dynamics in the Former Soviet Bloc", London: Routledge Curzon
- Rondeli A., (2003) "The Reflections of Globalization on the Security and Strategies of the Caucasus", in the Proceedings of the First International Symposium on "Globalization and International Security", The Turkish General Staff Military History and Strategic Studies Directorate (SAREM), Ankara: The Turkish General Staff Printing House
- Schneider-Deters W., (2001) "GUUAM: The Need for a Raison d'être", *Insight Turkey*, 3/4

# The Impact of Social Media Sentiment and Economic Policy Uncertainty on Digital Currency Volatility

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## Abstract

With the advent of the information age, digital finance has revolutionized the traditional financial industry. Digital currency is a typical symbol of digital finance, and we just can't afford to ignore it. Given the advancement of digital currency, the research on this topic is far behind the practice. Specifically, little is known about the nature of the digital currency market. Some researchers try to explain the market fluctuation by macro conditions, such as economic or political parameters; Others try to address this issue from a micro perspective, digging into text mining of news or posts. Founded on Social Cognitive Theory (SCT), this study proposes a comprehensive model that integrates both macro and micro factors to analyze the market volatility of the digital currency. In particular, for macro-level factors, we adopt the Economic Policy Uncertainty (EPU) index developed by the Federal Reserve Bank of St. Louis to reflect contextual conditions; for micro-level factors, we consider digital currency-related social media posts (Key Opinion Leaders), company events, and hacker news to reflect their distinct impacts. More importantly, we also investigate the interacting effect between macro and micro factors. Our work can contribute to theory and practice by presenting a context-specific and fine-grained conceptualization of the market volatility of the digital currency.

**Keywords:** digital finance, digital currency, social media.

**JEL code:** O33

## Introduction

With the advent of the information age, digital finance has achieved great success, continuously infiltrating people's daily life, and its importance in the financial market is also increasing. This new phenomenon also raised many unanswered questions waiting to be explored. For example, even though the wild volatility in cryptocurrency is well-known, most investors are still caught by surprise by the 99.9% drop in the Luna coin's prices, a sister of the stable-coin TerraUSD. 40 billion US Dollar market was wiped out overnight. None of the researchers can agree on what might lead to this instance. Apparently, the digital currency market is in an urgent need of studies investigating factors contributing to market fluctuation. Governments, on the other side, are very active in exploring the possibilities of digital currency. For example, in 2015, virtual currencies were defined as commodities by the US Commodity Futures Trading Commission (CFTC); In 2019, the People's Bank of China (PBOC) released the digital currency electronic payment, known as e-CNY. Japan, Korea, Russia, Canada, and many other countries are actively involved. To make rules and regulations for guiding the digital currency market, a more comprehensive understanding of the dynamic mechanism of the digital currency market is imperative.

This is what motivates us to dig into this field: to understand the digital finance market better and help the government make better policy guidance. Our study aims to conduct more in-depth research by developing a comprehensive conceptual framework integrating macro and micro factors and their impacts on digital finance market performance. This paper can fill the current research gap in digital finance, provide policymakers with some reference suggestions, and guide investors with some insights.

The following sections are organized as follows: the second section will provide a literature review. The third section will introduce social cognitive theory as our theoretical foundation, followed by our conceptual framework. Continually, the next section provide more detailed information of our research with research proposals. Finally, we will end our discussion with conclusions and limitations.

## **1. Literature Review**

At present, the research on digital finance is mainly carried out from either a macro perspective or a micro perspective. Some people take a macro view because changes in the economic policy uncertainty, population structure, regulatory environment, interest rate, and the inflation rate will impact the performance of digital finance. Some micro research views by researching people's opinions from financial news, press release, Twitter, and stock board, since related investors' views will affect the performance of digital finance. With limited research in this field, often time, the conclusions are inconsistent and sometimes contradictory to each other. Studies from a macro perspective can lead to conflicting findings, and the reflections from the micro point of view are only suitable for the short term, not for long-term application. The research on the digital finance market is suffered from isolated thoughts, therefore more integrative and longitudinal studies are in desperate need.

### **2.1 Macro-factor and Financial Performance**

Economic policy is one of the most significant factors in investigating financial market performance, among many macro factors. The interaction between monetary policy and asset price volatility began with the stock market turmoil in 2000 and 2007 and has attracted widespread attention. In 2016, Baker, Bloom, and Davis proposed that EPU can interpret policy uncertainty. The development of EPU has triggered a series of studies on policy uncertainty and Financial Performance. Liu & Zhang (2015) incorporated EPU into the existing volatility prediction model and compared the prediction capabilities of the model, and it was concluded that EPU is predictive of stock market volatility. Demir, Gozgor, Lau, and Vigne (2018) chose the rise and fall of bitcoin prices to represent financial performance, and the results proved that EPU also has predictive power for bitcoin. Shaikh (2020) also confirmed that the cost of Bitcoin is more sensitive to EPU in the United States, China, and Japan. Some studies showed that bitcoin is being used as a hedge against the stock market being influenced by the EPU (Wang, Xie, Wen, & Zhao, 2019; Mokni, Ajmi, Bouri, & Vo.,2020). Based on EPU (Baker et al., 2016), Davis (2016) established an indicator of global economic policy uncertainty, namely GEPU. GPU is derived by weighting the EPU of the top 20 countries in terms of output. Li, Ma, Zhang, and Zhang (2020) verified the relationship with China's stock market by decomposing the direction of GEPU, and the results showed that changes in GEPU can lead to high volatility in China's stock market.

#### **2.1.1 Population Structure and Digital Financial Performance**

Countries with younger demographics are also more open to adopting digital finance tools, such as Fintech. According to Ernst & Young FinTech Adoption Index in 2017, 48 percent of people whose ages ranged from 25- to 35-year-old are willing to adopt Fintech, and in the age interval of 35 to 44, 41% of the consumers are eager to embrace Fintech. However, in the population whose age is above 75, the percentage declined to 9%. That shows that young people are more willing to adopt Fintech. The report also indicates that Brazil, India, Mexico, South Africa, and China's average adoption of

Fintech is 46%; this also proves that countries with younger demographics are more willing to use Fintech. However, according to Baeck, Collins, and Zhang (2014), in P2P consumer lending, P2P business lending, and community shares, there are over half of 55-year-age consumers.

### **2.1.2 Regulatory environment and digital financial performance**

The rigor of the regulatory environment will impact digital financial performance. Rau(n.d.) proposed that clear regulations can promote the development of global crowdfunding platforms. Braggion Manconi and Zhu (2018) point out that when the upper limit of loan to value ratio is subject to stricter supervision, it will increase P2P credit demand. Buchak, Matvos, Piskorski, and Seru (2018) also proposed that shadow banking would be further developed when traditional banks face more excellent supervision. However, Navaretti et al. (2018) pointed out that if the regulatory environment of banks is relatively loose, these banks will make more investments in digital finance, which is conducive to promoting the development of digital finance.

### **2.1.3 Interest Rate and Digital Financial Performance**

The default risk can also measure digital financials like P2P's performance, and if it is high, the performance is poor. Otherwise, it is performing well. A high-interest rate will positively affect digital financial performance by pushing more loan burden on the borrower. According to Bester (1985), the higher interest rate will inhibit the borrower's ability to pay a debt and increase the possibility of default. However, Goel and Hasan (2011) point out that an economy with a higher lending rate will lower the default rate. Ghosh (2015) claims that the relationship between actual interest rates and non-performing loans is insignificant.

### **2.1.4 Inflation Rate and Digital Financial Performance**

The inflation rate is another macroeconomic index that shows the economic development level. Since high inflation erodes the actual value of borrowers' available funds and leads to more household spending, leading to higher delinquency rates. Ghosh (2015) finds that the probability of non-performing loans is relatively greater when commercial banks are in a period of high inflation. Nigmonov, Shams, and Alam (2022) also show a positive relationship between high inflation and default rates.

While studies at the macro level carry different angles, they are also embedded with conflicting conclusions or do not have strong evidence to show the relationship with digital financial performance. So some people try to understand it from a micro point of view.

## **2.2 People's Views On the Incident and Financial Performance (Micro-factor)**

A common manifestation of financial performance is the stock market. In the stock market, changes in shareholders' views on events will trigger changes in stock prices. In 1989, Cutler, Poterba, and Summers first proposed the research direction of predicting stock prices by analyzing investors' views on the stock market. With the introduction of this research, a series of studies on investor sentiment and stock market performance spurted out. According to the channels used to extract investor sentiment, a series of follow-up studies can be divided into three aspects: financial news, press releases, Twitter tweets, and stock board.

### **2.2.1 Financial News**

Financial news is a source of information considered by the public to be authoritative and reliable. As a trusted and concerned information source, a different tone of voice will also have other effects on investor sentiment, which will eventually have a different impact on the stock market's Performance (Gidofalvi & Elkan, 2001; Tetlock, 2007).

Gidofalvi and Elkan (2001) used naive Bayes classifiers to analyze text data and user data to train classifiers. The results show that financial news can predict short-term stock market trends. Schumaker, Zhang, Huang, and Chen (2012) collected financial information on Yahoo! Finance and used the AZFinText system and OpinionFinder tools with three emotional features of objective,

subjective and neutral to perform text analysis and model building on articles. The model's performance test on the stock market shows that positive and negative sentiments in financial news can affect the stock market. Tetlock (2007) focused on the "Wall Street Journal" "column synchronized with the market," studied the use of GI and Harvard IV-4 psychosocial dictionary to analyze the text, and used VAR estimation to prove the pessimism of the media and stock market transactions. There is a correlation between the quantities. Cohen-Charash, Scherbaum, Kammeyer-Mueller, and Staw (2013) selected five newspapers with the highest circulation as texts, used Lexis-Nexis for manual search, selected the target articles, and determined the inspirational words in them, using time series to test the results, the results obtained show that positive sentiment is positively correlated with the Nasdaq price, and vice versa, it is negatively correlated, verifying the correlation between financial news and stock market performance.

### **2.2.2 Press Release**

A press release is a manuscript that discloses material non-public information. The purpose of the company's public statement is to meet the requirements of the Securities Exchange Law (M. -. Mittermayer, 2004). Since press releases can reveal some unexpected data to the market, leading to volatility in the stock market, Mittermayer (2004) chose press releases for research. This research uses a different newscast to select learning examples, compile trading recommendations for text analysis, and establish models and market simulations for verification. The results show that the classification of news articles can provide better forecast information.

### **2.2.3 Twitter and Stock Board**

With the development of the Internet and the rise of social media, more and more people express their opinions and attitudes on social media and online forums (Luo et al., 2016).

As a representative of social media, Twitter has many users and has followed, like, and interactive functions. Yasir, Attique, Latif, Chaudhary, Afzal, Ahmed, and Shahzad (2020) proposed using tweets on Twitter to represent investor sentiment to study the correlation between tweets and stock market performance. The study selected five large-scale emergencies, analyzed 9 million related tweets through word lists and dictionaries, and used deep learning, linear regression, and support vector regression (SVR) methods to prove that the analysis of tweet text can Optimize the forecasting model. Bollen, Mao, and Zeng (2011) also analyzed Twitter tweets to represent public sentiment to study the relationship between public opinion on social media and stock market performance. The study first used OpinionFinder and GPOMS to generate public sentiment time series during Thanksgiving Day and the US presidential election and then trained a fuzzy neural network to predict DJIA. The results showed that the general sentiment state analyzed by Twitter could be used to predict the stock market. Performance. Zhou (2017) also pointed out that in the era of the gradual development of social media, the CEO as the vital opinion leader influences the changes in the stock market.

Internet forums give people a free place to discuss financial meetings more dedicated to discussing finance as a form of new media. Their posts will also impact stock prices (Tumarkin & Whitelaw, 2001). Duan & Zeng (2013) researched online forums, using the Guba forum with the most significant number of users and views in China, using the OpinionExtraction algorithm to divide the posts in the discussion into five types of opinions, analyzing and extracting emotions, using Bayesian theory Simulating stock returns, the results show that there is a relationship between online forum news and stock market performance. Hallett (2007) used event research methods to study the impact of message boards on the stock market, and the results strongly proved that message boards have a significant effect on the stock market.

In the above methods of using text analysis to predict the stock market, the main innovations focus on using different types of text for analysis; second, research focus on various innovative research methods. On the one hand, it is to improve the text analysis process to obtain more accurate text classification and sentiment analysis; on the other hand, it is to innovate in machine learning.

However, these innovations focus on short-term events or data that may lose their effectiveness with time changes and cannot explain the difference in the long run.

The existing macro or micro research literature fails to provide an accurate picture of digital financial performance. To fill the gap, we believe it is essential to consider both macro and micro factors and the interaction of the two.

### **3. Social Cognitive Theory (SCI)**

The social cognition theory is Holt's concept in 1933 and originated from psychology. Bandura (1986) named the new approach in the book the idea of social cognition. This theory points out that personal knowledge will interact with external media, social interaction, and experience to influence people's behavior. In other words, people's behavior will be affected by the environment and individuals. Bandura (2001) introduces SCI into the mass media, suggesting that people's thoughts, emotions, and behaviors will be affected by the spread of social media symbols. Bandura (2011) applies SCI theory to solve global problems by promoting the application of family planning policies through the media, indicating that policies and the superimposed influence of the media will affect people's behavior together. Bandura also showed that based on social cognition theory, a large amount of repeated information and images presented in mass media would be processed and encoded by the audience, which may amplify the potential impact of media. SCT is now widely used in education, workplace management, and organizational behavior (Lent, Brown, and Hackett,1994), the related research distributed among business, education, and psychology. Our research adopts a social cognitive theory perspective to integrate macro and micro-level factors, considering specific and contextual influences.

### **4. Conceptual Model**

In our research model, we use EPU to indicate macro influence. Baker, Bloom, and Davis (2016) proposed that policy uncertainty can be measured using EPU. They initially developed EPU through the manual reading of 12,000 newspapers and commercial data verification. We adopt the EPU since it is a comprehensive index, summarizing different macro influences, such as fiscal policy, monetary policy, health care situation, national security, regulation, financial supervision, sovereign debt, currency crises, rights plan, and trade policy. In particular, we adopt the Economic Policy Uncertainty (EPU) index developed by the Federal Reserve Bank of St.Louis, which owns higher credibility and is generally accepted by researchers, with weekly frequency data and updating.

Since social media is the most-used channel for news and updates, we will consider social media posts as our primary sources of micro influences. Specifically, we divide them into three aspects: Key Opinion Leader (KOL)'s digital currency-related social media posts, company events (companies with significant shares of digital currency), and hacker news. We select nine KOL from three categories: famous digital currency investors, entrepreneurs who own businesses out of the digital currency area, and others. Among them, we selected two investors, Anthony Pompliano, Tyler and Cameron Winklevosse based on 1 million Twitter followers, and we selected three industrialists, Elon Musk, Micheal Saylor, and Warren Buffett, based on 1.5 million Twitter followers, and selected Vitalik Buterinc, Charlie Lee, Tone Vays, and Layah Heilpern 4 key opinion leaders with the standard of 200,000 followers. We decided on the top 10 companies with the most significant digital coin holdings published on the buybitcoin worldwide website and collected posts on their Twitter accounts and Bitcoin-related tweets for the company events. These ten companies include MicroStrategy and Tesla. Galaxy Digital Holdings, Voyager Digital LTD, Marathon Digital Holdings Inc, Square Inc., Hut 8 Mining Corp, Riot Blockchain, Inc., Core Scientific, and Bitfarms Limited. For hacker news, we choose the loss of more than tens of millions from the hacker news of hacker network attacks, offline physical robbery, and system internal loopholes for research.

Specifically, we will focus on the digital currency market as a representative of the digital financial

market. Since bitcoin, Ethereum, and Ethereum are the three most popular digital currencies and have received the most attention, we choose to investigate the market fluctuation of these three digital currency to understand their underlined mechanism for changes. After checking the main fluctuation period of the digital currency, we define the time frame for our study as four years, from January 2018 to January 2022.

Figure 4.1 shows the basic conceptual framework of this research. The figure shows independent, dependent variables and contextual variables. The box on the left represents micro-level factors, and the box in the middle represents macro-level factors. The box on the right represents the performance of the digital currency. The arrows connecting the boxes in the middle and the line between the micro-level variable and digital currency performance represent the macro-level variable's moderate effect.

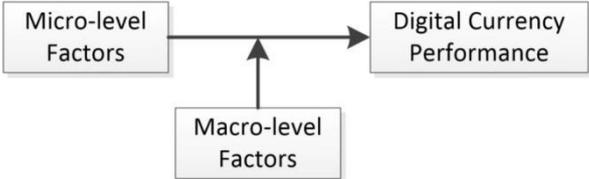


Figure 4.1 Research Conceptual Framework

The figure below (Figure 4.2) shows a detailed research conceptual framework. For the micro-level factors part, we will consider three factors: key opinion leaders' posts on Tweets, company events, and hacker news. For the digital currency performance, we use Bitcoin, Ethereum, and Dogecoin weekly returns to represent. For the macro-level factors, we choose EPU, which contains a fiscal policy, monetary policy, health care, situation, and national security to represent. Considering that changes in the trading volume of institutional investors holding a large amount of currency will significantly affect market performance, we decide to take a weekly trading volume of 10 significant institutions as a control variable to remove the influence of institutional trading volume factors on the study.

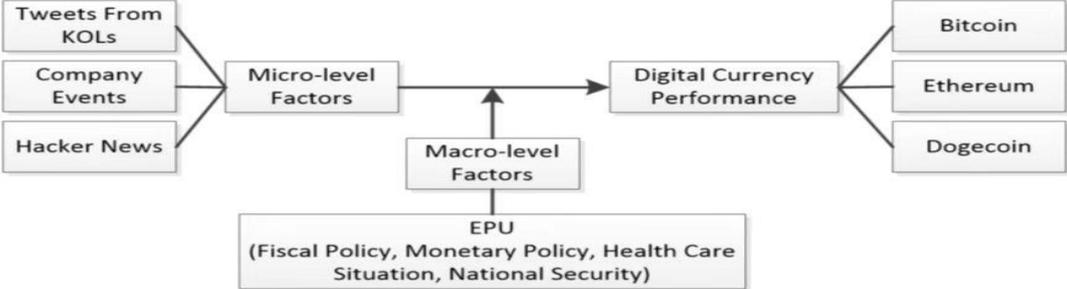


Figure 4.2 Detailed Research Conceptual Framework

**5. Research Proposals**

**5.1 EPU and Digital Currency Price Return**

EPU as an index can show the economic and policy uncertainty. The stability of the financial and policy situation will influence the digital currency market performance. Wang, Li, Shen, and Zhang (2020) find out that the highest EPU will lead to the highest BTC return, and the lowest EPU will lead to the lowest BTC return. However, Demir, Gozgor, Lau, and Vigne (2018) find that EPU negatively relates to bitcoin return. Yen and Cheng (2021) even claim that the EPU in America and Japan has no relationship with digital currency volatility. Based on the above literature review, we propose the following hypothesis:

**Proposal 1:** EPU has a positive relationship with digital currency return in America.

**5.2 KOL's Post and Digital Currency Return**

Twitter is a place where people can communicate, share opinions and follow others. People's views on Twitter will be spread around and influence others. The influential power is even more significant when this tweet is by a KOL. Bollen, Mao, and Zeng (2011) have proved Twitter's prediction ability for the financial market. Sattarov, Jeon, Oh, and Lee (2020) claim that Twitter's sentiment will influence the performance of Bitcoin. Georgoula, Pournarakis, Bilanakos, Sotiropoulos, and Giaglis (2015) point out that the sentiment ratio of Twitter has a positive relationship with the Bitcoin price. Based on the above literature review, we propose the following hypothesis: Zaman, Yaqub, and Saleem (2022) also point out that the number of tweets by Elon Musk has a positive relationship with Bitcoin price. They also claim that the sentiment of Elon Musk's tweet does not affect the Bitcoin price. Ante (2021) also believes that Elon Musk's tweet has a positive relationship with digital currency, especially dogecoin, and points out that the KOL on Twitter has significantly influenced digital currency performance.

**Proposal 2:** The sentiment from the KOL's post has a positive relationship with digital currency return in America.

### **5.3 Company's Event and Digital Currency Return**

Investors of digital currency tend to pay attention to the trend of big companies' events, and the posts of these companies on Twitter may cause investors' attention and mood changes, thus affecting the price of digital currency. Using tagged tweets, Sprenger, Tumasjan, Sandner, and Welpé (2014) find that the sentiment of company-related tweets has a positive relationship with digital returns. However, Mironeanu, Irimia, Săndulescu, and Teodoroiu, in 2021, point out that the post of the tesla investment in bitcoin has no or even negative effect on the bitcoin price. Based on the above literature review, we propose the following hypothesis:

**Proposal 3:** The sentiment from the company's tweet positively relates to digital currency return in America.

### **5.4 Hacker News and Digital Currency Return**

Because of the decentralized feature of the digital currency, the digital currency market lacks regulation, which will eventually affect serious security issues, and one of the most dangerous of those issues is the hack attack (Cheah & Fry, 2015). For example, there was a hack attack that affected bitcoins by about 9 million dollars, and the market price of bitcoins shrank to 0.01% of the cost before the attack in June 2011 (Plassaras, 2013). Based on Strum's research, such hacking events that cause significant price changes will negatively affect investment confidence (2003) and further affect financial performance (Jansen & Nahuis, 2003). Based on the above literature review, we propose the following hypothesis:

**Proposal 4:** The hacker news negatively affects digital currency return in America.

### **5.5 EPU Index and Micro-Level Factors**

In 2011, When Bandura solved global social problems, the macro perspective was introduced into the original social cognitive theory, which illustrates the adjustment effect of macro factors on micro factors. The contextual variable is an environmental factor that will strengthen or weaken the relationship between the dependent and independent variables. According to Zhang, Zhu, and Liu (2012), contextual variable culture has a specific moderate effect on micro-factors of adoption of mobile commerce. Here, we consider EPU as an environmental factor that will have a moderating influence between the micro-level factors and digital currency performance.

Since the positive sentiment of KOL's post will cause people to be favorable of digital currency performance, the relationship between the KOL's post and digital currency performance is positive. According to Anamika, and Subramaniam (2022), when the S&P 500 is rising, as is the case with environmental variables, the herding behavior of investors caused by public information increases and causes the digital currency price to increase in the end. Here, we also assume the contextual variable's addition will enhance the positive relationship between the KOL's post and digital currency

performance. That means investors will be more willing to invest the digital currency when the environment is good.

The company event is also positively related to digital currency performance, that is because when the related company event is good, investors will invest in the digital currency and lead to a positive digital currency return. In the reverse situation, investors will sell the digital currency, and a declining price may occur. Based on Anamika and Subramaniam’s research (Anamika and Subramaniam, 2022), we can predict that the contextual variable will strengthen the influence of the herding behavior caused by public information, that is S&P 500 and the digital currency price will be affected on a deeper level. Therefore, we also assume the contextual variable here will enhance the positive relationship between individuals factors with market performance.

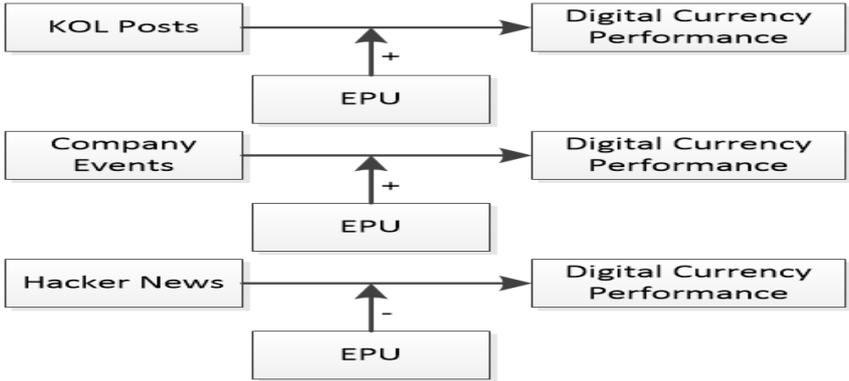


Figure 5.1  
Effect of

Micro-Level Factor

The  
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The hacker news will disturb investors and cause a price decline in the digital currency, so they are negatively related. As a contextual variable decreases, the negative relationship between the hacker news and the digital currency performance will be enhanced. According to Lyócsa, Molnár, Plíhal, and Širaňová (2020), hacker new announcements are more concentrated and have a more significant impact on bitcoin volatility when the environment is more fragile. It shows that the hacker news will bring stronger nervousness to investors, leading to a more violent selling tendency when the economic environment is terrible.

**Proposal 5:** EPU index moderates KOL’s posts, company events, and hacker news as a contextual variable.

**6. Limitations**

This research mainly has three limitations: first, this research has no data analysis and data support; second, the micro and macro-level factor this paper chose are limited. This paper chose the EPU index from all macro-level factors and KOL’s posts, company events, and hacker news from all micro-level factors; thirdly, this paper does not consider the timing factor. This paper has not evaluated the impact of the last timing period on the next timing period. After collecting the data, considering more factors from both the macro and micro-level, and analyzing the timing factor in the future, we can propose a more comprehensive paper.

**Conclusion**

We build a research model which integrates macro and micro-level factors and researches the influence of these factors on digital currency performance. We propose four hypotheses based on the literature review and the conceptual model. Our research has four main contributions: firstly, it can fill the gap in the digital finance area by giving an integrated perspective that concludes macro and micro-level factors. Secondly, we envision that our paper can guide policymakers in making the policy. Thirdly, this research can as a reference for teaching and regulating some of the discourse on Twitter

and as a guide for controlling the content of press releases. Fourthly, our research results can provide investors with a more comprehensive perspective and a reference to hedging the risk from the policy and economic environment.

## References

- Anamika, A., & Subramaniam, S. (2022). Do news headlines matter in the cryptocurrency market?. *Applied Economics*, 1-17.
- Ante, L. (2021). How Elon Musk's twitter activity moves cryptocurrency markets. Available at SSRN 3778844.
- Baek, P., Collins, L., & Zhang, B. (2014). Understanding alternative finance. The UK alternative finance industry report, 2014.
- Bandura, A. (1986). Social foundation of thought and action.
- Bandura, A. (2001). Social Cognitive Theory of Mass Communication. *Media Psychology*, 3, 265–299.
- Bandura, A. (2011). The social and policy impact of social cognitive theory. *Social psychology and evaluation*, 33-70
- Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593–1636.
- Bandura, A. (2001). Social Cognitive Theory of Mass Communication. *Media Psychology*, 3, 265–299.
- Bester, H. (1985). Screening vs. rationing in credit markets with imperfect information. *The American economic review*, 75(4), 850-855.
- Bollen, J., Mao, H., & Zeng, X. (2011). Twitter mood predicts the stock market. *Journal of Computational Science*, 2(1), 1–8. <https://doi.org/10.1016/j.jocs.2010.12.007>
- Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2018). Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*, 130(3), 453–483. <https://doi.org/10.1016/j.jfineco.2018.03.011>
- Cheah, E.-T., & Fry, J. (2015). Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin. *Economics Letters*, 130, 32–36. <https://doi.org/10.1016/j.econlet.2015.02.029>
- Cohen-Charash, Y., Scherbaum, C. A., Kammeyer-Mueller, J. D., & Staw, B. M. (2013). Mood and the market: can press reports of investors' mood predict stock prices? *PloS one*, 8(8), e72031.
- Davis, S. J. (2016). *An index of global economic policy uncertainty* (No. w22740). National Bureau of Economic Research.
- Demir, E., Gozgor, G., Lau, C. K. M., & Vigne, S. A. (2018). Does economic policy uncertainty predict the Bitcoin returns? An empirical investigation. *Finance Research Letters*, 26, 145-149.
- Duan, J., & Zeng, J. (2013). Mining opinion and sentiment for stock return prediction based on web-forum messages. *2013 10th International Conference on Fuzzy Systems and Knowledge Discovery (FSKD)*, 984–988.
- EY FinTech Adoption Index in 2017(2017) *Ernst & Young* p6. Retrived from: [https://assets.ey.com/content/dam/ey-sites/ey-com/en\\_gl/topics/banking-and-capital-markets/ey-fintech-adoption-index-2017.pdf](https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/ey-fintech-adoption-index-2017.pdf)
- Georgoula, I., Pournarakis, D., Bilanakos, C., Sotiropoulos, D., & Giaglis, G. M. (2015). Using time-series and sentiment analysis to detect the determinants of bitcoin prices. Available at SSRN 2607167.
- Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states. *Journal of financial stability*, 20, 93-104.
- Gidofalvi, G., & Elkan, C. (2001). Using news articles to predict stock price movements. *Department of Computer Science and Engineering, University of California, San Diego*.
- Global FinTech Adoption Index 2019 (2019) *Ernst & Young* Retrived from: [https://assets.ey.com/content/dam/ey-sites/ey-com/en\\_gl/topics/banking-and-capital-markets/ey-global-fintech-adoption-index.pdf](https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/ey-global-fintech-adoption-index.pdf)
- Goel, R. K., & Hasan, I. (2011). Economy-wide corruption and bad loans in banking: international evidence. *Applied Financial Economics*, 21(7), 455-461.
- Hallett, A. (2007). *The impact of electronic message board takeover rumours on the US equity market*. Working Paper (Australian National University).
- Holt, B. E. (1933). Animal drive and the learning process. An essay toward radical empiricism. *The Journal of Nervous and Mental Disease*, 78(5), 554.
- Jansen, W. J., & Nahuis, N. J. (2003). The stock market and consumer confidence: European evidence. *Economics Letters*, 79(1), 89–98. [https://doi.org/10.1016/S0165-1765\(02\)00292-6](https://doi.org/10.1016/S0165-1765(02)00292-6)
- Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of vocational behavior*, 45(1), 79-122.
- Li, T., Ma, F., Zhang, X., & Zhang, Y. (2020). Economic policy uncertainty and the Chinese stock market volatility: Novel evidence. *Economic Modelling*, 87, 24-33.
- Liu, L., & Zhang, T. (2015). Economic policy uncertainty and stock market volatility. *Finance Research Letters*, 15, 99–105.
- Luo, B., Zeng, J., & Duan, J. (2016). Emotion space model for classifying opinions in stock message board. *Expert Systems with Applications*, 44, 138–146. <https://doi.org/10.1016/j.eswa.2015.08.023>
- Lýócsa, S., Molnár, P., Plíhal, T., & Širaňová, M. (2020). Impact of macroeconomic news, regulation and hacking exchange markets on the volatility of bitcoin. *Journal of Economic Dynamics and Control*, 119, 103980.
- Manconi, A., Braggion, F., & Zhu, H. (2018). Can Technology Undermine Macroprudential Regulation? Evidence from Peer-to-Peer Credit in China.
- Can Italy grow out of its NPL overhang? A panel threshold analysis. *Economics letters*, 159, 185-189.
- Mironeanu, A., Irimia, B., Săndulescu, V., & Teodoroiu, C. (2021). The impact of Tesla's bitcoin investment and its plans to accept it as payment method on the evolution of bitcoin. In *Proceedings of the International Conference on Business Excellence* (Vol. 15, No. 1, pp. 58-74).
- M. -. Mittermayer. (2004). Forecasting Intraday stock price trends with text mining techniques. *37th Annual Hawaii International Conference on System Sciences, 2004. Proceedings of The*, 10 pp. <https://doi.org/10.1109/HICSS.2004.1265201>

- Navaretti, G. B. mname, Calzolari, G. mname, Mansilla-Fernandez, J. M. mname, & Pozzolo, A. F. mname. (2018). Fintech and Banking, Friends or Foes? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3099337>
- Nigmonov, A., Shams, S., & Alam, K. (2022). Macroeconomic determinants of loan defaults: evidence from the US peer-to-peer lending market. *Research in International Business and Finance*, 59, 101516.
- Plassaras, N. A. (2013). Regulating Digital Currencies: Bringing Bitcoin within the Reach of IMF Comment. *Chicago Journal of International Law*, 14(1), [i]-408.
- Rau, R. (n.d.). *Law, trust, and the development of crowdfunding*. 49.
- Sattarov, O., Jeon, H. S., Oh, R., & Lee, J. D. (2020). Forecasting Bitcoin price fluctuation by Twitter sentiment analysis. In 2020 International Conference on Information Science and Communications Technologies (ICISCT) (pp. 1-4). IEEE.
- Schumaker, R. P., Zhang, Y., Huang, C. N., & Chen, H. (2012). Evaluating sentiment in financial news articles. *Decision Support Systems*, 53(3), 458-464.
- Shaikh, I. (2020). Policy uncertainty and Bitcoin returns. *Borsa Istanbul Review*, 20(3), 257–268.
- Sprenger, T. O., Tumasjan, A., Sandner, P. G., & Welpe, I. M. (2014). Tweets and trades: The information content of stock microblogs. *European Financial Management*, 20(5), 926-957.
- Sturm, R. R. (2003). Investor Confidence and Returns Following Large One-Day Price Changes. *Journal of Behavioral Finance*, 4(4), 201–216. [https://doi.org/10.1207/s15427579jpfm0404\\_3](https://doi.org/10.1207/s15427579jpfm0404_3)
- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of finance*, 62(3), 1139-1168.
- Tumarkin, R., & Whitelaw, R. F. (2001). News or noise? Internet postings and stock prices. *Financial Analysts Journal*, 57(3), 41–51.
- Wang, G. J., Xie, C., Wen, D., & Zhao, L. (2019). When Bitcoin meets economic policy uncertainty (EPU): Measuring risk spillover effect from EPU to Bitcoin. *Finance Research Letters*, 31.
- Wang, P., Li, X., Shen, D., & Zhang, W. (2020). How does economic policy uncertainty affect the bitcoin market?. *Research in International Business and Finance*, 53, 101234.
- Yasir, M., Attique, M., Latif, K., Chaudhary, G. M., Afzal, S., Ahmed, K., & Shahzad, F. (2020). Deep-learning-assisted business intelligence model for cryptocurrency forecasting using social media sentiment. *Journal of Enterprise Information Management*.
- Yen, K. C., & Cheng, H. P. (2021). Economic policy uncertainty and cryptocurrency volatility. *Finance Research Letters*, 38, 101428.
- Zaman, S., Yaqub, U., & Saleem, T. (2022). Analysis of Bitcoin's price spike in context of Elon Musk's Twitter activity. *Global Knowledge, Memory and Communication*.
- Zhang, L., Zhu, J., & Liu, Q. (2012). A meta-analysis of mobile commerce adoption and the moderating effect of culture. *Computers in human behavior*, 28(5), 1902-1911.
- Zhou, H. (2017). Can CEO Activities in Social Media Networks Affect The Firm Value And The Firm Performance?. Erasmus University Rotterdam.

## **Evaluation of LEED-certified Office Buildings in Turkey in Terms of Water Efficiency**

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### **Abstract**

Water is the substance that ensures the continuity of life and that all living things have to meet and use on common ground. However, industrial developments, advancements in technology, and global warming have negatively affected water as well as other environmental damages. Water pollution and population growth reduce the amount of potable water day by day. The unconscious use of water in buildings negatively affects the future of water. Therefore, one of the main goals of the green building certifications, which have emerged to reduce the negative environmental impacts of buildings, is to protect the amount and quality of water. In this context, the aim of this study is to examine the evaluation criteria related to water efficiency in LEED green building certification and evaluate water-saving methods that ensure water efficiency in order to achieve the highest score in LEED evaluation. Within the framework of this aim, the water saving methods of twenty-two LEED-certified office buildings in Turkey were investigated. Generally, it was determined that LEED-certified green office buildings in Turkey provide water-saving through low water usage armatures and less water-required landscaping. Moreover, it was ascertained that rainwater harvesting systems and greywater systems are not preferred due to both the high initial investment cost and the fact that they are not mandatory in LEED certificate evaluation.

**Keywords:** Water Efficiency, Domestic Water Consumption, LEED, Office Buildings.

# How Artificial Intelligence is acting as an Enabler to achieve Sustainable Development?

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## Abstract

The 21st century is said to be the age of data revolution where sustainable development should be the primary concern of mankind. In this regard, Artificial Intelligence offer some wonderful avenues in its application where the defined sustainable development goals of United Nations can be achieved both efficiently and effectively.

**Keywords:** sustainable development, sustainable development goals, enabler, artificial intelligence, AI, technology and development.

## I. INTRODUCTION

The 1968 film, 2001: A Space Odyssey, featured an intelligent computer named HAL 9000 as an antagonist who had a human personality. This encapsulated the optimism that Artificial Intelligence (AI) will be an integral part of everyday human life by 2001. It proved to be a false dawn since the bubble was reared on science-fiction movies propagating false expectations. AI has made a comeback recently after years of exile and rehabilitation.

John McCarthy coined the expression ‘Artificial Intelligence’ in a conference in 1956 for a field of computer sciences which could capture or mimic human abilities. In a more recent interpretation, AI is defined in terms of self- learning, adaptive systems [1]. AI possesses the functions of perception<sup>1</sup>, decision making<sup>2</sup>, automatic knowledge extraction<sup>3</sup>, data pattern recognition<sup>4</sup>, interactive communication<sup>5</sup>, and logical reasoning<sup>6</sup>. In the modern times, artificial intelligence is deeply interlinked with environmental outcomes, economic productivity (recent studies predict a 15.7 trillion US dollars economic impact by year 2030)<sup>7</sup>, and social equality; the three pillars of sustainable development as per United Nations ECOSOC agenda<sup>8</sup>.

## II. APPLICATIONS OF ARTIFICIAL INTELLIGENCE

Before analyzing the role of Artificial Intelligence in sustainable development, a brief overview of AI’s application in four main domains of the human society, namely education, healthcare, agriculture, and governance are provided below:

### A. AI for Education

Education is categorized as a ‘social elevator’ being a core resource to drive prosperity [2]. Therefore, it is pertinent to ensure the universal accessibility of quality education<sup>9</sup>

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<sup>1</sup> Perception includes multiple types of sensory recognitions including visual, text-based, audio, and tactile recognition.

<sup>2</sup> For example, medical prognosis and diagnosis systems.

<sup>3</sup> This filters information through big data analysis.

<sup>4</sup> E.g., data discovery of hate speech on social media.

<sup>5</sup> It includes social robots and chat bots, etc.

<sup>6</sup> For example, theory development from premises.

<sup>7</sup> <http://www.pwc.com/AI> ; See also, Linné FLOW Centre, KTH Mechanics, SE-100 44 Stockholm, Sweden

<sup>8</sup> <https://www.un.org/ecosoc/en/content/promoting-sustainable-developmen>

<sup>9</sup> The Blue DOT: issue 9 (2018) Artificial intelligence and the future of education. UNESCO MGIEP. Accessed June 2021: <https://www.schooleducationgateway.eu/en/pub/resources/publications/the-blue-dot-issue-9-ai-in-edu.htm>

Not only varied teaching methodologies that can be adaptive to each person's learning needs, but also inclusive education of disadvantaged groups including women can be achieved through the applications of AI [3].

In the words of Director General of UNESCO, Ms Audrey Azoulay: "Education will be profoundly transformed by AI. Teaching tools, ways of learning, access to knowledge, and teacher training will be revolutionized"<sup>1</sup>.

Argentina has created an ecosystem of educational innovation where teachers are provided with training to utilize AI tools. An adaptive mathematics program has been developed which is accessed by students across the country since the government sees its role empowering both the private and public education sectors. Similarly, Niger which has the youngest population in the world with the literacy rate of 30%, has started developing 'smart villages' connecting 15,000 villages with education. Moreover, NGO War Child Holland is helping refugees to read and learn through a series of games. Chinese middle schools have also embraced a new ICT curriculum which promotes students' information consciousness, digital learning, computational thinking, and responsibilities for the information society [4]. An AI-assisted global virtual school named 'Tella' has been opened by Finland to teach students via cloud technology. In short, all the abovementioned case studies suggest that the countries are tapping the potential of AI to achieve sustainability in their regions.

### *B. AI for Healthcare*

From providing mobile health to medical robotics, AI has revolutionized the healthcare administration. COVID-19 proved exceptional role of AI in fighting the pandemic. AI cannot only optimize workflows in hospitals, but also has capabilities for improved patients' care. For example, England is harnessing the benefits of 'BenevolentAI' which provides the suitable treatment to the right patients at the right time utilizing deep learning<sup>2</sup>. Similarly, 'Freenome' utilizes AI for diagnostic tests, screenings, and blood groups for cancer detection at the earliest stages.

In Israel, Zebra Medical Vision provides an AI-enabled assistant to the radiologists providing clinical findings after automatically analysing the imaging scans for diagnostic purposes. *Google DeepMind Health*, an AI software is used by hospitals all around the world to move patients from testing stage to treatment efficiently and effectively. Undoubtedly, AI is mapping the unbounded opportunities in healthcare.

### *C. AI for Food and Agriculture*

Developed countries are using AI for farm management and predictive analysis based on data from crop, soil, weather, etc. Smart agriculture has profound impacts on both the quality and quantity of food production. In America, Blue River Technology is assisting the farmers to control weeds using a robot called 'See & Spray' to prevent herbicide resistance benefitting the corn and soybean crops by \$43 billion<sup>3</sup>. Similarly, 'aWhere' uses machine learning<sup>4</sup> algorithms connected with satellites to predict weather, analyze crop sustainability, and detect pests and diseases. To address the challenges of labor force, 'Harvest CROO Robotics' can harvest eight acres in a single day replacing thirty human laborers<sup>5</sup>. Recently, to preserve agricultural production against locusts' attacks in Pakistan, local drones were deployed to fight against food insecurity. Hence, AI can even revolutionize the agricultural economy of developing countries.

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<sup>1</sup> Accessed in September 2021: <https://unesdoc.unesco.org/ark:/48223/pf0000370308>

<sup>2</sup> Deep Learning uses multi-layered data which is unstructured or unlabelled to use it for making its own decisions.

<sup>3</sup> <https://emerj.com/ai-sector-overviews/ai-agriculture-present-applications-impact/>; For demonstrated video of the technology, click here: <https://youtu.be/-YCa8RntsRE>

<sup>4</sup> Machine Learning means that the algorithms learn and improve autonomously from its previous experiences and data inputs.

<sup>5</sup> For demonstrated video, click here: <https://youtu.be/5chk9Sory88>

#### D. AI for Law and Governance

The deployment of AI in law and governance can ameliorate multiple structural and functional discrepancies. Corruption-free, transparent, accountable, inclusive, equitable, cost-effective, efficient, and environmental- friendly mechanism can be ensured as a result.

In Europe, one of the countries revolutionizing its machinery through the usage of artificial intelligence is Estonia. From its e-residency program<sup>1</sup> to the national ID smartcard<sup>2</sup>, the deep learning algorithms have automated several functions of government. To check whether the subsidized farmers are following the rules, Estonia has deployed algorithms which scan the satellite images and determine their results. Additionally, on the direction of Estonian Ministry of Justice, the chief data officer of Estonia designed a program where robot judges were inducted for the disputes having claims of less than 7000 euros. Since 2011, Netherlands is using AI to render e-court judgments in cases related to debt collection. Similarly, the US criminal justice system has *Correctional Offender Management Profiling for Alternative Sanctions (COMPAS)*, which is an assessment tool for analyzing the risks of recidivism in criminal defendants through a data algorithm. Hence, countries globally are moving towards smart governance and the future seems optimistic.

### III. AI AND UN SUSTAINABLE DEVELOPMENT GOALS

The United Nations established seventeen sustainable development goals (SDGs) for its 2030 agenda when all 193 member states adopted the UNGA resolution in 2015 called “Transforming our world: the 2030 Agenda for Sustainable Development”<sup>3</sup>.

The seventeen SDGs are further divided into 169 targets whose progress and success is being measured by 232 monitoring indicators<sup>4</sup>. According to a documented report demonstrated in Figure 1, AI has an integral role in achieving the Sustainable Development Goals acting as an enabler for 79% of the total targets (134 out of 169) [5]. In the following, the enabling role of AI for each SDG is enlisted below:

#### A. SDG 1: No Poverty

- Fight poverty and food shortage through AI and blockchain-driven decision support systems for fair, transparent, and traceable governing processes enabling participatory decisions at large scale—e.g., resource sharing, assisting vulnerable communities, dispel corruption etc.
- National income prediction using mobile device data through deep learning techniques
- Preventing economic breach by supporting governmental decision-making through digital technologies
- Applying regression methods to accumulate digital transaction and property data

#### B. SDG 2: Zero Hunger

- Identification of sensitive areas which are prone to hunger and integration of simulation models to enhance the sustainability of food manufacturing
- Prediction of plagues, famines, and floods with the assessment of expected demand ratio after any certain calamity utilizing demographic & socioeconomic information via satellite data

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<sup>1</sup> Digital entrepreneurs are assisted to build their company in European Union by the e-residency program of Estonia. It is done irrespective of their domicile which provides them access to the Estonia’s transparent digital business environment.

<sup>2</sup> The ID card system provides the nationals with the opportunity to use it for multiple services including electronic voting and digital tax filing.

<sup>3</sup> United Nations, General Assembly (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Resolution A/RES/70/1. Retrieved from: [https://www.un.org/en/ga/search/view\\_doc.asp?symbol=A/RES/70/1](https://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/1)

<sup>4</sup> Inter-agency and Expert Group on SDG Indicators (2018, May 11). Tier Classification for Global SDG Indicators.

- Management of Water-Energy-Food Nexus through sequential decision-making data algorithms to ensure food sustenance
- Smart farming and automated stockbreeding through robotics and drones

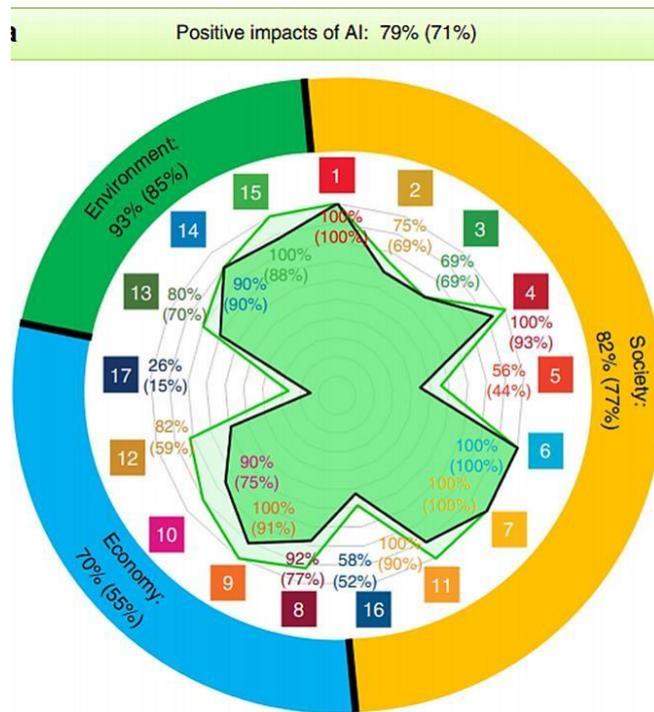


Fig. 1. AI as an Enabler (Source: Vinuesa et al., 2020)

### C. SDG 3: Good Health and Wellbeing

- Embracing the possibilities of explainable and trustworthy AI systems in healthcare, public health management, prognosis and diagnosis, vaccine development, etc.
- Early detection of epidemic diseases through mobile phones and sensory algorithms in smart territories for e.g., COVID-19 prevention via trend analysis on electronic media
- Smart environments for older patients driven by IoT and AI-management of scarce health resources for village areas
- Advancing social network, mobile and wearable device data to raise awareness providing services through electronic media and personalized AI tools that promote healthy nourishment, exercising and mental health habits, sexual health sensitization, and help to fight substance abuse or addiction

### D. SDG 4: Quality Education

- Interactive and personalized learning tools according to each learners' individual needs
- Resource sharing across disciplines and immersive- learning for social interaction & user-centred software designs for inclusive education
- Intelligent tutors who can support and assist students with special needs

### E. SDG 5: Gender Equality

- Guided AI utilization focusing on girls, women, and other disadvantaged groups to promote their empowerment
- Blockchain for participatory governance and political processes which are more accessible,

and prioritize the visibility, participation, and representation of women and marginalized groups

- Natural Language Processing to detect dishonest, bullying or harassing behaviours for enforcing legal laws by providing relevant evidence

#### *F. SDG 6: Clean Water and Sanitation*

- Water system management & risk analysis through AI techniques for suitable modelling & simplification of complex water-systems
- Assistance of Machine learning (ML) for weather prediction and drought prevention enabling timely resource planning
- Blockchain for reliable water-systems as well as fair distribution of water resources
- Minimizing human intervention in complicated water systems through virtual reality applications

#### *G. SDG 7: Affordable and Clean Energy*

- Distributed-computing-paradigms for decentralized systems of grid management using AI and IoT
- Management of huge energy infrastructures via 5G- technology
- Smart grids & smart meters for efficient and sustainable energy with optimal costs
- Drive edge computing architectures to avoid data storage explosion in data centers, thereby decreasing consumption of energy

#### *H. SDG 8: Decent Work and Economic Growth*

- Digital labor, e-commerce, mobile technologies, secure online banking, and external outsourcing for creating employment opportunities and driving economic growth
- Job risk assessments through ML, ambient intelligence and IoT
- Promoting strongly scientific and technical (STEM) formative itineraries in higher or postgraduate education to alleviate the technological unemployment
- Intelligent transportation and interaction systems for efficient work commutation and flexible working

#### *I. SDG 9: Industry, Innovation, and Infrastructure*

- Edge computing, 5G, and intelligent sensors for real-time infrastructure monitoring and safe logistics
- Detection of anomalies and problems, facilitating maintenance infrastructure through 3D modelling and remote computer vision
- Robust traffic predictions and automated route plannings via neural networks
- Industry 4.0 to assist SMEs and entrepreneurships

#### *J. SDG 10: Reduced Inequalities*

- Detection of manipulation in the financial markets through ML-powered cyber-security
- Alleviation of economic breaches in different sectors via ‘financial recommender systems’
- Non-biased AI data algorithms focusing on data collection and annotation processes to avoid inequalities in recommendations and decisions

#### *K. SDG 11: Sustainable Cities and Communities*

- Augmented and virtual reality for urban design planning and management to enhance safety of sustainable cities, their mobility, citizen lives, and access to local services
- Video surveillance and radar positioning for heritage preservation and to control traffic congestion

- Public awareness about the repercussions of using certain products or services through smart information systems
- Finding public opinion to improve e-governance through their participation by applying sentiment analysis

*L. SDG 12: Responsible Consumption and Production*

- Reducing energy consumption and overuse of raw materials through ML
- Big Data and IoT for improving production processes, distribution networks, and their resulting contamination effects via sensorization, and obtaining deeper insights into consumption habits, patterns, and fluctuations.
- Exploiting natural resources rightfully in conjunction with biodiversity applying land-use policies extracted through IoT

*M. SDG 13: Climate Action*

- Prediction of rains in the desert areas to understand the desertification trends more accurately
- Reinforcement among young people about climate change and sustainability education through chatbots and augmented reality
- Reduction of pollutants having major ecological impacts through AI prediction analytics

*N. SDG 14: Life Below Water*

- Prediction of water quality, oil dumping, and ocean acidification via neural networks
- Monitoring marine ecosystem through bio- geological & chemical data variables
- Exploiting ocean resources sustainably i.e., fishery for balanced ocean ecosystems

*O. SDG 15: Life on Land*

- Automated fire detection providing safe action and cost-efficient mechanisms using sensor-driven technologies.
- Detection of diseases in crops at an early stage reducing the usage of herbicides and ecological impact
- Monitoring and preserving land as well as detecting diseases in plants through surveillance drones and UAVs

*P. SDG 16: Peace, Justice, and Strong Institutions*

- Fraud detection through data mining on credit cards and online transactions
- Securing digital transactions and other administrative processes by using blockchain technology and cryptocurrencies
- Ensuring better decision-making in criminal justice systems by using adaptable expert systems.
- Electronic platforms with crime predictions having low costs and swift access to justice

*Q. SDG 17: Partnerships for the Goals*

- Promoting supranational partnerships to formulate universal AI guidelines to use its innovations in multifarious development sectors as a powerful vehicle of change
- Developing a suitable framework to ensure the accountability of artificial intelligence and its usage for achieving the sustainable development goals.
- Raising citizens awareness towards a universal and global vision of human centered AI with public initiatives
- Defining and disseminating the correct implications of artificial intelligence in governmental sector utilizing expert recommendations

#### IV.

#### CONCLUSION

In conclusion, although there are ethical and humanistic concerns regarding the use of Artificial Intelligence, however, these issues can be systematically and universally addressed. Since the present AI focuses specific targets (called Artificial Narrow Intelligence), therefore, universally accessible, inclusive, non-discriminatory, human-centered, and trustworthy AI shall be administered and implemented. Policymakers and legislators shall perform their due diligence to enable a robust environment necessary for maintaining sustainability and driving innovation. The unjustifiable fear of AI will lead us nowhere because the best way to predict future is to create it on sustainability.

#### REFERENCES

- [1] Legg, S., & Hutter, M. (2007). Universal intelligence: A definition of machine intelligence. *Minds and Machines*, 17(4)
- [2] World Education Forum (2016) Incheon declaration and framework for action. education 2030: Towards inclusive and equitable quality education and lifelong learning for all. Accessed June 2021: [http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en\\_2.pdf](http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en_2.pdf)
- [3] Zhuhadar L, Marklin S, Thrasher E, Lytras MD (2016) Is there a gender difference in interacting with intelligent tutoring system? can bayesian knowledge tracing and learning curve analysis models answer this question? *Comput Hum Behav* 61:198–204
- [4] Stanford University. 2016. Artificial Intelligence and Life in 2030, report of the 2015 One Hundred Year Study Panel. Accessed June 2021: [https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai\\_100\\_report\\_08\\_31fnl.pdf](https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai_100_report_08_31fnl.pdf)
- [5] Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., ... & Nerini, F. F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*, 11(1), 1-10. Accessed June 2021: <https://www.nature.com/articles/s41467-019-14108-y.pdf>