# IBM zStudent Contest

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## Theme:-

## Sustainability

IBM is a longstanding leader in environmental sustainability and the IBM z16 was designed to make a powerful improvement in sustainability intentional and by design. The features on the z16 enable a smaller energy footprint by reducing costs in every aspect. The zSystems machine performances reduce overall system power consumption, require less floor space and reduce CO2 emissions compared to an x86 server.

To go along with the zSystems machines sustainability, this contest is focused on using your skills on IBM zSystems to meet the sustainability goal of identifying, locating and acquiring the components of a fuel cell to power your zMobile.

**Solution for this theme:-**

The system's IBM Telum dual-processor chip has 16 cores and runs at 5.2 GHz. IBM says that the z16 comes with up to 200 configurable cores in a single model—the Model A01—and includes 40TB of redundant array of independent memory (RAIM) per system.

But while z16 family, available May 31, is more powerful, the system also promises to accelerate other core IBM strategies of growing hybrid computing and open-source based enterprise systems. And it is particularly suited to processing artificial intelligence apps, the company said.

“I think the world of AI just changed with the introduction of this system,” said Ross Mauri, general manager of IBM Z. “Whether it’s for driving costs down, cutting down on the risk of fraud, or driving more revenue a whole new set of possibilities are going to be opened up with the AI on the z16 system that couldn’t be considered before.”

The AI accelerator on the Tellum processor utilizes an AI inferencing model that analyzes details from the massive transaction processes that go on within the mainframe to spot trends and make intelligent predictions.

“AI has a broad applicability to a wide set of use cases across a variety of different industries, from banking and finance to insurance to healthcare, and many others,” said IBM Distinguished Engineer and Z Architect Elipida Tzortzatos. “But if you look at what is happening in the world today, things such as instant payments, increasingly stricter regulations that require anti money laundering (AML), and a dramatic increase in online transactions has broadly increased the amount of fraud.”

That’s where embedded AI comes into play because it can handle massive amounts of critical transactions and workloads in real time and at scale, Tzortzatos said.

The AI accelerator is a game changer, according to Patrick Moorhead, founder, CEO and chief analyst at Moor Insights & Strategy. “According to IBM, the z16 with z/OS has a 20x response time with 19x higher throughput when inferencing compared to a comparable x86 cloud server with 60ms average network latency.”

The AI capabilities enabled by the new Telum processors should measurably improve the way businesses detect and address fraudulent purchases will reduce the amount of network traffic produced by AI applications, too, said Charles King, founder and president of the Pund-IT consultancy.

“Since AI inference is performed on-chip, the z16 can perform those complex functions without moving data to/from an AI or analytics appliance, as many other vendors’ solutions do,” King said. “That could be highly beneficial in situations like the large-scale transactional environments that the z16 is designed to support.”

While AI capabilities of the z16 will generate enterprise interest, experts say, the performance and scalability of the new systems will also enable more use of the Big Iron in hybrid-cloud environments.

For example, the IBM Z and Cloud Modernization Stack, announced in February offers industry-standard tools to modernize z/OS applications on a pay-per-use basis. The service includes support for z/OS Connect, which utilizes a JavaScript Object Notation (JSON) interface to tie into and link with existing applications to make Z applications and data part of a hybrid cloud strategy. It also includes z/OS Cloud Broker, which integrates z/OS-based services and resources into Red Hat OpenShift to support creating, modernizing, deploying, and managing applications, data, and infrastructure.

Future z/OS container use cases are planned to promote application modernization, new application development, and API creation with tight integration to core z/OS applications, IBM stated.

The IBM Z and Cloud Modernization Stack is the first set of capabilities offered through the recently announced IBM Z and Cloud Modernization Center, which offers tools, training, resources, and ecosystem partners to help IBM Z clients accelerate the modernization of mainframe applications, data, and processes to work with hybrid-cloud architectures.

"We're making it easier to get to the data on the mainframe and then with the advent of OpenShift on the platform, run containerized, microservice workloads on the mainframe," Mauri said. "We embrace open-source technology on the IBM z systems platform, and establishing a common developer experience across the hybrid cloud and the z16 with its increased capacity and power will better handle modern workloads."

The z16 reflects the company's strategic focus on maximizing hybrid-cloud services and solutions, King said. z16 servers with z/OS support 20 times lower response time and up to 19 times higher throughput than comparable x86 cloud servers, he said. The z16's capacity and encryption features also enable customers to securely run mission-critical applications and processes while also leveraging public cloud services, he said, "an important point for businesses impacted by data residency and data sovereignty regulations."

Security is also a major part of the z16. Specifically, the z16 supports the Crypto Express8S adapter to deliver quantum-safe APIs that will let enterprises start developing quantum-safe cryptography along with classical cryptography and to modernize existing applications and build new applications, Mauri said.

"The z16 is protected with quantum-safe technology through the multiple firmware layers during the boot process. It's the industry's first system to support a quantum-safe secure boot. When the system boots up, it must be confident that the firmware loaded in that system is authentic," Moorhead said.

"In nefarious hands, quantum computers can break some of the cryptographic technologies we've used for many years. That is the fear," Moorhead said. Preparation for quantum attacks might have already started with the "harvest now decrypt later" attack scenario, where attackers steal encrypted data and wait until a quantum computer can decrypt it.

Another IBM z16 capability called IBM Z Flexible Capacity for Cyber Resiliency enables shifting capacity and production workloads between IBM z16 systems at different sites on demand and for them to remain at those alternate sites for up to a year. This can help enterprises comply with regulations that require the ability to shift production to alternate sites for extended periods, IBM stated.

This capability is also designed to help avoid disruptions from unplanned events. For example, it enables moving  workloads to avoid disruptions from impending natural disasters as well as enabling facility maintenance, IBM stated.

z16s also support network-based enhancements including:

- **FICON Express32S** supports a link data rate of 32 Gbps and autonegotiation to 16Gbps and 8Gbps backwards compatibility with existing switches, directors, and storage devices. With support for native FICON, High Performance FICON for z Systems (zHPF), and Fibre Channel Protocol the IBM z16 server is designed to enable an end-to-end 32 Gbps infrastructure to provide lower latency and increased application bandwidth requirements. FICON adapters are used primarily to link mainframes with peripheral devices.
- IBM z16 will support a new long-range Open System Adapter called the **OSA-Express7S 1.2 25 GbE LR** that provides direct mainframe connectivity to LAN devices. OSA-Express7S adapters support a variety of Ethernet links including 1000BASE-T Ethernet for copper environments along with 25GbE SR, 10 Gigabit Ethernet and Gigabit Ethernet on single-mode and multimode fiber.

Reference video link: https://www.youtube.com/watch?v=LMyXyuhyBzY&t=15s


**Abstract:-**

The concept of sustainable development (SD) was introduced in the "Our Common Future" report, launched in 1987, which influenced the emergence of many studies related to the role played by organizations as actors supporting SD. SD is a consolidated concept; however, since 1987, many political, social, and natural events have occurred on our planet, which have impacted companies' behaviors. However, the diversity of research from different fields has provoked, among the academic community, a lack of clarity surrounding "sustainability" (S), "corporate sustainability" (CS) and "corporate social responsibility" (CSR) concepts. This lack of clarity can also be identified in companies, which have referred to "sustainability" only in the environmental field. Recently, increased discussions related to corporate sustainability metrics have shed light on the ESG criteria (environmental, social, and governance), increasing misperceptions associated with the concept. Ambiguous definitions and constructs may prevent managers from identifying sustainability goals for their companies. Therefore, literature reviews as a research method are more relevant than ever. Thus, in this work, we aim to answer the following question: How should we integrate different perspectives on corporate sustainability, in order to broaden the understanding of the concept? In this study, we conducted a focused bibliographic review and revisited the papers that most influenced the construction of the concepts. The information in this paper is helpful to improve the understanding of CS; to provide specific insights into the studies that have investigated this field; to help managers and entrepreneurs who are improving CS actions in their companies; and to support academia by putting together a large amount of information about this theme in one paper.


**Introduction:-**

Recently, the current definition of sustainable development (SD) has already been discussed and ratified by the crises that have interconnected the topics related to climate change, economic recession, and rising food, fuel, and raw material prices, all of which have had a more severe impact on the most impoverished communities. However, since 1980, the ways in which societies have related to environmental and social issues have changed around the planet. Over the past forty years, we have learned a lot about the principles of SD, which has resulted in more sustainable policies, mechanisms, and projects [1]. We have also learned to monitor and evaluate how human actions have had an impact on the environment and people's lives. Over time, the concepts of sustainability and SD have acquired greater importance, since, on the whole, societies have become more aware of their impacts on environmental scenarios [2].

Today, the world is increasingly globalized and interconnected. New actors and new technologies shape the results in resource development and management on a much larger scale than before, showing the critical roles of companies in the promotion of a better way of life. The technologies developed, such as artificial intelligence, drones, and blockchain, for instance, have helped the environment; new drugs and vaccines have helped us to extend and improve our quality of life; improvements associated with gender equality have reduced the social gap. These are examples of how some companies have worked to reduce environmental and social problems, and therefore, promoted the evolution of concepts, given the technological development that we have at hand [3,4,5,6,7]. However, these evolutions are not happening in the same way (volume and velocity) around the world, and the existing patterns of development remain closely associated with increased energy requirements and the use of fossil fuels. Globalization, climate change, the effective and efficient management of available resources as well as their depletion, and the aging of the population, among others, invite societies to change the direction of quantitative economic growth towards a more qualitative and responsible dimension [2].

The diversity of events and the multifaceted socioeconomic and environmental challenges require the adoption of multidisciplinary scientific approaches in their assessment [8,9], which implies knowing topics from different knowledge areas, with different frameworks [10], such as natural sciences, economy, engineering, philosophy, and mathematics. For example, we must understand: material flows and dynamic organization of the different life support systems; functioning and dynamics of different organisms and ecosystems; forms of social organization and the ways of building meaning, culture, and values in different societies; ways of transforming natural resources and reproducing our conditions of existence; the distribution of economic resources; the impact of our activities and the waste generated in the environment. In the ethical field, where we find uncertainties, risks, and different equally legitimate values, we need the opinion of the parties affected by their inalienable rights to participate in the configuration of their destiny.

The corollary of all this movement, both in the external environment of the organizations and in the internal environment, is the emergence of a series of papers on themes related to SD and corporate sustainability (CS) [10,11,12,13]. Therefore, a review of the literature, as a research method, is more relevant than ever [11].

Fundamentally, we need to collectively consider all the knowledge about SD and CS to learn how the different dimensions and aspects are related to each other and, thus, to understand how the development unfolds [14]. Therefore, SD is viewed systemically, since we need several areas of science to be able to understand it. There is also some confusion between SD and CS. Some authors [10] have argued that the lack of consensus among the definitions has been because the designation "sustainability" has been based on processes and activities while "SD" has focused on people and their well-being.

As defined, the concepts of SD and CS are so broad and generically applicable that the inherent vagueness renders them inoperative and open to conflicting interpretations [15]. Sustainability con be considered to be a "plastic word", i.e., a word with enormous ideological power and legitimization of social action, yet devoid of concrete meaning [14]. For those less familiar with the subject of sustainability, SD and sustainability may have the same meaning, but when we carry out a thorough review of the origin of both designations, we find differences between them [11]. Sustainability is the ability of a human system, natural or mixed, to resist or adapt to an endogenous or exogenous change indefinitely; SD is an intentional and evolutionary change that increases or maintains the system attribute, meeting the needs of the population [15]. From this perspective, sustainability is a long-term goal. In this paper, we propose that SD refers to a place or region, and CS refers to a business or company.

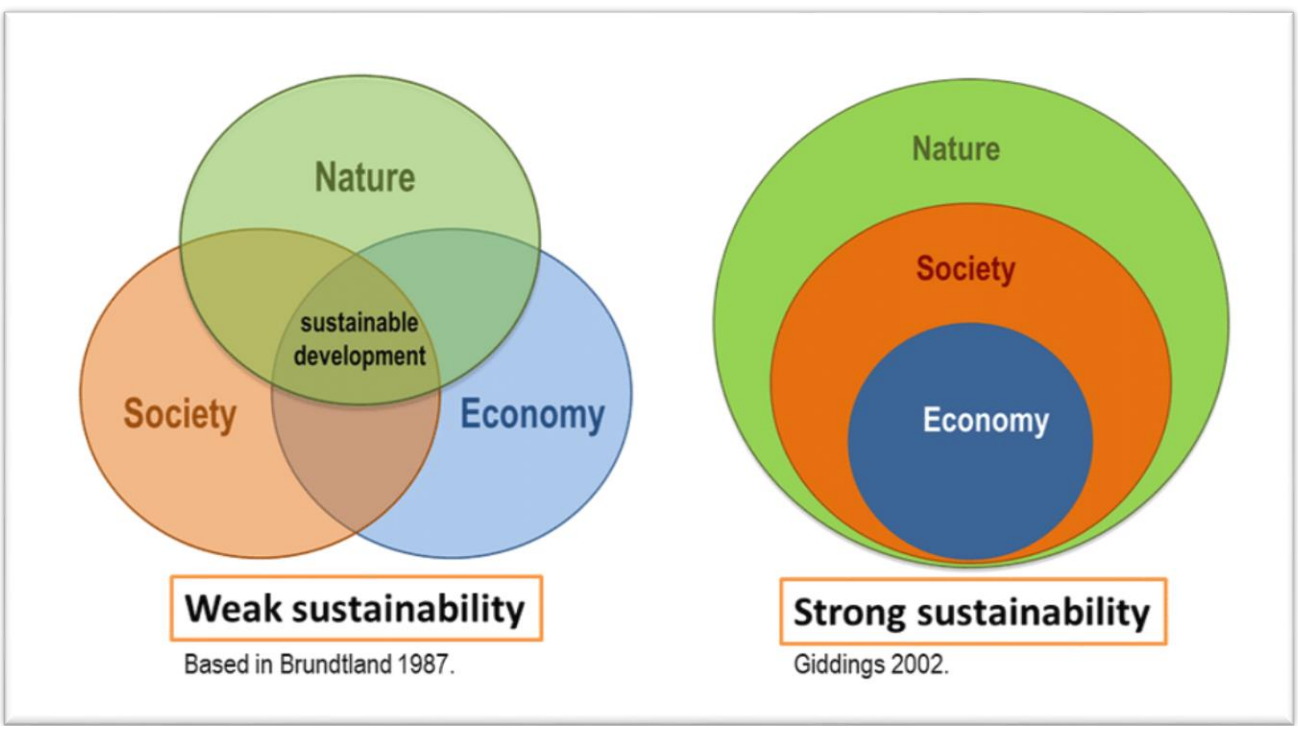
For the authors, neither SD nor CS should be confused with environmental, social and governance (ESG). We understand that ESG is a tool to control environmental and social practices performed by an organization. In addition, ESG serves to assess risk in sustainable investments [16].

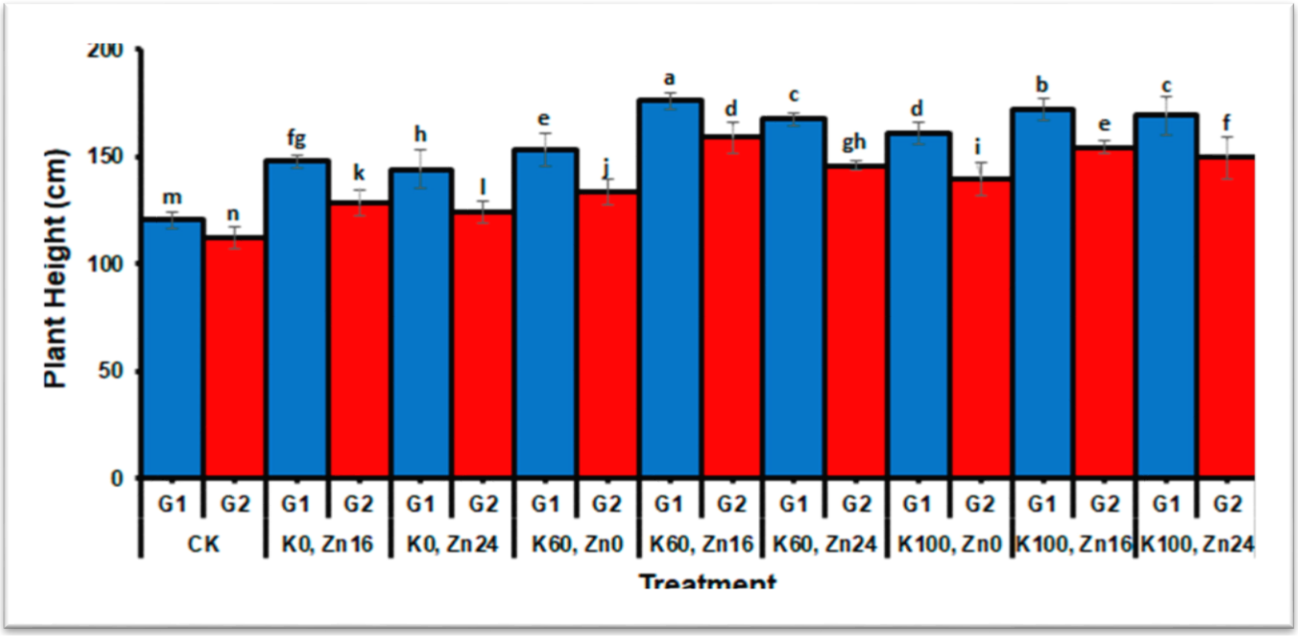
Perhaps because CS has been equated with "doing good" [17], or because of the diversity of disciplines contributing to its understanding, the scholarly community suffers from a lack of clarity around the nature of the CS concept [18]. This becomes difficult to keep pace with the state-of-the-art and be at the forefront of research, as well as to assess collective evidence in a specific area of business research [19].

Thus, in this paper, our main objective is to deepen the knowledge about the concept of CS, establishing a guideline in the evolution of seminal concepts and, in this way, to answer the following question: How should we integrate different Corporate Sustainability perspectives in order to broaden its understanding?

However, we do not aim to bring together the different disciplines in which the term is involved, nor the application of the term in practical activities. In this work, we seek to consolidate a set of studies that have already been published, in high-impact journals, which aim to find to define the subject.

**Sample Graphic representation for Sustainability:-**






**Sample Coding:-**

**Python Language:-**

```
#!/usr/bin/env python3
"""
Usage: poetry run test_parser FR production
"""

import pprint
import time
from datetime import datetime
from logging import DEBUG, basicConfig, getLogger
from typing import Any, Callable, Dict, List, Union

import arrow
import click

from electricitymap.contrib.config import ZoneKey
from parsers.lib.parsers import PARSER_KEY_TO_DICT
from parsers.lib.quality import (
    ValidationError,
    validate_consumption,
    validate_exchange,
    validate_production,
)
```

```
logger = getLogger(__name__)
basicConfig(level=DEBUG,        format="%(asctime)s        %(levelname)-8s        %(name)-30s
%(message)s")


@click.command()
@click.argument("zone")
@click.argument("data-type", default="production")
@click.option("--target_datetime", default=None, show_default=True)
def test_parser(zone: ZoneKey, data_type, target_datetime):
    """\b
    Parameters
    ----------
    zone: a two letter zone from the map
    data_type: in ['production', 'exchangeForecast', 'production', 'exchange',
      'price', 'consumption', 'generationForecast', 'consumptionForecast']
    target_datetime: string parseable by arrow, such as 2018-05-30 15:00
    \b
    Examples
    -------
    >>> poetry run test_parser FR
    >>> poetry run test_parser FR production
    >>> poetry run test_parser "NO-NO3->SE" exchange
    >>> poetry run test_parser GE production --target_datetime="2022-04-10 15:00"

    """
    if target_datetime:
        target_datetime = arrow.get(target_datetime).datetime
    start = time.time()

    parser: Callable[
        ..., Union[List[Dict[str, Any]], Dict[str, Any]]
    ] = PARSER_KEY_TO_DICT[data_type][zone]
    if data_type in ["exchange", "exchangeForecast"]:
        args = zone.split("->")
    else:
        args = [zone]
    res = parser(*args, target_datetime=target_datetime, logger=getLogger(__name__))

    if not res:
        raise ValueError("Error: parser returned nothing ({})".format(res))

    elapsed_time = time.time() - start
    if isinstance(res, (list, tuple)):
        res_list = list(res)
    else:
```

```
    res_list = [res]

try:
    dts = [e["datetime"] for e in res_list]
except:
    raise ValueError(
        "Parser output lacks `datetime` key for at least some of the "
        "ouput. Full ouput: \n\n{}\n".format(res)
    )

assert all(
    [type(e["datetime"]) is datetime for e in res_list]
), "Datetimes must be returned as native datetime.datetime objects"

assert (
    any(
        [
            e["datetime"].tzinfo is None
            or e["datetime"].tzinfo.utcoffset(e["datetime"]) is None
            for e in res_list
        ]
    )
    == False
), "Datetimes must be timezone aware"

last_dt = arrow.get(max(dts)).to("UTC")
first_dt = arrow.get(min(dts)).to("UTC")
max_dt_warning = ""
if not target_datetime:
    max_dt_warning = (
        " :( >2h from now !!!"
        if (arrow.utcnow() - last_dt).total_seconds() > 2 * 3600
        else " -- OK, <2h from now :) (now={} UTC)".format(arrow.utcnow())
    )

print("Parser result:")
pp = pprint.PrettyPrinter(width=120)
pp.pprint(res)
print(
    "\n".join(
        [
            "---------------------",
            "took {:.2f}s".format(elapsed_time),
            "min returned datetime: {} UTC".format(first_dt),
            "max returned datetime: {} UTC {}".format(last_dt, max_dt_warning),
        ]
```

```
        )
    )

    if isinstance(res, dict):
        res = [res]
    for event in res:
        try:
            if data_type == "production":
                validate_production(event, zone)
            elif data_type == "consumption":
                validate_consumption(event, zone)
            elif data_type == "exchange":
                validate_exchange(event, zone)
        except ValidationError as e:
            logger.warning("Validation failed @ {}: {}".format(event["datetime"], e))


if __name__ == "__main__":
    # pylint: disable=no-value-for-parameter
    print(test_parser())
```