



ORIGINAL RESEARCH PAPER

Management

EMERGENCE of SPACE INDUSTRY: EFFECT on GLOBAL HUMAN RESOURCES SKILLS

KEY WORDS: Space economy, Space technology, STEM, Space junk, Space skills

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ABSTRACT

The Space has always fascinated mankind to know and explore the phenomenon happening in the space. Recently, the governments have opened the sector for private investments including development and deployment of the satellite as well as the Rocket or the Launch Vehicles. The current enterprises as well as the new ones are looking to provide satellite based service and Data. The sector is attracting private investments from firms like SpaceX, Blue Origin, Virgin Galactic, Northrop Grumman etc. and multitude of small start-ups across geographies. The sector is expected to become USD 1.4 trillion by 2030. Skills and the talent are the key ingredients towards the development, growth and the problem solving requirements of the space sector over the period till the sector acquires a degree of maturity. The study intends to explore the skills criticality and influence on the space sector as well as assess the availability and readiness of institutes of higher learning to contribute skills for the sector.

INTRODUCTION

The Space industry is an emerging area offering newer dimensions to conventional and new businesses. The Geospatial analytics market does network analysis, geovisualisation and surface analysis, Geospatial Analytics Artificial Intelligence, Reusable space craft, Satellite manufacturing, Space Mining etc.

The Space for Earth technology is segmented into Global Positioning System (GPS), Global Information System (GIS), remote sensing etc.

The advances in science and technology have helped researchers to design experiments differently as also to tackle ever-more complex questions relating to data, discovery and colonization. Due to changes in the economy and in industry funding models, private commercial enterprises are initiating projects that were solely the government prerogative. The technological advances and the private investment appetite has brought the Billionaires into the forefront and they are committing huge funds on such projects as public trips to Mars and back.

The space sector is experiencing continuing growth. As such, it makes the sector attractive for new entrants to the labour market too. Also, at a time when various other sectors have seen a downturn in demand due to the Covid-19 crisis, job opportunities in the space sector looks promising to workers with relevant skills seeking to move elsewhere and to those interested in upskilling and/or reskilling.

This emerging sector needs very specialised high-level skills, interdisciplinary skills, computing & data analytics skills (where the sector has to compete with already established tech sector which also needs similar skills).

The imminence of this sector can also be understood by the fact that Germany has increased its space investments by thirty two percent, India has increased the investment in space sector by seventeen percent while Australia has increased space investments by twenty nine percent.

Currently about 80 nations are operating in space and 40 spaceports across five continents (and a dozen more spaceports are in development pipeline), thus it makes the space is brighter than ever, even with the failures, the sector has more successes and breakthroughs. Realizing the trillion-dollar space economy thus hinges on one important resource here on Earth: The Talent.

Aim and Objective

The paper intends to look at and focus on the emerging skills required in the space industry. It also intends to find/identify relevant gaps in soft skills, technical skills, and technology-specific skills relevant to the STEM education and professional development.

LITERATURE REVIEW

Spatial skills are an important component of success in science, technology, engineering, and Math (STEM) fields. With more than 50% of science, technology, engineering, and math (STEM) majors leaving the STEM fields prior to graduation, there has been an increased focus on improving STEM retention rates at universities across the USA.

Spatial cognition in STEM disciplines, Discipline-based education research (DBER) “investigates learning and teaching in a discipline using a range of methods with deep grounding in the discipline’s priorities, worldview, knowledge, and practices” (National Research Council, 2012b)

Having a strong appreciation for the large number of spatial problems that STEM disciplinary experts face in their work, and recognizing that these kinds of problems are a source of difficulty for novices trying to learn the discipline (e.g., Alles & Riggs, 2011; Kali & Orion, 1996), many researchers conducting DBER have focused their efforts on identifying how to bolster students' skills for completing spatial tasks within their respective domains (e.g., Harle & Towns, 2011; Reynolds et al., 2005; Sorby, 2007).

METHODOLOGY TRENDS ANALYSIS

The paper starts by reviewing the drivers of change and the interactions that are expected to shape industry structures and skills labour markets. We also assemble detailed information about occupations. The paper uses trend analysis as the method for collecting, collating and analysis of the data.

OBSERVATION

The much-needed manpower for the sector is difficult to come by and this skills supply situation has affected about twenty three percent of the organisations as retention rates has dipped over the period.

The organisations with fifty or more staff, experienced rising difficulty to recruit fresh talent as well as experienced talent. Initially only sixty seven percent of these businesses (in the space sector) faced recruitment difficulty but with time about

ninety seven percent businesses were found to be facing difficulty regarding the procurement, retention or the skills gap issues in their businesses.

Recruitment Difficulty

The study found that the most commonly occurring difficulties amongst the businesses in the space sector were related to recruitment from the external labour market, secondly these businesses had difficulty soliciting experienced applicants in the required fields too. The study also found that there was also dearth of applicants with required specialist skills, knowledge or qualifications. It was also found that the space sector in United Kingdom faced challenging times due to Brexit as it reduced the attractiveness due to lack of free mobility of high skilled people from Europe to complete or take up specialised short-term roles or functions.

Table 1: Job Openings across organisations

Sl.No.	Name of the Organisation	Sampled Job Openings
1.	AXIOM SPACE	6
2.	DAWN AEROSPACE	6
3.	EMBOTECH	6
4.	SES	6
5.	SPIRE GLOBAL	6
6.	GALAXYSPACE	8
7.	PLANET	8
8.	ASTRA	9
9.	VIRGIN GALACTIC	9
10.	IQPS	13
11.	MAXAR TECHNOLOGIES	16
12.	UNITED LAUNCH ALLIANCE	16
13.	SIERRA SPACE	20
14.	BALL AEROSPACE	21
15.	VIASAT	23
16.	SPACE-X	40
17.	BLUE ORIGIN	74
18.	NORTHROP GRUMANN SPACE	309

Source: Collated using sampled data from various job sites over same period

Skill Gaps

The study also found that the difficulty as regards the skills gap was particularly more for the bigger businesses, as they indulged more in fresh or new hirings rather than developing the talent in-house. These larger businesses also faced more problems for attracting and retaining highly skilled professionals in STEM fields than the lower skilled jobs of technicians or associate professionals.

The study also found that about fifty one percent of the existing workforce (in these larger businesses) did not possess the required skills.

The data also showed that Australia needs about twenty thousand talent in the space sector by 2030 which is currently not available hence it needs to train eight thousand non-STEM graduates, three thousand new qualified scientists, and about nine thousand engineers till 2030 if it has to develop a thriving space sector in the country.

The study also found that the skills gaps in scientific, engineering, technical functions were in skills related to software engineering, radio frequency engineering, systems engineering, electronics design, electronic engineering at Artificial Intelligence, Machine Learning and professional

level. The data showed that the scientific, engineering, and the technical functions experienced about eighty six percent skill gap while managerial and entrepreneurial functions had about forty three percent skills gap.

Table 2: High intensity skills needs in each Tier One Skill category

High intensity skills need in each Tier One skill category	Skill Needs
Satellite Payload and Sensor Development	0
Soft Skills	0
Satellite Payload and Ground-Based Technologies Development	1
Space Environment Monitoring Technologies	1
Launcher and Spacecraft Development	4
Space Applications	6
Space System Project Management	7
Ground Systems Technologies and Services	10
Software, Programming and Computer Skills	12
Space sector Enabling Skills	13
Space Exploration Technologies Development	15
Spacecraft Mechanisms, Structures and Materials Development	17
TOTAL	86

Source: Collated using sampled data from various job sites over same period.

The problem of skills gap is all the more pronounced with sixty seven percent of the Tier Three skill sets as there are no training providers currently available in this category of the skills.

The study found that training providers are available for only for twenty eight percent of Tier Three skills.

It was also found that five thousand new jobs were added indicating about 3.2 percent growth over last year. Most of these jobs were for the development and production of space vehicles, guided missiles, wireless communication equipment.

The study also found that in the year 2020, the total talent working in the space sector was 1.48 lakh compared to 1.50 lakh total number of talents in the year 2011.

As regards the salary, the study found that for the data available that the private space sector pays more than double the salary for comparable jobs in the government funded space sector and about 25-30% more than other STEM occupation salary.

CONCLUSION

The paper found that the space sector is a rapidly growing sector as the offerings of the sector is meeting the mass markets as well as the high paying specialised user group needs. Given the current projections of sectoral maturity, development of newer applications and uses in this sector coupled with high interest of investment interests, the sector seems very promising. The sectoral salary differential is also large which looks appropriate to create the required pull for the talent needs of the sector. However, talent for sector is new and also has competing as well as compelling offers from the Tech sector. Also, the pipeline for such talent has not surged thus making enormously challenging for the players in this sector.

SCOPE FOR FUTURE RESEARCH

Future research in the talent needs assessments, data collection, analysis and projection as to the talent pool development and similar dimensions in the space sector will go a long way in substantiating, fostering and growth of the sector.

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