# PROJECT MANAGEMENT AND ECONOMICS OF MINING & MANUFACTURING IN SOLAR SYSTEM SPACE


## AUTHOR:

G.YASMIN,
ASSISTANT PROFESSOR,
HINDISTHAN ARTS AND SCIENCE COLLEGE,
COIMBATORE.

## CO-AUTHOR:

RAJA MOHAMMED M A S
DIRECTOR AT
ARFASAMEEHA STAR TECH OPC PRIVATE LTD



**ABSTRACT**

This paper has reference to the past historical data and the authors future assumptions for Outer Space Economy with analysis using Project Management Models and summarize economy using Portfolio Types. The Outer Space Economy had started after the successful satellite missions that made way for high speed internet communications, remote sensing, aviation, weather monitoring, defense, fiber optic communication and medicine research at zero gravity. Space is a global interest and has a valuation of $176 billion in 2006, around 58 countries had invested more than $10 million in space programs in 2017, and the global space marketplace has expanded to an estimate exceeding $345 billion in 2018. This study describes brief historical economic developments in space economy and makes an Analysis on solar planets and moons in view of business in mining and manufacturing sector. The Result leads to categorize the possible business in Types A to E considering Physical properties of planet and type of high-end technology required for its accomplishment. For Each Category a suitable typical Project Management Models are detailed for initiation, execution, monitoring and accomplishment are noted. After the successful mission the possible Portfolio Management for Financial Market are tabulated in summary. This detailed study describes the upcoming space economy that can be of a high value for human in future generations in Economic, technological, political and wellbeing excellence.


***Key words:*** Outer space economy, Project management, mining, manufacturing sector, solar planets

## I) INTRODUCTION

Space Economy is the collective revenue in view of Financial Market considering the private sectors and govt sectors contributions, various commercial products and commercial services that are occurred related to the Space Research. There had been a tremendous enhancement in science and technology after the successful orbital working of satellite.

## II) OBJECTIVES OF THE STUDY

- The study describes the growth in financial market during the technological advancement in the space research and commercial use of space along with the revenue from various products, manufacturing & service development.
- The Study describes the Typical Project Management Model procedure for outer space in manufacturing and mining sector.
- The study tabulates the Typical Portfolio Investments type possibilities in outer space mining & Manufacturing.

## III) NEED AND IMPORTANCE OF THE STUDY

Financial Market had advanced in better way after the successful commercial network communication around the globe had been developed through satellite technology. Further advancement to cloud networking, high speed processor had facilitated to

ease the complex works in financial market as well as revenue earnings in various sectors. The Space Economy are expected to increase while utilizing the resources of feasible planets, moons, asteroids and colonize for better survival.

## IV) RESEARCH METHODOLOY

The Historical data of investments and revenue from various sectors are considers and Forecast using the average pattern trending in market. The scientific observation study on planets are done and its feasibilities for mining and manufacturing sector are categorized and A Typical Project Management Model to accomplish are listed. The Business possibilities in investment are summarized in Portfolio management for each Type.

## V) SCOPE OF THE STUDY

As the subject is very vast and the technology is changing day by day. The study mainly focused the Economics and Project Management of manufacturing, mining outside earth in solar system in Milky Way galaxy

## VI) STATISTICAL TOOLS AND TECHNIQUES

The present study has used for the Historical Financial Market analysis and interpretation of data in space economy and are tabulated with the help of using MS Excel. Project Management Model and Portfolio Management are tabulated

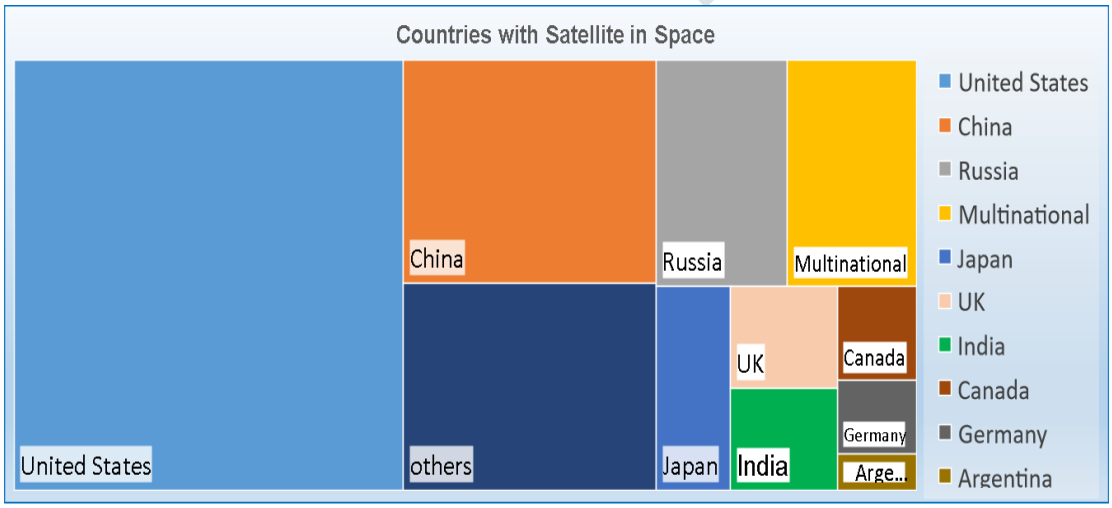
## VII) COMMERCIAL USE OF SPACE

The first commercial and private funded use of outer space occurred in 1962 by AT&T and Bell Telephone Laboratories, for launch of Telstar 1 satellite to transmit television signals, telephone, fax, and other data signals. Over the Atlantic Ocean. Two years later, the Hughes Aircraft Company developed the Syncom 3 satellite was used to telecast the 1964 Olympic Games from Tokyo to the United States. Later the Soviet Union launched the Orbita satellite, which provided television signals across Russia, and started the first national satellite television network. 1972 Anik A satellite, launched by Telesat Canada, allowed the Canadian Broadcasting Corporation to reach northern Canada for the first time. In 1980 Indian Remote Sensing (IRS) started and developed to RISAT , Cartosat and Resourcesat series of High resolution data for land, ocean and atmospheric obsrvations. In 1997, Iridium Communications provided the first satellites for direct satellite telephone service.

## VIII) HISTORICAL COMMERCIAL USE OF SPACE IN ECONOMY

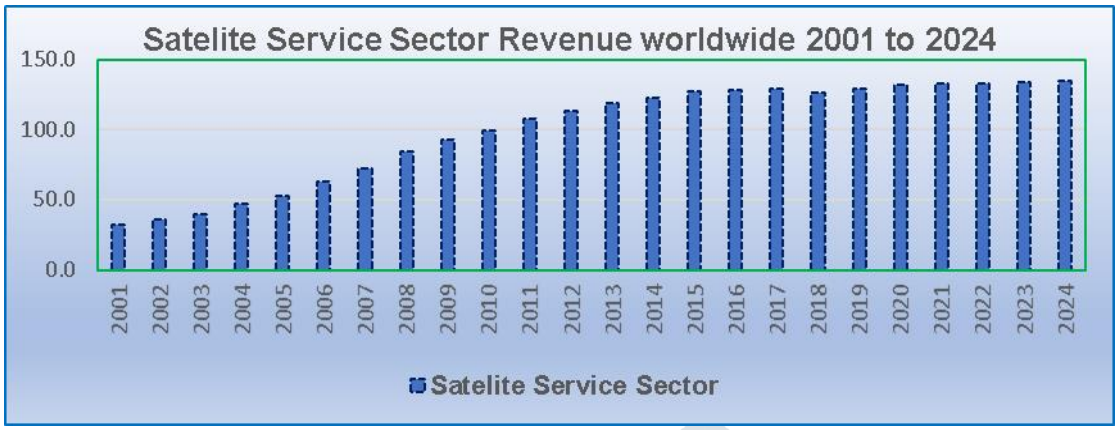
- Satellite Navigation, Weather Monitoring , Satellite Television and Fax
- Satellite Imagery
- Satellite remote location tracking, Remote sensing for defense
- Public Commercial Manufacturing Industry for Space Equipment
- Private Commercial Manufacturing Industry for Space Equipment
- Satellite Goods & service launch to Earth Space Orbit (at LEO)
- Space Tour to International Space Station
- Private Satellite Communication
- Research at GEO and Outer Space exploration missions

## IX) SATELLITES AND EQUIPMENT MANUFACTURING



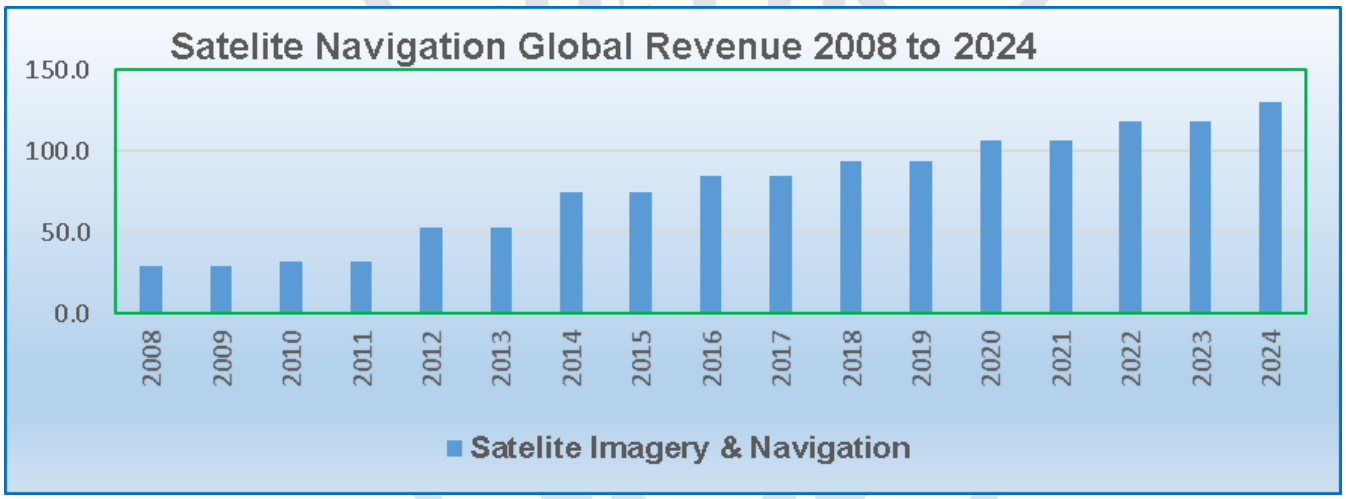
## X) SUBSCRIPTION SATELLITE SERVICES

In 1994, DirecTV debuted direct broadcast satellite in 1996 in Malaysia MEASAT

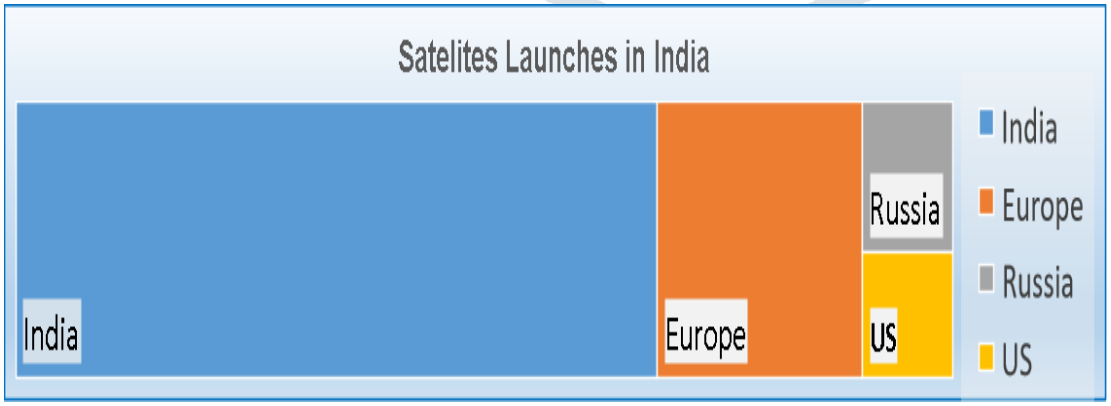



## XI) SATELLITE IMAGERY

As of March 2018 an estimated annual revenue of $64.4 million, and an estimated value that exceeds $1 billion.




## XII) SATELLITE LAUNCHES IN INDIA



## XIII) TECHNOLOGIES DEVELOPED USING INTERNATIONAL SPACE STATION RESEARCH

| General Products & Services in Research , Navigation , Defence & Commercial use | |
|---|---|
| 3-D map of surrounding area navigation | Market Size in 2018 is 2.8 billion |
| | Forcasted 18% annual |
| For Rescue work Auto Identification Sys | Market Vaue est in 2014 is 174 million |
| | Forcasted 225 million in 2020 |
| Commercial Space optical ZBLAN fiber | Market Vaue est in 2015 is 4.7 billion |
| | Forcasted 19.2% annual |
| Research Facility service Space Station | Estimated revenue in 2016 is 25 million |
| Global Television Sector | Annual revenue in year 2016 is 97 billion |
| Commercial Space Flight | Annual revenue in year 2016 is 1.1 billion |
| GNSS Chipsets | Annual revenue in year 2016 is 60 billion |
| Broadband Internet Service | Annual revenue in Year 2016 is 2 billion |
| Satellite Radio Service | Annual revenue in Year 2016 is 5 billion |
| Network Equipments | Market Value Estimated in 2016 is 10.3 billion |
| Ground Equipments | Market Value Estimated in 2016 is 60 billion |
| Consumer Equipments | Market Value Estimated in 2016 is 50 billion |
| Satellite Manufacturing | Annual revenue in year 2016 is 13 billion |

## XIV) AIR PURIFICATION TECHNOLOGY

Space Research technology is used in earth for air purification and used in medical, food processing and other sectors. The products are used for air pollution control measures

| Air Purifier - Equipment Demand from Global Data | | |
|---|---|---|
| Each year demand | 20.4 | billion |
| Market size projected | 208.6 | billion |
| Market volume uinit per each year | 115 | million |
| Employment opportunity | 1.2 | million |
| Yearly order | 47 | billion |
| Internet of Things with Air Filter Eq users | 14 | million |
| Electrical use with Air Filter Eq users | 6 | persent |
| Revenue - yearly with Air Filter Eq users | 97 | billion |
| Average population indoor time per day | 90 | persent |

| Air Polution 2016 | |
|---|---|
| KSA | 144 |
| UAE | 132.4 |
| India | 109.8 |
| China | 98.5 |
| Brazil | 40.4 |
| France | 27.5 |
| Germany | 25.2 |
| UK | 23.3 |
| US | 18.3 |

| Air Polution 2018 | | Yearly |
|---|---|---|
| Delhi | 105 | |
| Kolkata | 92 | 17% |
| Mumbai | 74 | 15% |
| Hyderabad | 59 | |
| Chennai | 31 | |

| | |
|---|---|
| **Air Purification Product** | |
| Airocide | Annual Commercial Revenue 4.2 million in 2018 |
| **Water Purification Product** | |
| Water Purifier Aquaporin | Annual Commercial Revenue 6.9 billion in 2017 |
| **Medical Treatment & Research Product** | |
| Eye | |
| Chronos Eye-Tracking Devices (C-ETD) | Major Eye Hospitals are facitated |
| Augmented reality glasses - Eyespeak | Annual Shipment 150k in 2016 |
| Surgery | |
| NeuroArm MRI surgical robotic system | Market value in 2018 is 1900million |
| Image Guided Robot (IGAR) surgical sys | Market value in 2019 is 39million |
| Bone | |
| Prolia Bone Fracture Treatment | Annual Sale value is 48K in 2017 |
| Astma | |
| Astma Treatment | Air purification Equipments used |
| Infection | |
| Cold plasma therapy | Annual usage increased by 16.2% in 2018 |
| Research | |
| 3D Bioprinting at Space | Market value in 2019 is 651million |
| | Forcasted 1647million by 2025 |
| Equipments Microbial Check Valve | Market Value in 2019 is 8 billion |
| | Forcast 5.9% annual |
| Adv Diagnostic UltrasoundMicrogravity | Research activity in Space |
| | For Doctors at Earth Conducting Treatement |
| Crystallized (H-PGDS/HQL-79 complex) | Research activity in Space |
| | For medical treatement in Space |
| Space radiation risks study lymphocytes | Research activity in Space |
| | For medical treatement in Space |

| | |
|---|---|
| **General Safety & InJury Protection Products** | |
| Flame Extinguishment (FLEX) | Market value is 4.4 billion in year 2018 |
| RoboGlove technologies | Use Space Robo Glove Reduce motion injuries |
| Robo Arm - for support assistance | Market Value is 5645 million in year 2020 |
| **Water Resource Finder Product** | |
| mWater testing kit | Market Size 10.34 billion year 2017 |
| | Forcasted 7.4 % annual |

## XV) SPACE TOURISM

For recreational purposes. Orbital, suborbital and lunar space tourism. Orbital space tourism has been performed only by the Russian Space Agency Work also continues towards developing suborbital space tourism vehicles. This is being done by aerospace companies like Blue Origin and Virgin Galactic. Space X (an aerospace manufacturer) announced in 2018 that they are planning on sending space tourists, including Yusaku Maezawa, on a free-return trajectory around the Moon on the Starship

## XVI) ASTEROID MINING

Commercial recovery of space resources is the exploitation of raw materials from asteroids, comets and other space objects, including near-Earth objects. Minerals and volatiles could be mined then used in space for in-situ utilization (e.g. construction materials and rocket propellant) or taken back to Earth.

## XVII) PLANET AND MOON PHYSICAL NATURAL DETAILS IN COMPARISON TO EARTH

The following details are interpreted data from satellite observation data on each planet in solar system and while in comparison to earth for feasibility and the level of high tech needed for mining and manufacturing actives that can be accomplished.

| | | Earth | Moon | Mars | Venus | Mercury | Jupiter | IO Jup Moon |
|---|---|---|---|---|---|---|---|---|
| Gravity - Times Earth | EG | 1 | 0.16 | 0.3 | 0.9 | 0.37 | 2.5 | 0.18 |
| Escape Velocity - Times Earth | EEV | 1 | 0.21 | 0.44 | 0.92 | 0.38 | 5.38 | 0.22 |
| Single Day Time- Times Earth | EDT | 1 | 27.32 | 1.1 | 243 | 58 | 0.41 | 0.42 |
| Surface Pressure - Times Earth | ESP | 1 | 9.86e10-6 | 0.006 | 908 | 4.93e10-15 | 1.97 | 3.94e10-13 |
| Avg Temprature- Times Earth | ET | 1 | 1 | 1 | 15.5 | 14.22 | 5.36 | 4.76 |
| Mean Radius - Times Earth | EMR | 1 | 0.27 | 0.53 | 0.95 | 0.76 | 10.99 | 0.28 |
| Mass - Times Earth | EM | 1 | 0.0123 | 0.107 | 0.815 | 0.055 | 317.8 | 0.015 |
| Density of Planet - Times Earth | ED | 1 | 0.6 | 0.61 | 0.94 | 1 | 240e10-9 | 0.63 |
| Distance from Sun - Times Earth | ESD | 1 | 1 | 1.524 | 0.723 | 0.39 | 5.203 | 5.203 |
| Single Rotation Around Sun - Year Time Earth | EYT | 1 | 1 | 1.87 | 0.61 | 0.24 | 11.86 | 11.86 |

| | | Earth | Europa J Moon | Saturn | Titan Sat Moon | Uranus | Neptune | Pluto |
|---|---|---|---|---|---|---|---|---|
| Gravity - Times Earth | EG | 1 | 0.18 | 1.2 | 0.13 | 0.88 | 1.13 | 0.006 |
| Escape Velocity - Times Earth | EEV | 1 | 0.18 | 3.22 | 0.23 | 1.91 | 2.1 | 0.11 |
| Single Day Time- Times Earth | EDT | 1 | 3.5 | 0.425 | 15.95 | -0.745 | 0.795 | -6.39 |
| Surface Pressure - Times Earth | ESP | 1 | 9.86e10-16 | 1.32 | 1.44 | 0.98 | 0.98 | 9.86e10-6 |
| Avg Temprature- Times Earth | ET | 1 | 5.36 | 6.3 | 5.96 | 6.56 | 7.26 | 76.33 |
| Mean Radius - Times Earth | EMR | 1 | 0.24 | 9.16 | 0.4 | 3.99 | 3.87 | 0.18 |
| Mass - Times Earth | EM | 1 | 0.008 | 95.2 | 0.023 | 14.5 | 17.1 | 0.0025 |
| Density of Planet - Times Earth | ED | 1 | 0.63 | 0.12 | 0.34 | 0.23 | 0.29 | 0.33 |
| Distance from Sun - Times Earth | ESD | 1 | 5.203 | 9.539 | 9.539 | 20 | 30.06 | 39.53 |
| Single Rotation Around Sun - Year Time Earth | EYT | 1 | 11.86 | 29.45 | 29.45 | 84.06 | 164.8 | 247.69 |

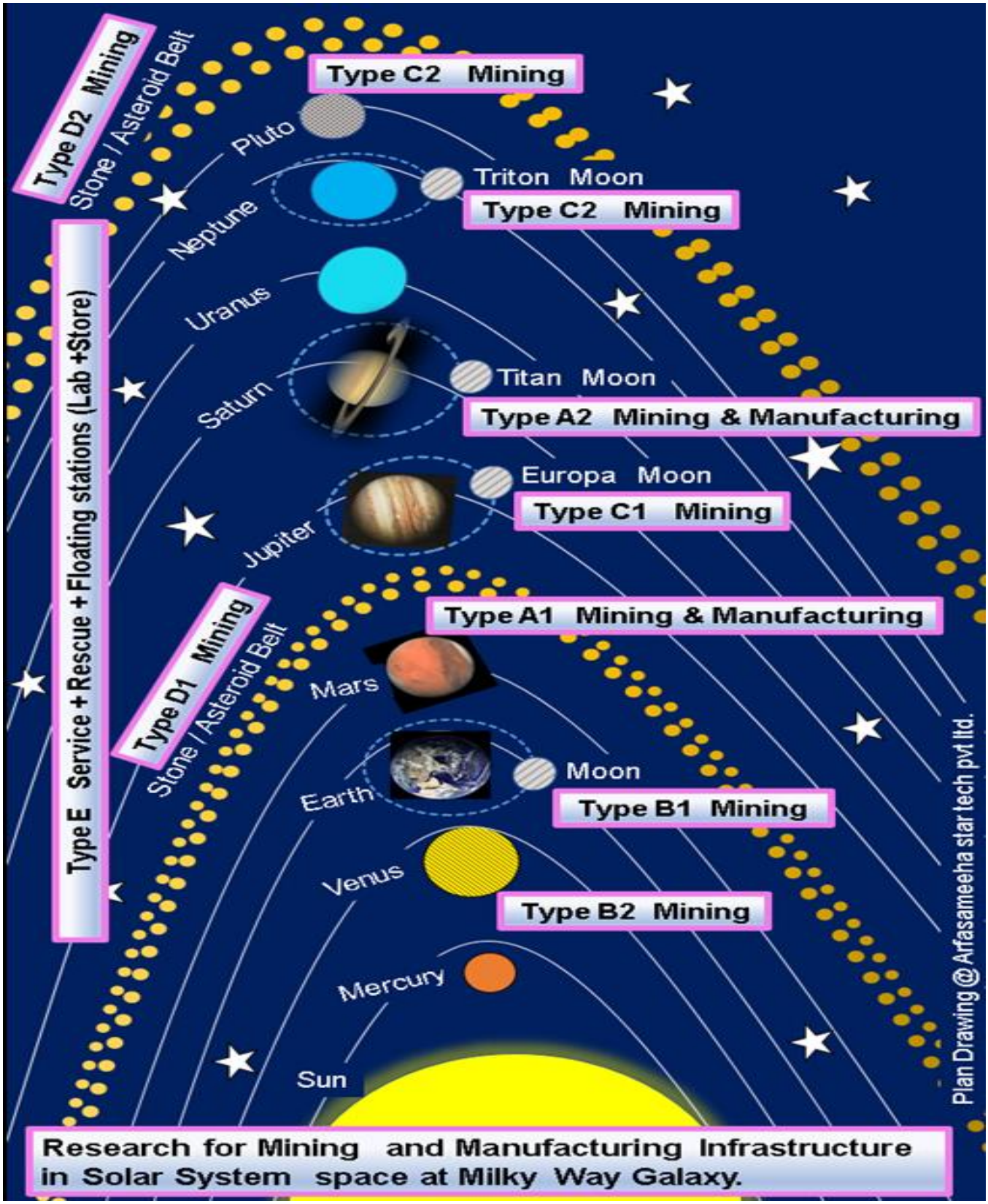
## XVIII) CHEMICAL COMPOSITION IN PLANETS AND MOONS

Using the Satellite navigation data the Planets and moons are analyzed and space craft landing missions are progressed for further studies. The following table summarize Chemical compositions in planet and moons and in comparison, with earth are noted.

| | | Earth | Moon | Mars | Venus | Mercury | Jupiter | IO | Europa | Saturn | Titan | Uranus | Neptune | Pluto |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Silica | SiO2 | Y | Y | Y | x | Y | x | x | x | x | x | x | x | x |
| Alumina | AL203 | Y | Y | Y | x | Y | x | x | x | x | x | x | x | x |
| Lime | CaO | Y | Y | Y | x | x | x | x | x | x | x | x | x | x |
| Magnesia | MgO | Y | Y | Y | x | x | x | x | x | x | x | x | x | x |
| Ironoxide | FeOT | Y | Y | Y | x | Y | x | x | x | x | x | x | x | x |
| Sodium Oxide | Na2O | Y | Y | Y | Y | x | x | x | x | x | x | x | x | x |
| Potassium Oxide | K2O | Y | x | Y | Y | x | x | x | x | x | x | x | x | x |
| Titanium Dioxide | TiO2 | Y | Y | Y | Y | x | x | x | x | x | x | x | x | x |
| Phosps Pentoxide | P2O5 | Y | x | Y | Y | x | x | x | x | x | x | x | x | x |
| Maganese Oxide | MnO | Y | x | Y | Y | x | x | x | x | x | x | x | x | x |
| Methane | CH4 | Y | x | Y | x | x | Y | x | x | Y | Y | Y | Y | Y |
| Nitrogen | N | Y | x | x | Y | x | Y | x | x | x | Y | x | x | Y |
| Carbon di oxide | Co2 | Y | x | x | Y | Y | x | x | x | x | x | x | x | Y |
| Oxygen | O | Y | x | x | x | Y | x | Y | Y | x | x | x | x | x |
| Water | H2O | Y | x | x | x | x | x | x | Y | Y | x | Y | Y | Y |
| Water vapour | H2O | Y | x | x | x | Y | x | x | Y | x | Y | Y | Y | Y |
| Sulfur | S | Y | x | Y | x | x | x | Y | Y | Y | x | Y | Y | x |
| Sulfur di oxide | So2 | Y | x | x | Y | x | x | Y | Y | x | x | x | x | x |
| Hydrogen | H | Y | Y | x | x | Y | x | x | x | Y | Y | Y | Y | x |
| Helium | He | Y | Y | x | x | Y | Y | x | x | Y | x | Y | Y | x |
| Ammonia | NH3 | Y | x | x | x | x | x | x | x | Y | Y | Y | Y | x |
| Chlorine | Cl | Y | x | Y | x | x | x | Y | Y | x | x | x | x | x |
| Sodium | Na | Y | Y | x | x | Y | x | Y | Y | x | x | x | x | x |
| Boron | br | Y | x | Y | x | x | x | x | x | x | x | x | x | x |
| Calcium | Ca | Y | x | x | x | Y | x | x | x | x | x | x | x | x |
| Neon | Ne | Y | Y | x | x | x | x | x | x | x | x | x | x | x |
| Argon | Ar | Y | Y | x | x | Y | x | x | x | x | x | x | x | x |
| Radon | r | Y | Y | x | x | x | x | x | x | x | x | x | x | x |
| Ferric cloride | FeCL | Y | x | x | Y | x | x | x | x | x | x | x | x | x |

## XIX) OBSERVATION & ANALYSIS FROM PLANETARY INFORMATION GATHERED

Reference to Mining & Manufacturing in outer space the Physical characteristics and Chemical properties of planets and moons are noted. Some of the Planets space craft landing not available due to no proper land surface available, or high pressure cloud a gaseous state etc. Now considering the usage of Robotics High tech under the development are used then we consider to categorize the Planets in Type A to Type E in this study. The Valuable resource in outer space can be mined and bought to earth for use and in some planets, we can manufacture products and bring products to earth. We can develop floating stations for tourism and space exploration with temp store for outer space survival. During the chance of finding a habitable planet then humans can have better survival in outer space. The Manufacturing in outer space can help to accelerate the raw material needed for better space explorations rather depending on all materials from earth. Even pollution during the manufacturing work can be minimized in earth by manufacturing in outer space in future.




Planning Category Type A1 – Mining + Manufacturing at 30 degree Celsius
Planning Category Type A2 – Mining + Manufacturing at very low temp
+ High Pressure + High Tolerance
Planning Category Type B1 – Mining - Medium to High Temp
Planning Category Type B2 – Mining -Very High Temp.
Planning Category Type C1 – Mining in Jupiter Moon (Special Launcher + Lander)
Planning Category Type C2 – Mining in Long distance Neptune + Pluto
Planning Category Type D1 – Mining in Asteroid Belt between Mars & Jupiter
Planning Category Type D2 – Mining in Asteroid Belt Long distance next to Pluto
Planning Category Type E – Service for outer space activities Launch Pad
Rescue service+ Floating Stations at dedicated locations
Lab service and Store service

**Project Management - Typical Resource Finding Model**
STAGE RF01 - Concept Design with Budget

STAGE RF02 - Manufacturing Tech for STAGE RF01
STAGE RF03 - Service Model – Service 01 Transport + Landing to Location
STAGE RF04 - Robotic Exploration + Drilling + Sample Testing + Sample Gathering
STAGE RF05 – Packing + Transport to earth
STAGE RF06 – Testing and confirming the resource from STAGE RF05

**Project Management - Typical Mining Model**
PHASE MM01 - Resource Finding Model STAGE RF06
PHASE MM02 – Cost Estimation after PHASE MM01
Plan A – Equipment + Technology + Transport + value of resource in production + risk
Plan B – Alternative method of Plan A
Budget Cost Analysis from Plan A & Plan B
PHASE MM03 – Mission on Hold or to Proceed PHASE MM02
PHASE MM04 – After PHASE MM03 Manufacturing Equipment's & Safety check
PHASE MM05 – Launch Transport to Target landing in outer space
PHASE MM06 – Mining Infrastructure Assembling in suite and Trial test.
PHASE MM07 –Packing of resource gathered and Launch Transport to Earth
PHASE MM08 - Cost Analysis & Control and proceed further upgrade Tech
PHASE MM09 - Start Mining Activity in outer space

**Project Management - Typical Manufacturing Model**
PART MF01 - implement (PHASE MM01 to PHASE MM 06) from Typical Mining Model
PART MF02 - Assembly Setup Test Lab
Trial Work on particular Product Typical High Temp + High Pressure
+ Storage + Scrap disposal trials
PART MF03 – Quality Control + Packing of Trial Test
PART MF04 – Launch Transport of Trial Test of Particular Product to earth
PART MF05 - Quality Control check at Earth
PART MF06 - Cost Analysis & Control and proceed further upgrade Tech
PART MF07 – Start the Manufacturing at the outer space with implements in PART MF06

**Project Management - Typical Regulation at EARTH Model**
STAGE RAE01 - Design Heavy Transport "**IN-OUT-SPACE-TRANSPORT-LOCATION**"
STAGE RAE 02 - TRIAL RUN for STAGE RAE01 around the resource needed global points
STAGE RAE 03 - National and International Treaty regulation for STAGE RAE 02 restriction
STAGE RAE 04 - Periodical Meetings Update of REA 03 - for Safe Landing of Heavy Goods
STAGE RAE 05 - Analysis of **Existing and Next Spacecraft location** regulations and REA 04

**Project Management - Typical Recycle Model at EARTH Model**
STAGE RECYCLE01 - Design Heavy Transport "**Container Reuse Model for Space**"
STAGE RECYCLE 02 - TRIAL RUN for STAGE RECYCLE E01.
STAGE RECYCLE 03 - National and International Treaty regulation for STAGE RECYCLE 02.
STAGE RECYCLE 04 - Periodical Meetings Update of RECYCLE 03 - for Safety
STAGE RECYCLE 05 - Analysis of Existing and disposal of scrap regulations and RECYCLE 04

**Project Management - Typical Service Model**
**PHASE TSMT01 - Service Testing and Audit**
STAGE 01 Planning Method implementation Trial for each service
STAGE 02 Monitoring Model implements in trial in STAGE 01 and Quality Control
STAGE 03 Budget Model implements for alternatives for STAGE 02 in each service
STAGE 04 Market Analysis and valuation and contract with firms
STAGE 05 Manufacturing Equipment's for Basic operation of service
Manufacturing Equipment's as per contract service
STAGE 06 Periodical launch incorporating contract requirements

**Project Management - Service SM 01 Transport**
Pack +Launch from Earth to Required location outer space
Pack +Launch from Required location outer space to Earth
Pack +Launch from Required location outer space to other outer space location
Equipment relocation, Assembling, Dismantling + Packing

**Project Management - Service SM02 Equipment Maintenance**
Technical Defect Maintenance of Equipment using Robotics
Maintenance of Equipment using Manual & Robotics at safe feasible location
Upgrade the existing equipment's in outer space
Refueling service

**Project Management - Service SM03 Rescue activity**
Rescue of floating equipment to particular location
Tracking service – Equipment, other Resource for safe landing.
Forecast collusion alert- approaching Comet, asteroid or other floating object

**Project Management - Service SM04 Floating Station**
Floating Station – conduct research in Lab
Floating Station – Storage of Fuel, Storage of Spares and Equipment

**Project Management - Typical Cost Analysis & Control Model**
STAGE CAC01 Analysis on Material Supply Rate from Existing Market, Forecast in time
Analysis on Technological Service Rate in Existing & Forecast in time
Analysis on Product Demand in Existing Market & Forecast in time
Analysis on Transportation Service in Existing Market & Forecast in time
Analysis on Human Professional & Training in Existing Time, Forecast in time
STAGE CAC02
Analysis on Safety & quality control for STAGE CAC01
Analysis on Rate from peer Private Eye Sector for STAGE CAC01
STAGE CAC03
Budget with current resource for STAGE CAC02
Alternative Budget Plan with Re-Run of STAGE 01 and STAGE CAC02
STAGE CAC04
Presentation in Common Format for STAGE CAC03

**Project Management - Typical Monitoring Model**
STAGE M01 Format List for each Sector for Contract C05
PART M01 Procedure & Format based on Sector Model
PART M02 Contract Model Participants implication for PART 01
PART M03 Safety, Law, Quality implement s for PART 01 & PART 02
PART M04 Budget Model implements for PART 01 & PART 02
PART M05 Budget Alternatives for PART 04
STAGE M02 Contract Model implements on STAGE M01
STAGE M03 Update in Safety, Quality, Law implement & Re-Run PART M05
STAGE M04 Infrastructure Model implements for STAGE M03
STAGE M05 Quality & Safety test Trials for STAGE M04
STAGE M06 Routine invisible Private Eye sector Set for Ethical & Moral & publish in newspaper

**Project Management - Typical Contract Model**
PART C01 Main Scope Set a draft Contract include the following
Member List Private Sector
Appointed List Investment Sector
Member Legal adviser Sector
Member List Govt Sector
Member List Monitoring Model (min 2 Nos Monitoring +min 2 Nos Private eye)
Member Wage & Appointed Team Wage Set per activity in Scope
PART C02 Contract approval for PART C01 from Govt Sector
PART C03 Member Meeting & Rerun PART C01 & PART C02
PART C04 Agreement set between Members in Scope after PART C03
PART C05 Update PART C03 and PART C04

**Project Management - Typical Scope Model**
Type SCM01 Initiate based on Govt Sector Tender
Type SCM02 Initiate based on Private Sector Concept Run
Type SCM03 Initiate Virtual Simulation Analysis for Research Sector Concept Run
Type SCM04 Initiate Virtual Simulation Analysis for Investment Sector based Concept Run

**Project Management - Typical Infrastructure Model**
PART T01 Scope List from STAGE SCM04 of Monitoring Model in contract
PART T02 Procure approved Resource Under system data reconcile in each activity
PART T03 at Earth Infrastructure Implements Civil, MEP
PART T04 at Earth essential Assembling, Trial Test prior Packing in sequence
PART T05 at Earth Packing after PART T04 and from PART T02
PART T06 Dispatch to launch Pad.
PART T07 Tracking Space Craft Planning Category (Type A1 & all other Types)
PART T08 Confirm to Transport Agency for particular Location Space Craft Landing
PART T09 after Landing Re-align Coordinates and check on ground condition
PART T10 Initiate PHASE MM06 of Mining Model
Assembling in location (Automated service Robo Procedure)

Trial Test and quality check confirming to Infrastructure setup Accomplishment.
PART T11 Start Gathering material + Packing + to Launch Pad.
PART T12 Initiate Service 01 – Transport for PART T11
PART T13 Implement PART T07, PART T08 for PART T12

**Project Management - Typical Safety Model**

STAGE S01 Scope List from PART 03 of Monitoring Model in contract
STAGE S02 Sector based set Safety procedure for STAGE S01
STAGE S03 Checklist Set for STAGE S02 to Stop Crime Possibilities
STAGE S04 Team Communication Language Limit Set for STAGE S03
STAGE S05 Feedback of STAGE S04 to Monitoring Model
STAGE S06 Routine Update STAGE 03 of Monitoring Model Including suggestions from Private eye for STAGE S03

**Project Management - Typical Quality Model**

PART QM01 Scope List from PART M03 of Monitoring Model in contract
PART QM02 Sector based set procedure for PART QM01
PART QM03 Feedback using PART QM02 to PART QM03 of Monitoring Model in contract
PART QM04 Fuel standards Regulation for spacecraft to meet National & International Treaties

**MARKET SIZE**

Type A1 – Market Value $xxx Trillion (Mars-Mining + Manufacturing + Transport)
Type A2 – Market Value $xx Trillion (Titan moon in Saturn Mining + Manufacturing + Transport)
Type B1 – Market Value $x Trillion (Moon Mining + Transport)
Type B2 – Market Value $x Billion (Venus Mining + Transport)
Type C1 – Market Value $xxx Billion (Europa Moon in Jupiter Mining + Transport)
Type C2 – Market Value $x Billion (Triron Moon in Neptune + Pluto Mining +Transport)
Type D1 – Market Value $xx Billion (Asteroid Belt span Mars - Jupiter Mining +Transport.)
Type D2 – Market Value $x Billion (Asteroid Belt span Pluto Mining + Transport.)
Type E – Market Value $xxx Billion Service for outer space activities

## XX) INVESTMENTS AND DEVELOPMENTS IN BANKING SECTOR

Investment in Products from outer space (Z Fiber cable, Medicine)
Investment in Value oriented rare resource mining
Investment in Space Travel Tourism
Investment in Floating Stations research service
Investment in Manufacturing Equipment's for outer space
Investment in Robotic and software developments
Investment in Real Estate outer space for research and occupancy development

**Portfolio Management** for Planning Category Type A to E

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Mars for investors Portfolio analysis and implementations.

| | Portfolio For Type A1 - Mars Planet | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-A1-Service Transport - Mars | x | xx | xxx |
| 3 | Stock -A1-**Mineral Product 01** - Mars | x | xx | xxx |
| 4 | Stock -A1-**Mineral Product 02** - Mars | x | xx | xxx |
| 5 | Stock -A1-**Mineral Product 03** - Mars | x | xx | xxx |
| 6 | Stock- Manufacturing Model - Firm / Company | x | xx | xxx |
| 7 | Stock -A1-**Product 01** - Mars | x | xx | xxx |
| 8 | Stock -A1-**Product 02** - Mars | x | xx | xxx |
| 9 | Stock -A1-**Product 03** - Mars | x | xx | xxx |
| 10 | Stock -A1-**Product 04** - Mars | x | xx | xxx |
| | **Total Value For Type A1 - Mars** | | | **xxxxx** |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Titan Moon in Saturn for investor Portfolio analysis implementations.

| | Portfolio For Type A2 - Titan moon in Saturn | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-A1-Service Transport - Titan moon in Saturn | x | xx | xxx |
| 3 | Stock -A1-**Mineral Product 01** - Titan moon in Saturn | x | xx | xxx |
| 4 | Stock -A1-**Mineral Product 02** - Titan moon in Saturn | x | xx | xxx |
| 5 | Stock -A1-**Mineral Product 03** - Titan moon in Saturn | x | xx | xxx |
| 6 | Stock- Manufacturing Model - Firm | x | xx | xxx |
| 7 | Stock -A1-**Product 01** - Titan moon in Saturn | x | xx | xxx |
| 8 | Stock -A1-**Product 02** - Titan moon in Saturn | x | xx | xxx |
| 9 | Stock -A1-**Product 03** - Titan moon in Saturn | x | xx | xxx |
| 10 | Stock -A1-**Product 04** - Titan moon in Saturn | x | xx | xxx |
| | **Total Value For Type A2 - Titan moon in Saturn** | | | **xxxx** |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Moon for investors Portfolio analysis and implementations.

| | Portfolio For Type B1 - Moon | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-B1-Service Transport - Moon | x | xx | xxx |
| 3 | Stock -B1-**Mineral Product 01** - Moon | x | xx | xxx |
| 4 | Stock -B1-**Mineral Product 02** - Moon | x | xx | xxx |
| 5 | Stock -B1-**Mineral Product 03** - Moon | x | xx | xxx |
| | Total Value For Type B1 - Moon | | | xxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Venus for investors Portfolio analysis and implementations.

| | Portfolio For Type B2 - Venus | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-B1-Service Transport - Venus | x | xx | xxx |
| 3 | Stock -B1-**Mineral Product 01** - Venus | x | xx | xxx |
| 4 | Stock -B1-**Mineral Product 02** - Venus | x | xx | xxx |
| 5 | Stock -B1-**Mineral Product 03** - Venus | x | xx | xxx |
| | Total Value For Type B2 - Venus | | | xxxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Asteroid Belt in Space Span between Mars-Jupiter for investors Portfolio analysis and implementations.

| | Portfolio For Type D1 - Asteroid Belt span Mars - Jupiter | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-D1-Service Transport - Asteroid Belt span Mars - Jupiter | x | xx | xxx |
| 3 | Stock -D1-**Mineral Product 01** - Asteroid Belt span Mars - Jupiter | x | xx | xxx |
| 4 | Stock -D1-**Mineral Product 02**- Asteroid Belt span Mars - Jupiter | x | xx | xxx |
| 5 | Stock -D1-**Mineral Product** 03- Asteroid Belt span Mars - Jupiter | x | xx | xxx |
| | Total Value For Type D1- Asteroid Belt span Mars - Jupiter | | | xxxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Asteroid Belt in Space Span near Pluto orbit distance for investors Portfolio analysis and implementations.

| | Portfolio For Type D2 - Asteroid Belt span Pluto | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-D1-Service Transport - Asteroid Belt Mars - Jupiter | x | xx | xxx |
| 3 | Stock -D1-**Mineral Product 01** - Asteroid Belt Mars - Jupiter | x | xx | xxx |
| 4 | Stock -D1-**Mineral Product 02**- Asteroid Belt Mars - Jupiter | x | xx | xxx |
| 5 | Stock -D1-**Mineral Product 03**- Asteroid Belt Mars - Jupiter | x | xx | xxx |
| | Total Value For Type D1- Asteroid Belt Mars - Jupiter | | | xxxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Service Sector – (From launch pad ,fuel , goods cargo , maintenance, research lab in outer space and storage facility for other missions in space) for investors Portfolio analysis and implementations.

| | Portfolio For Type E - Service for outer space activities | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-E-Service **Transport** - Service for outer space activities | x | xx | xxx |
| 3 | Stock-E-Service **Fuel** - Service for outer space activities | x | xx | xxx |
| 4 | Stock-E-Service **Maintainance** - Service for outer space activities | x | xx | xxx |
| 5 | Stock-E-Service **Research Set** - Service for outer space activities | x | xx | xxx |
| 6 | Stock-E-Service **Temp Storage** - Service for outer space activities | x | xx | xxx |
| | Total Value For Type E - Service for outer space activities | | | xxxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Europa Moon in Jupiter for investors Portfolio analysis and implementations.

| | Portfolio For Type C1 - Europa Moon in Jupiter | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-C1-Service Transport - Europa Moon in Jupiter | x | xx | xxx |
| 3 | Stock -C1-**Mineral Product 01** - Europa Moon in Jupiter | x | xx | xxx |
| 4 | Stock -C1-**Mineral Product 02** - Europa Moon in Jupiter | x | xx | xxx |
| 5 | Stock -C1-**Mineral Product 03** - Europa Moon in Jupiter | x | xx | xxx |
| | Total Value For Type C1 - Europa Moon in Jupiter | | | xxxxx |

The following shows the list of Financial Stock in Financial Market reference to mining and manufacturing unit in Tririon Moon in Neptun and Manufacturing units in Pluto for investors Portfolio analysis and implementations.

| | Portfolio For Type C2 - Triron Moon in Neptune + Pluto | Qty | Price | Amount |
|---|---|---|---|---|
| 1 | Stock -Mining Model - Firm / Company | x | xx | xxx |
| 2 | Stock-C1-Service Transport - Triron Moon in Neptune + Pluto | x | xx | xxx |
| 3 | Stock -C1-**Mineral Product 01** - Triron Moon in Neptune + Pluto | x | xx | xxx |
| 4 | Stock -C1-**Mineral Product 02** - Triron Moon in Neptune + Pluto | x | xx | xxx |
| 5 | Stock -C1-**Mineral Product 03** - Triron Moon in Neptune + Pluto | x | xx | xxx |
| | Total Value For Type C2 - Triron Moon in Neptune + Pluto | | | xxxxx |

## XXI) BANKS & BANKS SYSTEM RISK

Strategic and profitability risks ,Cyber risk, Increased interconnectedness between financial parties, High operational risk systemic, High operational risk idiosyncratic, Third party vendor management risk , Compliance risk including failure to protect consumers and dats protection regulation, Money laundering terror fun risk, Liquid risk and volatility of bank funding sources.

## XXII) FINDINGS

1. Feasibility for mining work in planers, moons and asteroids are analysed and catogarized in type A to type E.
2. Feasibility for manufacturing are found in Mars and Titan moon of Sarturn.
3. Mining in Earth moon and Venus planet are under high temperature environment and all other are lower temperature zone.
4. Project management models is required for prompt implementation of mission and better portfolio return results.

## XXIII)SUGGESTIONS

The following aspects are the suggestions of the study for investment and research

- Major success in outer space directly depends on Accuracy of Correct Analysis done on a particular planet and Accomplishment of Automated Robotic Activity according to the analysis. Hence the Electronic and software industry must be enhanced to meet the requirement of challenges in outer space mining and manufacturing.
- Investment for Automation should also help for new job creation and provide quality products and better environmental aspects in the manufacture d products.
- Mineral Finding Mission needs to be given priority. And once the rare valuable resource are found then mining trial mission can be focused including setting up launch pad in the particular location can be proceeded.
- After mining of minerals are succeed then Manufacturing of product trial can be initiated.
- Space Tourism can be done using floating stations outside earth and transport service with rescue setup can be provided.

- After mining the transported material are to be delivered to earth. Trial orbital locations needs to be analyzed and under regulations such space area can be used for transport "**In-Out Space-Transport Location**" so that safety and rescue at land can be provided.

- Global meeting at regular interval of time needs to analyses the existing and future satellite locations, goods transport to outer space for regulations in national and international level

- "**Container Reuse Model for Space"** with regulations in national and international level are needed with disposal of scrap as per regulation.

- Space Craft **Fuel standards regulations** needs to meet the National and International Treaties.

- Project management regulations at earth model should be implemented to avoid fall of debris or good in public place in earth. Hence **In-out-space-transportation-location** should be done under international treaty.

- Recycle model for pollution control needs to be done under international standard.

- Contract model in project management needed to be adopted with registration with government authorities so that national and international treaty are covered for safety.

- Overall robotics hardware and software technology needs a tremendous advancement for best result in outer space resource gathering activity.

- Funding and returns needs to developed i.e. the research team must explain the pros and cons of mission in presentation along with assurance for better investor participation in space research and outer space mining are needed.

## XXIV) CONCLUSION

This detailed study describes the upcoming space economy that can be of a high value for human in future generations in Economic, technological, political and wellbeing excellence. The total outer space economy in overall are summarized with (a) Total number of resource utilization in each planet & moons, (b)Total manufactured products (c) Total technological enhancement (d) Total medical and food enhancement and (e)Space Tour. The study concludes in a forecast that a better Financial Market with sustainable growth pattern can be achieved using the space economy along with safety and quality standards with International Regulations.

## XXV) REFERENCE


- **Internet web site** for Commercial use of space
https://en.wikipedia.org/wiki/Commercial_use_of_space
- **Internet web site** for Commercial astronaut
https://en.wikipedia.org/wiki/Commercial_astronaut
- **Internet web site** for European Space Agency for Space Economy
https://www.esa.int/About_Us/Business_with_ESA/Global_Space_Economic_Forum/Space_Economy
- **Internet web site** for ESA Global Economic Forum and studies
https://www.esa.int/About_Us/Business_with_ESA/Global_Space_Economic_Forum/ESA_Studies
- **Internet web site** for Satellite service revenue data
https://www.statica.com/statics/185960/worldwide-revenue-with-satellite-services-since-2001/
- **Internet web site** for Air purification product Airocide
http://www.owler.com/company/airocide
- **Internet web site** for Smart Glasses
http://www.statista.com/statistics/610496/smart-ar-glasses-shipments-worldwide/
- **Internet web site** for Nero Arm Product
http://www.databridgemarketresearch.com/reports/global-c-arms-market/amp
- **Internet web site** for Image guided Robot Surgery equipment
http://www.mordorintelligence.com/industry-reports/robotics-market
- **Internet web site** for Bone Fracture
http://www.pharamacetical-technology.com/comment/global-osteoporosis-market-reach-11-2bn-2027/
- **Internet web site** for Infection Treatment
http://www.mordorintelligence.com/industry-reports/cold-plasma-in-healthcare-market
- **Internet web site** for 3d Bio Printng
http://www.marketsandmarkets.com/Market-Reports/3d-bioprinting-market-170201787.html
- **Internet web site** for Fire Extinguisher
http://www.imarcgroup.com/fire-extinguisher-market

- **Internet web site** for Robo Arm
http://www.profsharemarketsearch.com/robotic-packing-arm-market/
- **Internet web site** for Water Testing
http://www.google.com/amp/s/www.fortunebusinessinsights.com/amp/industry-reports/functional-water-market-100279
- **Internet web site** for Autonomus Docking Sensor System for Space Craft
http://www.marketandmarkets.com/Market-Reports/space-robotic-solution-market-64197036.html
- **Internet web site** for Goods & Service Launch pad service
http://www.cosmosmagazine.com/space/tree-new-reports-add-clarity-to-australia-s-space-sector-a-crowded-and-valuable-high-ground
- **Internet web site** for Reusable launch veichle
http://www.marketwatch.com/press-release/us-reusable-launch-vehicle-market-research-report-2020-2020-03-30
- **Internet web site** for Radiation Tolerant
http://www.analog.com/en/technical-articles/a-new-era-in-space-products-radiation-tolerant-commercial-space-products.html
- **Internet web site** for High tech Processor
http://www.statistics/1018886/global-radiation-hardened-electronics-market-by-region/
- **Internet web site** for 3d maping for navigation
http://www.marketsandmarkets.com/Market-Reports/3d-mapping-market-819.html
- **Internet web site** for For rescue work automation
http://www.marketsandmarkets.com/Market-Reports/automatic-identification-system-market-138357200.html
- **Internet web site** for Commercial Space optical ZBLAN fiber
http://www.factoriesinspace.com/zblan-and-exotic-fibers
- **Internet web site** for Research Facility service Space Station
http://www.google.com/amp/s/amp.ft.com/content/b62ffbe8-f9f3-11e6-9516-2d969e0d3b65


**JOURNALS**


- Market Analysis of a Privately owned and Operated Space Station Year 2016 By Keith W Crane & Benjamin A. Corbin Science & Technology Policy Institute.
- The Space Economy at a Glance 2014 OECD (2014) ISBN 978-92-64-21729-4(pdf) Space Development and space Science Together, an Historic Oppourtunity Philip T. Metzer Florida Space institute, University ofCentral Florida USA http://dx.doi.org/10.1016/j.spacepol.2016.08.004
- Expanding India's share in global space economy
- The Hindu News Paper date : 05 July 2019 RAKESH SOOD
- The Future of the European Space Sector
- Werner Hoyer and Elzbieta Bienkowska
- Article : European Investment Bank, 2019