Remote Sensing and the DIKW Pyramid

Satellite remote sensing industry is evolving and anyone working in it needs to become familiar with the Data, information, Knowledge, Wisdom (DIKW) pyramid as this is one map, albeit simplistic, of the industry's and our current journey.

Historically, satellite data was either sold as the original image or with a small amount of processing undertaken. If anyone wanted to do anything beyond basic processing, they had to do it themselves. However, things are changing.

According to a recent Euroconsult report, at least 3,600 small satellites will be launched over the next decade. The United Nations Office on Outer Space Affairs only lists 7,370 objects that have ever been launched into space, of which only 4,197 are still in orbit. We're increasing the number of objects orbiting the Earth by 85% by smallsats alone, larger satellites will add even more.

The volume, variety and speed of this data collected by these satellites will present a step change not only in the type of applications companies will be able to offer, but, crucially, also in customer expectations - more and more they will be looking for added value.

One way of considering this is through the DIKW pyramid, which can be seen at the top of the blog, it's credited to American organisational theorist Russell Ackoff in 1989, building on the ideas of Milan Zeleny two years earlier.

A simple summary of the pyramid starts with the collection of data which means nothing in its own right, it is simply data. Information is derived from data by asking the who, what, where, when and how questions. Knowledge is information to which expert skills and experience have been added to create more value – which is more profitable in a business context. Finally, wisdom is understanding what actions to take based on the knowledge you've gained.

Applying this to satellite remote sensing for agriculture, one example might be: data is the satellite data/image of the field. Information is knowing when the image was taken leading to where in the growing cycle the crop was. Knowledge is applying scientific algorithms to know the soil moisture, how much nutrients are in the soil or how much vegetation is present in various parts of the field.

Wisdom is knowing what nutrients and fertilizers to apply, based on the knowledge gained, to improve crop yields.

A lot of Earth observation products are at the data or information level, with a few at the knowledge level, and even fewer at the wisdom level. Customers more and more want wisdom products, and they aren't that interested in what was required to create them. When you add to this the additional types of geospatial information, e.g., optical and radar used together alongside airborne and in-field ground based measurements, the variety of open datasets and the new science and technological breakthroughs, things are going to look very different, very quickly.

We'd accept that the DIKW isn't a perfect tool, nor a perfect representation of our industry, but it is simple, indicative and worth thinking about. We wrote about our intention to create products in an earlier blog. We're a long way from the wisdom sector, but are hoping to be firmly within the knowledge sector and collaborating to create wisdom. It's not easy and some companies will find it harder to do than others, but is going to be the future. How are you preparing?