

**Topic:**  
Rapid Prototyping

## User Views on Rapid Prototyping

### Over 260 managers of design functions at mechanical engineering sites assess the potential of RP

*iCAD is produced by Business Advantage, a B2B research, business development and marketing consulting practice operating in the global IT, Digital and Telecommunication sectors.*

Although rapid prototyping (RP) has been available commercially for around 14 years, its capacity to strike off in new directions allows it to retain the feel of a 'happening' technology for many observers. Traditionally RP has been associated with certain industries in the manufacturing world such as aerospace and automotive, but the expanding range of applications has the potential to open up diverse new market opportunities. To assess the current experience of and attitudes to RP in the mechanical engineering sector, we interviewed managers with responsibility for the design and/or product development process at 262 UK sites. To help steer us through RP's unpredictable waters, we asked RP expert and industry consultant **Ed Grenda** for his views.

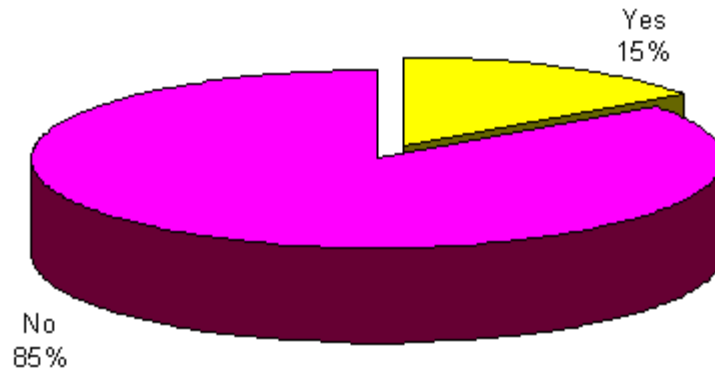
*Rapid prototyping refers to a range of technologies that make physical objects from 3D CAD or other 3D data sources. It is characterised by an 'additive' approach to building models/parts. RP systems join a range of materials layer by layer using horizontal cross-sections of the computer model. Uses of RP models include testing for form, fit and function, tool making, and for quote requests and proposals.*

#### The RP Users

Looking at the mechanical engineering sector as a whole, 15% of sites have used RP technology in the last twelve months. There are significant differences by company size however; only 8% of sites with less than 100 staff have used RP, compared to 28% of sites with more than 100 staff.

*Ed Grenda has been the CEO, founder or co-founder of several technology companies: Castle Island Co. operates 'The Worldwide Guide to Rapid Prototyping' web site (<http://home.att.net/~castleisland/>). Cambridge Technology, Inc. manufactures optical scanning instrumentation. Mr. Grenda was also the founding VP of Engineering of the company that has evolved into GSI Lumonics.*

### Have You Used RP In The Last 12 Months?



The number of sites in our sample who use RP was too small to allow further statistically reliable analysis. However it is interesting to note that of these 40 RP using sites, 13% do so in-house with their own RP systems, and 87% use a service bureau. Only three from this group of 40 thought they would produce/commission less prototype models/parts in the next twelve months. The other sites were split equally between those saying that their use of RP would increase, and those saying it will remain the same.

### Factors Against RP – The 3D CAD Factor

So what of the 85% of our sample who are not using RP? *"The reasons why the use of RP has not extended as far and as fast as it might have are complex,"* explains Ed Grenda. *"One key factor is the slow rate of adoption of 3D CAD - it's a prerequisite for market growth to have a higher proportion of 3D CAD users."* Our article ['Solid Modelling, Slow Progress'](#) in this issue of CAD Spaghetti, which reveals that 48% of sites in the mechanical engineering sector are not using solid modelling, highlights the problem this creates for RP suppliers.

### Price Barriers

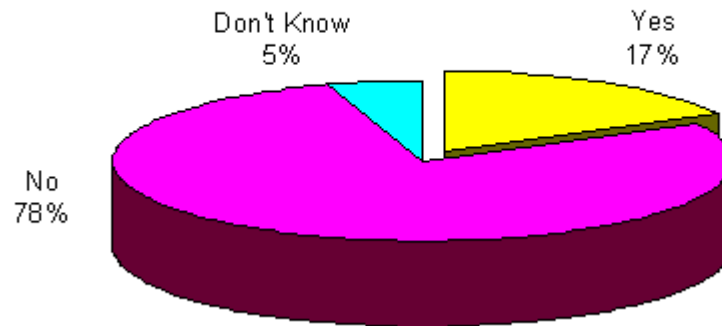
You only have to look at the prices of RP systems to establish a further inhibitor on market growth. *"At the top end of the scale you're looking at around \$700,000 or more for an RP machine,"* says Ed. *"It's hard enough for smaller companies to buy at the lower end of the price range, starting at around \$55,000. There are however a couple of vendors to challenge this picture. Israel's Objet Geometries is aiming to provide all the functions and features of much more expensive stereolithography systems at about a quarter of the price. Meanwhile SolidDimension, also from Israel, is making a very small desktop*

*laminated object-manufacturing machine for raw conceptual modelling and tasks of that nature. We don't know yet what their price will be - a range between \$15,000 to \$45,000 has been discussed. If they introduce it at the low end, it will be interesting to see what happens. If they introduce at the high end, I suspect they will fail to expand the market significantly."*

### RP Awareness

New applications of RP are developing all the time, opening up new opportunities for a broad range of engineering and manufacturing companies. **However, among those in our sample who are not using RP, 78% said they have not looked into the potential uses or benefits for this technology to their business.**

**Sites Not Using RP- Have You Researched Its Potential Uses/Benefits?**

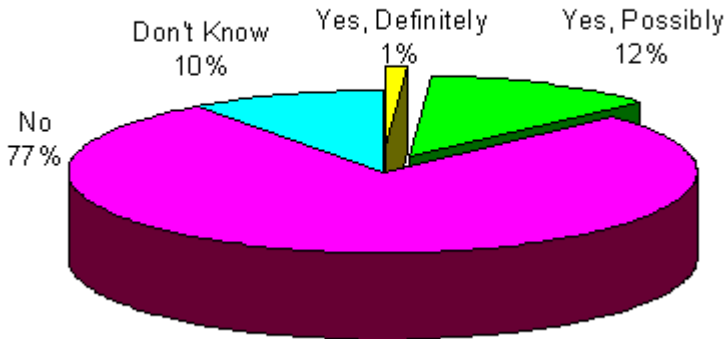


Lack of awareness is another key factor holding back the RP market. *"There has been startlingly bad dissemination of information about this field,"* says Ed. *"After hundreds of introductory articles, etc., there are still lots of potential users that have never heard of RP. Others base their views on what they heard ten years ago, when capabilities and materials were poorer. People tend to try something once and then they don't go back unless there's something to force them to do it."*

### Future Intentions

**Of those who are not using RP, 13% said that it's possible they might do so in future** (including only 1% who said they would definitely do so). Not too surprisingly, the 77% of those who have not researched the possible uses of RP said they are not considering using it in future. The size of the group who might use RP in future (29 sites) is too small for further analysis, but out of interest, three of these said they intended to purchase an RP system, twenty are more likely to use a service bureau, and six weren't sure.

### Sites Not Using RP - Will You Do So In Future?



Targeting potential customers according to company size is an important factor for RP suppliers; only 7% of sites with less than 50 employees said they might use RP in future, compared to 18% of sites with more than 50 employees.

### Market Growth

The findings above on future intentions fit broadly with the predictions for growth of the RP market. "Right now the situation is moderate growth overall, with an 8-10 % average for products and services on an annual basis," explains Ed. "That can be expected to more or less continue, unless some kind of revolutionary technology opens up new applications in a dynamic way. I mentioned earlier about the potential impact that companies such as SolidDimension and Objet Geometries could have on the market. Another trend that may push things to a wider domain is the use of rapid prototyping technology for manufacturing. In the United States alone there are about a million manufacturing companies. A very large number of companies would like for example to be able to make plastic parts in small volumes without tools and RP might be able to do that."

"There are several technical issues to be solved before this really takes off, but there are already some interesting commercially successful examples such as Align Technology, Inc.'s solutions for orthodonture. Indeed a couple of the biggest sales ever made in rapid prototyping now have been done for dental applications. I'd say that the real long-term opportunities lie in pushing the technology into these sorts of either custom or low-volume, tool-less manufacturing applications."

## Service Opportunities

For many companies the prohibitive price of RP machines means that service bureaus offer the best option for producing models or prototype parts. Are the opportunities still growing for such suppliers? *"I think the number of entrants into this market means that the size of the pie remains roughly constant but keeps getting cut into smaller pieces,"* explains Ed. *"In the service sector, much like many other markets, something like 75% or 80% of the business is probably going to 20% of the companies. And those are the people who have done a good job of providing an integrated service to the industry. Often if a company goes to a bureau, they don't just want to get back the stereolithography part. They want it to be finished to specified properties, with additional services such as the making of a rubber mould from this part."*

*"So I think the key in the future is going to be for service bureaus to specialise and become vertically integrated. It certainly is the way for any smaller bureau to go, or even a moderately sized one."*

*If the prices remain high for accurate systems, service bureaus should continue to be an important part of the RP world. However, I don't recommend to people in general that they go into this business because the competition is brutal, and prices have eroded quite a bit over the last several years."*

## Reasons Against

We asked the group of sites who are not considering using RP (representing 65% of the overall sample of mechanical engineering sites) for the reasons behind their decision. The vast majority (84%) said it was not relevant to their business, 10% said it is too expensive, and 4% feel the available products are not technically adequate for their needs. The other reasons provided each accounted for less than 4% of this group.

The majority of the group who feel that RP is irrelevant to them have not researched its potential applications. We know that approximately half of CAD/CAM using mechanical engineering sites are working in 2D, and are therefore less likely to be engaged in this topic. But what of the others? To what extent can we assume that this lack of interest has led them to dismiss RP prematurely? Or are there swathes of mechanical engineering activity for which RP is genuinely not relevant?

*"It's hard to think of any areas to which RP doesn't apply, both in mechanical engineering and manufacturing in general,"* says Ed. *"Take a look at the bibliography on our website and the range of recent papers there - it's astounding where all of these applications go. It's a very, very broad thing. Each area has its differences and different requirements of course, but there are as many as 100 variations of RP technology available, each of which has its niche."*

*"There is a lack of awareness about what additive technologies allow you to do that subtractive ones don't. You can deal with complex geometries, and go from art to part much quicker with them. There are a range of advantages which need to seep into the general consciousness of potential users before they can evaluate RP's role in solving specific problems, and much work yet to be done by material and system suppliers to address users' needs."*

## Conclusion

For RP suppliers wanting to target the 13% of this sector who feel they might use RP in future, the advantages of using a prospect database that enables direct marketing to larger sites using solid modelling are clear.

As Ed Grenda points out, RP suppliers face a major task in educating potential customers about the relevance of their products/services - in the mechanical engineering sector at least. Over three quarters of those not using RP have not looked into its uses, and are not intending to use it in future. If the new range of applications is genuinely opening up new market opportunities, RP suppliers need to find more direct ways of pushing the advantages of their products and services.

*Many thanks to Ed Grenda for his contribution to this article. The views he expresses are personal to him and do not necessarily reflect those of iCAD.*

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