

The Pricing Paradox: Unlocking profitability in Manufacturing-as-a-Service

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Providers who can offer flexible, nuanced pricing strategies that cater to their service offerings' specific needs and characteristics will not only maximise their profitability but also play a crucial role in shaping the future of flexible, on-demand manufacturing



Engineer working on metal 3d printer. Image: Shutterstock

The manufacturing industry has undergone a significant transformation in recent years, moving away from traditional ownership models towards more flexible, service-based approaches. This shift, called Manufacturing-as-a-Service (MaaS), is revolutionising how businesses access and utilise production capabilities. MaaS allows companies to leverage advanced manufacturing technologies and expertise without significant capital investments in equipment and facilities. The MaaS model encompasses various services, from on-demand production and rapid prototyping to

full-scale contract manufacturing. It offers businesses increased agility, reduced overhead costs, and access to cutting-edge technologies that might otherwise be out of reach. This approach is particularly beneficial for small and medium-sized enterprises, enabling them to compete more effectively with larger corporations.

Among the various technologies driving the MaaS revolution, 3D printing has emerged as a frontrunner, offering unparalleled flexibility and customisation capabilities. As the technology matures, 3D printer manufacturers increasingly offer their devices as a service (3DaaS) rather than selling them outright. This shift raises essential questions about how 3DaaS providers should price and structure their offerings to maximise value for them and their customers.

In our paper, "3D Printing-as-a-Service: An Economic Analysis of Pricing and Cocreation," published in the *Production and Operations Management Journal*, we construct an economic model to analyse the choice of pricing models by 3DaaS providers.^[1] Our findings offer several vital insights that are not only relevant to 3DaaS providers but also provide valuable lessons for the broader MaaS market. We analysed two standard pricing models: Fixed-fee, where customers pay a set fee to use the 3D printer for a specified period regardless of usage, and Pay-per-build, where customers are charged based on the number of objects they print. Each model has its advantages and potential pitfalls, and choosing between them requires a nuanced understanding of the printing technology and the customer base.

The 3DaaS market, like the broader MaaS landscape, is characterised by a diverse customer base with varying usage patterns and needs. This heterogeneity presents challenges and opportunities for service providers to determine the most effective pricing strategy. The fixed-fee pricing model attracts high-usage customers who benefit from unlimited access for a set price. On the other hand, the pay-per-build model may appeal to both low-volume and high-volume customers.

Beyond usage volume, the choice between these pricing models also depends on the value customers derive from the service. Pay-per-build pricing becomes an attractive option when the perceived value is high across the board. Even with a higher unit price, customers across the usage spectrum are likely to opt for the service due to the significant benefits they receive. Conversely, a fixed-fee model can be more appropriate when the overall value proposition is lower. This approach helps screen for high-value customers who can justify the upfront cost based on their usage and needs.

In the context of 3D printing, two key factors significantly impact customer value: job complexity and design co-creation dynamics. The interplay of these factors can significantly influence the choice of pricing model. When the service provider or the

customer takes primary responsibility for the job design process, it often results in higher overall quality, as the responsible party is likely to invest heavily in ensuring the best possible outcome. A pay-per-build model is often the most appropriate choice in such scenarios, where the net value gain is high due to superior design quality.

Job complexity adds another layer to this decision-making process. High complexity in manufacturing jobs can have a dual effect on customer value. On the one hand, successfully producing a sophisticated design can yield significant value for the customer, justifying a premium price. On the other hand, complex designs also come with a higher risk of failure, potentially decreasing the customer's perceived value. However, it is important to note that the complexity and failure rate relationship is not always straightforward.

In many cases, due to high learning-by-doing or significant expertise, the probability of failure might be low for complex jobs. This is particularly true in industries where manufacturers have developed specialised design knowledge.

This duality in job complexity leads to interesting implications for pricing strategy. A pay-per-build model can be highly effective for highly complex jobs with a low probability of failure – often the case with experienced users, well-tested designs, or providers with significant expertise. The high value of successful production runs justifies the high per-unit cost, and customers are willing to pay a premium for the expertise and technology required to handle such complexity.

Interestingly, when customer design expertise is low and the job is highly complex, the overall value to the customer can be lower due to the high efforts required to prepare the functional design. In such cases, a fixed-fee model may be more appropriate as it helps screen for high-usage customers who can justify the upfront cost based on their frequent use of the service. This approach also allows these customers to iterate and refine their complex designs without incurring additional fees for each attempt.

For more straightforward, low-complexity jobs, the choice of pricing model leans towards fixed-fee due to the low-value gains from less sophisticated designs. This approach is particularly suitable for standardised, routine manufacturing tasks where the value added by customisation is minimal.

As MaaS continues to evolve, optimising service pricing will be crucial for providers across various technologies. The insights gained from the 3DaaS market offer a valuable framework to help service providers maximise profitability while meeting diverse customer needs. Based on the above discussion, a one-size-fits-all approach

to pricing is not appropriate in this complex and dynamic market. MaaS service providers need to carefully categorise their service offerings based on several key factors: design co-creation dynamics (whether the service primarily involves standard designs or custom designs requiring significant collaboration), customer base expertise (the level of experience and skill their customers possess, particularly in handling complex jobs), and the degree of design sophistication that can be produced through their particular MaaS offering.

By thoroughly assessing these factors, MaaS providers can determine the most appropriate pricing model for each service category. By doing so, they can capture value across the entire spectrum of customers, from small businesses to large industrial users, while also fostering innovation and efficiency in the manufacturing sector. As the MaaS industry matures, the ability to navigate these pricing complexities will become a key differentiator. Providers who can offer flexible, nuanced pricing strategies that cater to their service offerings' specific needs and characteristics will not only maximise their profitability but also play a crucial role in shaping the future of flexible, on-demand manufacturing.

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[1] <https://journals.sagepub.com/doi/full/10.1177/10591478241257660>