

Remote Sensing as part of the Knowledge Economy for a Developed Malaysia

Dato' Dr Ahmad Sabirin Arshad and Aziz Yusoff
Astronautic Technology (M) Sdn Bhd (ATSB)
No 2, Jalan Jururancang U1/21
Glenmarie Industrial Park
40000 Shah Alam
Selangor, Malaysia
Tel: +603 5569 0100, e-mail: sabirin@atsb.my

Abstract:

As Malaysia continues to progress towards achieving a high income nation through various transformational strategies and Knowledge Economy gained via Remote Sensing has high potential to be developed with the ability to contribute to the economic growth. The space and satellite technology provides both upstream and downstream activities with innovative product enhancement and various value added services established in the Malaysia Remote Sensing technology landscape.

Although Malaysia has engaged in Remote Sensing activities for almost two decades, the industry remains at a nascent stage. Technologically, there have been some successes with improvements done at par with developed nations. There is significant limitation to the growth of the local Remote Sensing Industry as compared to global growth. With most related economic activities centered on Government and Universities, recent budget limitations have further increased concerns over the growth potential of the Remote Sensing Industry in Malaysia.

Remote Sensing must be a viable mature self sustaining industry and business to be a solid part of the Malaysian Knowledge Economy. As a part of the Knowledge Economy, indigenous Remote Sensing will be a socio-economical contributor not only locally but internationally.

1.0 Introduction

Astronautic Technology (M) Sdn Bhd (ATSB[®]) was established in 1996 with the mandate of developing Malaysia space technologies. ATSB[®] focuses in research and development in the area of design and development of space systems employing advanced and innovative technologies. ATSB[®] has developed ISO 9001 certified centre of excellences for space technology design, prototyping, manufacturing, and test

facilities include a space qualified high bay area for spacecraft assembly and integration, a space optics qualified clean room, electronic laboratories, and environmental test facility.

With its position as a Special Purpose Vehicle by the Malaysian Government, while structured as a private company, ATSB[®] has interest in the evolution of the Remote Sensing market in Malaysia particularly on the commercial side. For Malaysia to become a developed nation in 2020, factors such as Technological Independence and Increased International Stature and also Financial Potential for High Revenue returns to Malaysia are essential contributors. From an Earth Observation satellite manufacturer perspective, Satellite Images are the fundamental product. Hence, the economic sustainability of Remote Sensing, such as that can be accomplished by the implementation of a feasible K-Economy is essential to ensure the future of Malaysia' Space Programme.

2.0 Development of Malaysian Remote Sensing Satellites

The TiungSAT-1 programme was the first developmental microsatellite programme in Malaysia. Being designed for Earth Observation, the primary payloads of the satellite were a Narrow Angle Camera system allowing for a 76m GSD in 4 bands (RGB NIR). TiungSAT-1 was successfully launched via the Dnepr launch vehicle from Baikonour Kosmodrome, Kazakhstan in the year 2000. The first operational images were acquired during the first week post launch via the grounds station located at UKM.

The TiungSAT-1 programme was Malaysia's first exposure to the space development process. TiungSAT-1 images were mostly utilized for university research and outreach programmes.

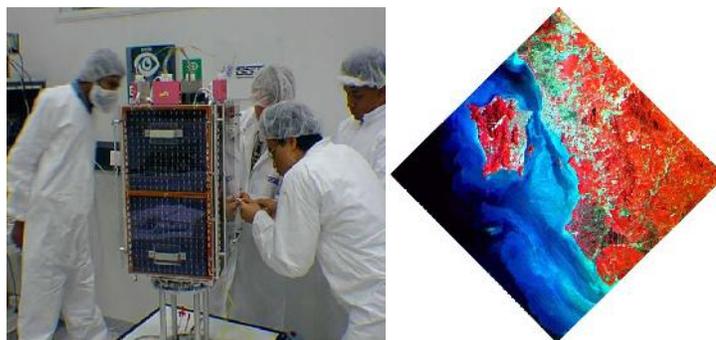


Figure 1. TiungSAT-1 Satellite and Image



Figure 2. TiungSAT-1 Produced Images

The RazakSAT[®] programme development was initiated in the year 2000 under the 8th Malaysian Plan (2000-2005) and culminated with its launching in the year 2009 during the 9th Malaysian Plan (2006-2010).

The RazakSAT[®] technologically aggressive programme became the major flagship and primary growth engine of Malaysia's space technology development capabilities. The satellite deployed the Medium Sized Aperture (MAC) Camera which had the capability imaging of Ground Sampling Distance of up to 2.5m Panchromatic and 5m multispectral in 4 bands (Red, Green, Blue and Near Infra Red). RazakSAT[®] orbit was additionally decided to be the innovative orbit of the Near Equatorial Orbit (NEqO) at 685km and 9° inclination allowing for significantly increased Malaysian imaging opportunities and countries near the Equator which includes several African and South American nations.

RazakSAT[®] was launched into orbit on July 14, 2009 from the Kwajalein Atoll in the Pacific via the Falcon 1 launch vehicle developed by SpaceX. Contact was established in the first pass and the first quick-look image was downloaded 7 days post launch. The satellite has successfully acquired more than a thousand images.



Figure 3. RazakSAT[®] Satellite and First Image



Figure 4. RazakSAT[®] Processed Images

The RazakSAT[®] programme directly contributed to the many achievements in the development of space technology within Malaysia such as the establishment of the Mission and Control Centre, the Assembly, Integration and Testing Facilities, Launch Service Procurement and Management, Launch Insurance, Human Capital Development, Commercialization of Space Technologies, Local Vendor Development, Intellectual Property and Publications. Various spin off programmes in other space related fields has also resulted from the RazakSAT[®] programme.

From the Remote Sensing wise, due to its orbit RazakSAT[®], posed challenges for Image Processing. Furthermore, most of RazakSAT[®] data was available raw at level 0, which is not commonly available or utilized in Malaysia before (ie. Level 2 and above), and needs to be processed further. The information for RazakSAT[®] is available for distribution to interested researchers.

For the present Rancangan Malaysia Ke-10 (RMK), the RazakSAT-2 programme has been approved by the government as the next flagship programme for Malaysian space technology development. The programme has just completed its Mission Study Phase and is in the process of its mission being formally formulated. For RazakSAT-2, the overall emphasis is to help better bolster the Remote Sensing K-Economy for Malaysia.

3.0 Needs Analysis of Malaysia Remote Sensing

As part of its very early study as preparation for RazakSAT-2, in order to understand the market conditions for Remote Sensing Products in Malaysia, ATSB[®]

conducted a market information survey in 2010. The survey was sent out to 93 potential respondents classified by organization. Out of these potentials, 16 respondents responded (17%). The data from the survey was then correlated to international data notably from American Society for Photogrammetry & Remote Sensing.

The leading sources of Remote Sensing Data in Malaysia are from SPOT and LandSat Satellites. This is followed by acquisition from Aerial Photography, Ikonos and Quickbird. Notable is the lack of utilization from Radar based sources.

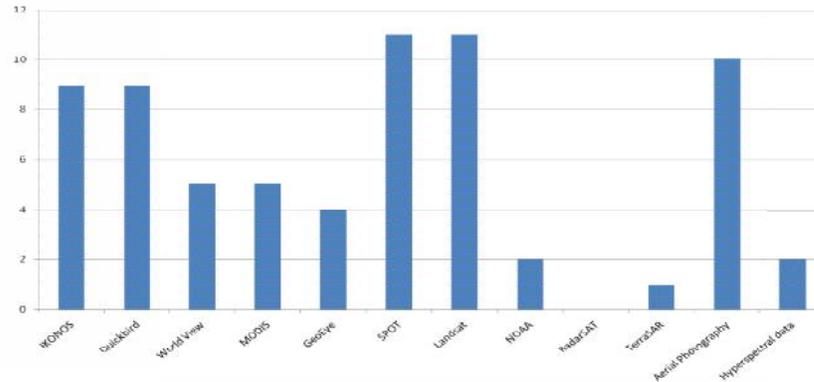


Figure 5. Malaysian utilization of Remote Sensing Sources

When compared to the global scenario, the leading data providers for space borne remote sensing are LandSat, Quickbird, Ikonos, followed by SPOT. Radar Satellites also have a better utilization rate compared to Malaysia.

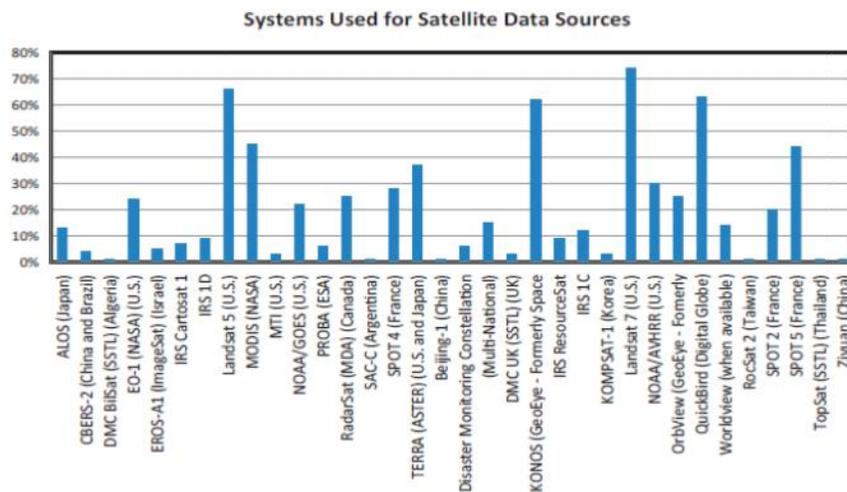


Figure 6. Global Utilization of Space Remote Sensing Data

Another very important consideration to appreciate the market segmentation in Malaysia, is the issue of timeliness of Remote Sensing data. The Malaysian market survey, as illustrated by the figure below, indicates that the community requests and utilizes information mostly from older sources that is a month or even a year old.

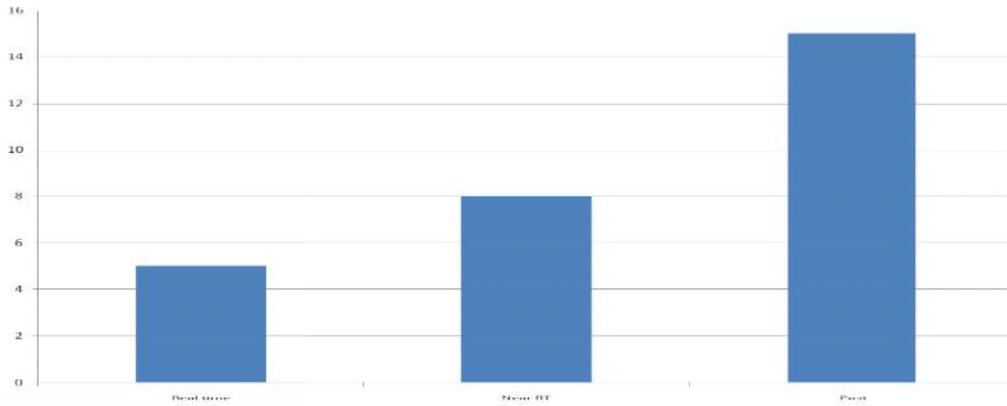


Figure 7. Timeliness Demand of Remote Sensing Information in Malaysia

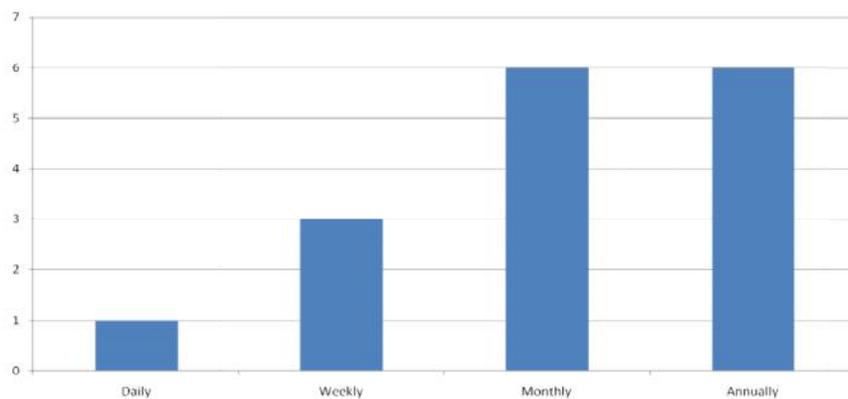


Figure 8. Timeliness Utilization of Remote Sensing Information in Malaysia

When this information is compared to the global community, it can be noted that here instead, there is a significant need for newer data where demand actually outstrips supply.

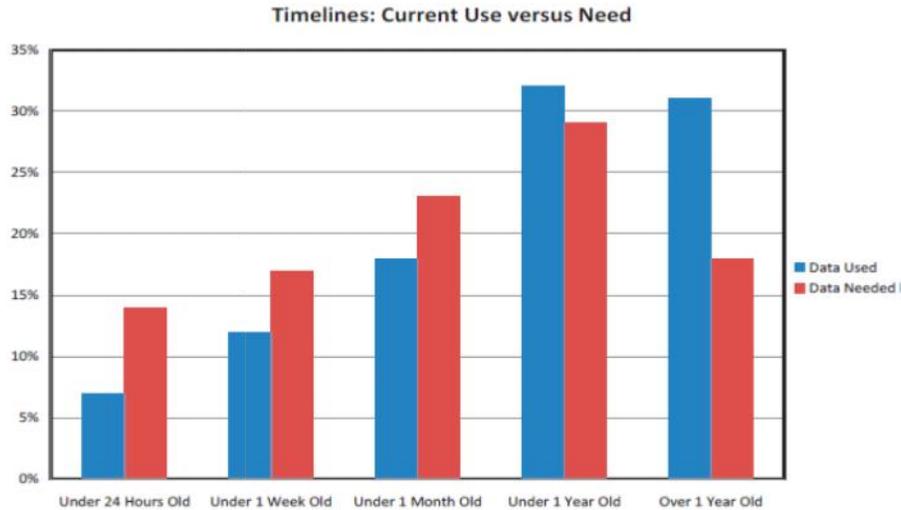


Figure 9. Timeliness of Supply and Demand of Remote Sensing Information Globally

This factor can possibly be attributed to the lack of available timely data in the Malaysian market. As previously noted, there is no freely available local asset for air or space borne Remote Sensing sources.

Finally, application wise, as can be noted from the results of the survey below, the Malaysian Remote Sensing Community has primary focused work to the study of Environment, Forestry, Agriculture, and Water Resources. Secondary focus work is in the fields of Cartography, Urban Planning and Regional Planning. Other applications are also studied and not ignored but generally have less importance.

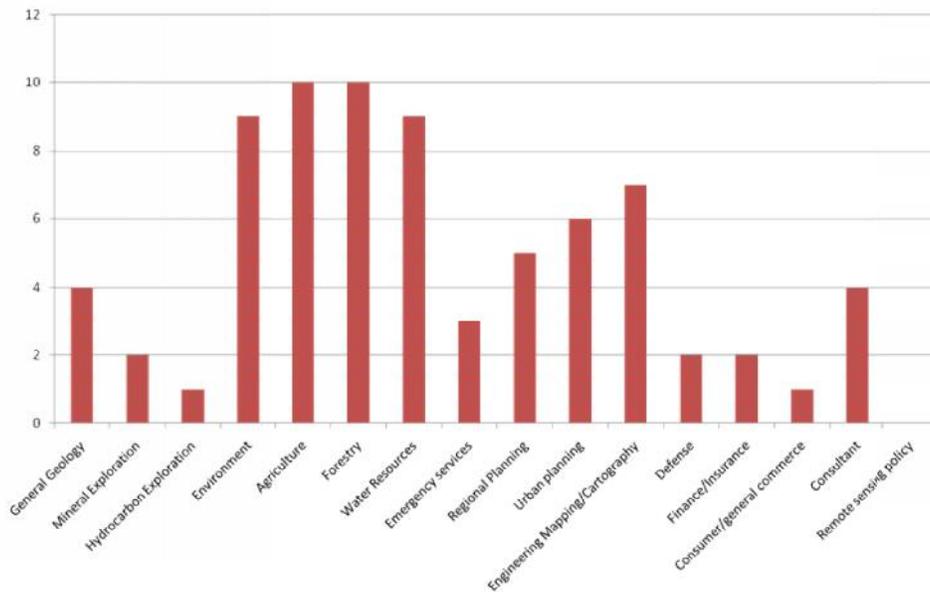


Figure 10. Scope of Utilization of Remote Sensing Information in Malaysia

Remote Sensing is still not seen as an important engine of the nation's economy. Presently Remote Sensing for Space is being driven by strategic national programmes like RazakSAT-2. National Programmes usually are first time implementations in many ways and can involve many unprecedented issues. Under the spotlight of national attention, the difficulty of successful implementation is exponentially increased. As R&D takes a long time to complete, things out of expectations can and will occur. There is still a lack of pioneering spirit in Malaysia where it is difficult to accept calculated risks. The Needs Analysis studies demonstrate that there is still space for expansion in Malaysia Remote Sensing market when compared internationally.

5.0 Conclusions

Despite the many obstacles, Technology Development of Remote Sensing Space Technology in Malaysia can be considered successful. However, it must be noted that the future of Space Remote Sensing is seriously threatened unless a clear way is found to incorporate Remote Sensing into the Economy. For the moment, Remote Sensing activities in Malaysia are far too Research orientated with very little economic spill over. The path to implementing Remote Sensing as a K-Economy will not be easy or straightforward. Technological Challenges are always there but for developing Nations, the survivability of any programme or initiative can be called into question by just a few failures despite large successes. To mitigate these questions, economic factors must be brought to prominence.

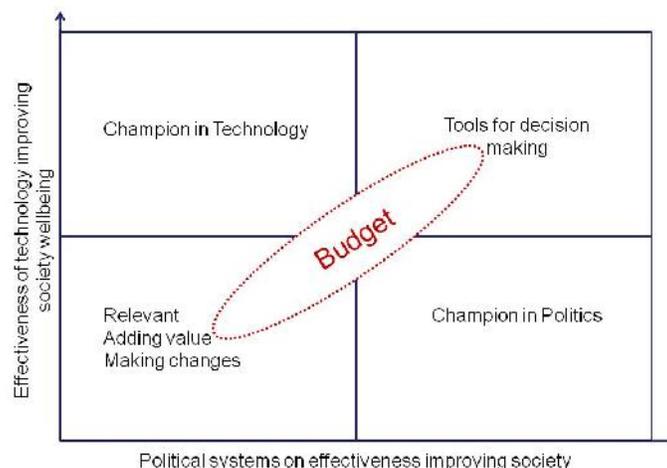


Figure 11. Balancing the Factors.

Other aspects must come into play as well for Remote Sensing to be a successful element of Malaysia's K-Economy such as government encouraged commercial friendly business ecosystem and legislation. This would allow local Remote Sensing businesses to sustain themselves and create a sustainable Remote Sensing k-economy. Indigenously Developed Products and Services can be then be better introduced competitively to the international market.

6.0 References

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