

What is the Value of Spatial Information?

A broader definition of the industry's business would help sell it.

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Further Reading

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A recent study by economic researchers ACIL Tasman called the The Value of Spatial Information prepared for the CRC for Spatial Information, reports that the economic impact of spatial information on Australia's GDP is about 1 per cent.

That is a conservative estimate from verifiable data. Add some 'gut feeling' and the estimate grows to 1.5 per cent. These figures will be broadly cited in the future, both because of the considerable effort that went into the study (which makes it unlikely that the work will be repeated soon), and because of the direct benefits for lobbying and marketing the profession in Canberra.

I applaud this effort, in particular the attempt to value the industry. I also applaud a methodology to accept only verifiable data. But I am concerned about the study's understanding of the spatial information domain and its definition of the spatial information sector.

I claim here that we urgently need a discussion of these definitions to better understand and shape our identity. My argument will set out from a simple observation: previous European research (for instance a pamphlet in support of GI2000 by Frank at the Technical University Vienna in 1999) came up with a figure of 15 per cent for the potential impact.

These two estimates differ by a factor of ten. So, how come? I will argue that the gap originates from a flawed definition of spatial information in the Australian study, which, by the way, goes back to the understanding of spatial information by the CRC for Spatial Information, the client of the study.

When we talk about the value of spatial information, it is crucial to begin with a well understood notion of spatial information. The study starts from the following definition: 'SI describes the physical location of objects and the metric relationships between objects.' (see also <http://www.crcsi.com.au/pages/about.aspx>).

But that's not the only possible definition. The Association of Geographic Information says SI is 'information about objects or phenomena that are associated with a location relative to the surface of the earth' (<http://www.agi.org.uk>).

ANZLIC says it is any information about a location in space and time.

The comparison shows that the study's definition is narrower than other definitions because of its talk of objects and metric relationships. By applying this narrow definition, it grossly underestimates the value of spatial information.

Discussing the subject in a 2004 paper, Krek suggested one should apply the standard definition from artificial intelligence literature, which defines the economic value of a given piece of information to be the difference in value of actions before and after the information is obtained.

So, what's wrong with the ACIL Tasman definition? Firstly, this definition neglects all spatial data and information about field phenomena such as elevation, soil, temperature, wind, or humidity.

Secondly, this definition neglects all non-metric spatial information. As an example, the London Underground Transport map is not bound to physical locations, is not metric, but is valuable for just these reasons. Another example, more timely perhaps: place descriptions are hierarchic and purely topological, and for these reasons effective in communication.

I would argue that non-metric spatial information—information about order, about connectedness, about nearness—is in many areas more valuable than metric information.

Thirdly, time is missing. Information about the physical location of a bus, or its metric relationship to the person waiting at a bus stop, is irrelevant (i.e., of no value). What counts for the person is the time of arrival of the bus at the bus stop. This is still spatial information.

Fourthly, scale is neglected. For us the term 'spatial' refers to geographic scale, limiting the scope of the discussion to geographic information. We cannot claim that methods developed in our domain, i.e: in the geographic scale range, are automatically suited to other domains, where distance are very big or very small. For example, microbiological or astronomical problems are often very spatial, but outside our realm.

The definition of spatial information given in the study is later refined by a distinction between relative and absolute spatial information. It is recognised in the study that there is no hard-and-fast rule to decide whether new processes or products that rely on spatial information should be included in this economic assessment, and I agree with that.

But then the text proceeds to exclude relative spatial information nonetheless, and unfortunately, for false reasons. For instance, CAD is counted as general ICT, hence not as technology in the spatial information sector. This is a vulnerable argument (of what else is spatial information a sector if not of general ICT), but that's not my point.

CAD should be excluded, because it is the wrong scale, not because it uses relative information.

In fact, relative spatial information of geographic scale is in many cases more valuable than absolute spatial information (or let's put it this way: generating relative spatial information from absolute information is value adding), and there is no reason why we should exclude this type of spatial information from our sector's product list.

Another false argument is that relative spatial information is more valuable if it is metric. But consider an instruction to a motorist from a navigation system to turn right in 134 metres. It takes an unreasonable amount of cognitive effort to

obey and even then, is highly prone to error. Compare that with much easier and more accurate instruction: 'take the second right'. It's not metric, but it is more valuable in this application.

Digital spatial information products are emerging in all sorts of application areas. This first generation of digital spatial information products has already an economic impact of at least 1 per cent of the GDP.

The discussion so far has shown that the only gap between the status quo and the potential impact of spatial information of 15% is making spatial information products more useable, and by this way, considering a broader range of information products spatial.

With this broader understanding of what spatial information is, it becomes clearer why academic research in this area is becoming more and more interdisciplinary. GI Science re-examines some of the most fundamental themes in traditional spatially oriented fields, such as geography, cartography, and geodesy, while incorporating more recent developments in cognitive and information science. It also overlaps with and draws from research fields such as computer science, statistics, mathematics, and psychology, and contributes to progress in those fields.

It may also become clearer why the spatial information industry needs the fertilisation by fundamental research in GI Science. History teaches us that it takes about ten years from fundamental research to product implementations. For example, it took ten years to market the first vehicle navigation system after the ground-laying research of White and Honey and others (realised in a 1984 US patent to Etac).

In other words, talking about better spatial information products—not epsilon improvements, but paradigm changes—requires long-term financial commitment and endurance. So when geographic information scientists study the use of landmarks in navigation systems (as Raubal and Winter did in 2002), it may take to 2012 before we will see products that can do the same.

Likewise, navigation systems that can talk with, rather than to, people (Richter et al. 2008) will probably not appear before 2018.

The scene is set to seize the other 14 per cent of the GDP.