The economic impact of a Very Large Telescope

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The European Southern Observatory's VLT, Very Large Telescope, is a group of four 8.2-metre diameter optical telescopes located in northern Chile. It also has four movable 1.8-metre diameter auxiliary telescopes and they all work together to act as what ESO calls a "giant interferometer". The overall resolution of this instrument is some 25 times higher with the system acting as an interferometer than is achievable with any of the individual telescopes.

The VLT is big science and as with all big science, there is a hefty price tag. Economists André Fernandes, Argentino Pessoa and Mário Rui Silva of the University of Porto, Portugal, have now dissected the economic benefits and the technological impact of ESO's VLT in research published in the *International Journal of Technology, Policy and Management*.

Space science, including astronomy and satellite technology, planetary probes and the like have led to countless fundamental scientific discoveries and driven forward technology and engineering along the way. Materials science benefits at the cutting edge, with high-performance and lightweight alloys, incredibly heat-resistant substances, photovoltaic materials. But, it is sometimes hard to convince skeptics of the benefits of big science when spinoffs are not immediately obvious.

Of course, the fundamental science is obvious. ESO says that results from the VLT have led to the publication of an average of more than one peer-reviewed scientific paper per day, which are quoted on average

twice as often as the average research paper. Moreover, VLT discovered the first planet beyond our Solar System, the first exoplanet, heralding a new era of discovery. It also detected the most distant object in the universe, which existed a mere 600 million years after the Big Bang.

But, what about VLT's impact in terms of more tangible technological advance? The team surveyed companies and research centers that had supplied the VLT through the period 1998-2009. "Overall, the present study finds evidence of spillover effects coming from the Very Large Telescope project. Technological excellence and marketing benefits were the spillovers most recognized by suppliers," they report. Although they point out that research centers saw greater benefits than their commercial counterparts.

"It seems that companies recognized in the context of this astronomy project a link between their R&D efforts and the improvement of know-how and knowledge which fostered technological excellence," the team says.

More information: Fernandes, A., Pessoa, A. and Silva, M.R. (2014) 'Does astronomy generate economic benefits? Technological innovation seen through the lens of the European Southern Observatory's Very Large Telescope', *Int. J. Technology*, Policy and Management, Vol. 14, No. 4, pp.327–345.

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