Optimizing Product Catalogue Design: A Comparative Study of Traditional Photography and 3D Modeling

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Abstract
This study examines the replacement of traditional studio photography with a 3D modelling and rendering workflow in product catalogue production. Using the case of Urnes, a manufacturer of wooden urns, we compared the two approaches in terms of time, cost, and visual fidelity. The 3D pipeline, combining Blender, Substance 3D Painter, and InDesign, reduced preparation time per variation from 179 minutes to 36 minutes—a 4.9-fold improvement. After an initial 50-hour setup, subsequent catalogue updates achieved time savings of 97.6%. An informal interview with 38 professional users confirmed that 3D renderings matched or exceeded photographs in colour and texture accuracy. Results demonstrate that 3D workflows significantly lower production costs, accelerate updates, and support product personalisation, positioning them as a sustainable alternative to photography in catalogue design.

Keywords
Product Catalogue Design, Computer Generated Imagery, Visual Fidelity, Cost Reduction

1. Introduction

A literature review shows that 3D modelling plays a crucial role in the production process along with various phases of engineering and assembly [1]. The increase in computer power and the development of advanced rendering algorithms have led to a rise in the visual quality of computer-generated imagery (CGI), which has begun to replace traditional product photographs in catalogues. Several online sources suggest that since 2014, 75% of the images in the IKEA catalogue have been computer-generated rather than photographed. Although this claim has not been confirmed by IKEA, there are several potential advantages to using CGI instead of photography. These include faster turnaround times for creating marketing materials, lower costs compared to product photography, and the ability to implement design changes quickly.

Unfortunately, there is a lack of sources that would enable a more comprehensive and detailed quantification of those advantages. To close this gap, we conducted a study that included the creation of a printed catalogue for a niche Slovenian company, Urnes, producing wooden urns.

Each year, the company releases a new catalogue of its products, showcasing 93 different urn models. The urns had to be manufactured first and then colored. After that, a motif was added by engraving or UV printing. Once these steps were completed, the urns were photographed in a controlled environment to ensure consistent lighting conditions for the entire collection. However, it was often necessary to retake several photographs to achieve an identical colour tone for the urns within the same collection.

After the photo shoot, the photographs were transferred to a computer, where colours were manually corrected and images cropped. Finally, reflections were added to enhance the urns' appeal for customers.

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The problem arises when specific urns within the collection were altered or when customers requested personalisation of the urns. In such instances, it was necessary to repeat the entire photography procedure along with all subsequent tasks for the entire collection.
We replaced the previous procedure with a new 3D pipeline that includes Blender for urn creation and Substance 3D Painter for texture generation. For designing the catalogue, we used Adobe InDesign. We measured the time required for each stage of this process and compared it to the traditional catalogue production method. To evaluate the quality of catalogue production, we conducted interviews with 38 customers. This allowed us to effectively assess the benefits of replacing product photographs with CGI, which is the primary focus of this article. The article is organised as follows: Section 2 presents the theoretical background, followed by a description of the methodology. Section 4 outlines the results, which are then discussed, leading to our conclusions.

2. Theoretical Background

Visual Communication and Product Presentation

Visual communication relies on the deliberate arrangement of images, colour, typography, and space to direct attention and support message clarity. In product catalogues, these principles ensure that buyers can quickly recognise product features and variations. Research has shown that hierarchy, balance, and contrast reduce cognitive load and improve comprehension [2], [3], [4]. 3D visualisation provides consistent lighting, accurate proportions, and scalable variations, which strengthen visual fidelity and brand coherence [5].

Development of 3D Visualisation Technologies

Over the last decade, advances in rendering engines and physically based materials have enabled photorealistic outputs that can be indistinguishable from photography [6]. Early applications of CGI in advertising date back to the 1980s (e.g., Coca-Cola's Brilliance campaign), but only in the 2010s did CGI become economically viable for large-scale catalogue production. Media outlets such as Fast Company and The Verge reported that by 2014, approximately 75% of IKEA's catalogue product images were computer-generated, based on interviews with IKEA's visualisation managers. While this figure is widely cited, it originates from media reports rather than an officially published statement. Nevertheless, IKEA's adoption illustrates the growing maturity of CGI workflows for mass-market communication.

Consumer Perception of CGI and Realism

The effectiveness of CGI-based images depends not only on cost efficiency but also on consumer trust and perception. Studies have shown that realism, telepresence, and interactivity improve engagement and purchasing intent [7], [8]. Other research demonstrates that viewers increasingly struggle to distinguish CGI from photography, provided that lighting and material textures are handled correctly [6]. However, limitations remain in colour calibration between screen and print, and in the representation of highly specific surface finishes, which may impact perceived authenticity.

Cost Efficiency and Workflow Optimisation

While academic studies on cost reduction remain limited, industry reports consistently highlight the economic benefits of CGI. Nfinite reports [9] that retailers adopting CGI experienced up to an 85% decrease in visual budgets, 40% lower image creation costs, and 63% faster production cycles. Similarly, Modelry/CGTrader [10] found that 3D virtual photography was up to six times cheaper than traditional photography for furniture products. These findings align with the concept of digital prototyping, where a single 3D asset can be reused across multiple variations, marketing channels, and even extended into AR/VR applications.

Research Gap

Existing literature emphasises visual fidelity, consumer perception, and industrial case studies, but few peer-reviewed studies quantify cost and time savings in catalogue production using 3D workflows. This study addresses that gap by comparing traditional studio photography with a unified 3D pipeline in terms of preparation time, costs, and customer evaluations.

3. Methodology

The research was conducted as a case study of Urnes company catalogue. Urnes is a Slovenian company that produces wooden urns. Historically, the creation of these catalogues relied on studio photography, which necessitated physical prototypes, intricate lighting arrangements, and extensive post-production efforts. This study seeks to investigate the potential of employing a 3D visualisation workflow (see Figure 1) as a substitute for traditional methods. The primary objective is to decrease production time and costs while ensuring that visual fidelity is preserved or enhanced.

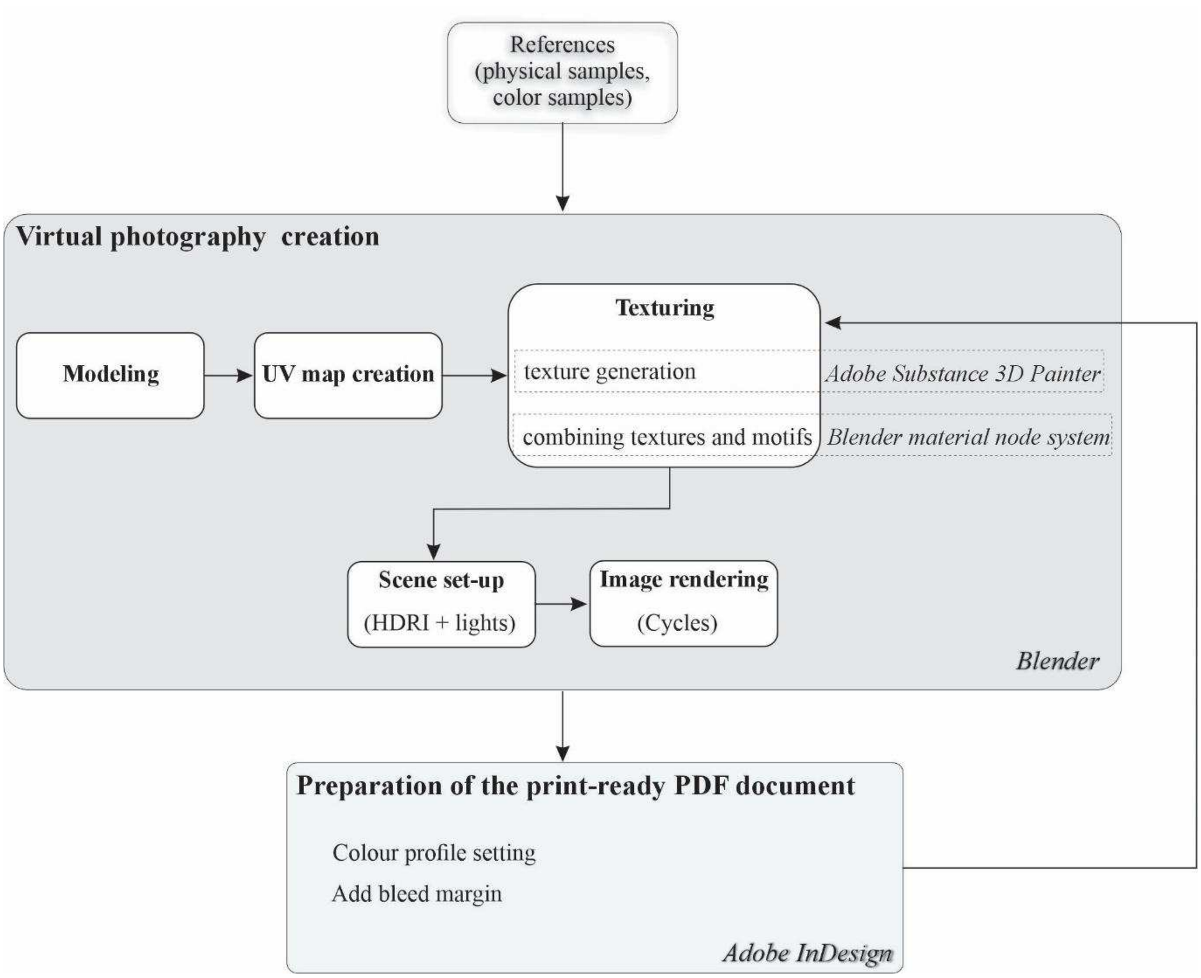

Figure 1: 3D visualisation workflow – from 3D model to printing.

The 3D pipeline incorporated several software tools to streamline the workflow. Blender was used to model the geometry of the urns and design the scene layouts. Adobe Substance 3D Painter was employed for material definition and texturing, allowing for a realistic simulation of wood surfaces and engraved motifs. Adobe InDesign was utilised for composing the catalogue, which included typography, page layout, and preparation for print.

This workflow enabled the reuse of base 3D assets across various product variations, making it highly adaptable for catalogue updates.

The effectiveness of the 3D workflow was assessed using three main metrics:

1. **Production time** – the duration required to prepare product variations and finalise catalogue pages, compared with traditional studio photography.

2. **Cost comparison** – an estimate of direct and indirect costs associated with both approaches, including labour, equipment, materials, and post-production.

3. **Customer evaluation** – assessment of perceived visual quality, realism, and usability of the catalogue by end users.

Data were collected using two complementary approaches:

- **Process logs** documented the steps and timing of catalogue preparation in both the photographic and 3D workflows, allowing for direct quantitative comparison.

- **Interviews** with 38 professional users, primarily funeral service providers who regularly interact with the catalogue, were conducted. Respondents were asked to evaluate the new 3D-based catalogue against previous photographic versions in terms of colour accuracy, texture fidelity, and response time to personalised orders.

4. Results

To evaluate the efficiency of the new 3D visualisation workflow, a direct comparison was made with the traditional photographic approach previously used in the Urnes product catalogue. The two methods were analysed along four dimensions: (1) process steps, (2) production time, (3) cost implications, and (4) visual and customer evaluation.

4.1. Process steps

The traditional catalogue production process at Urnes relied on studio photography. The workflow consisted of several sequential phases:

1. **Equipment setup** – A photographic studio was prepared with a camera, a tripod, and controlled lighting, as shown in Figure 2. This phase was performed once at the beginning of the session to ensure a consistent environment for capturing all urns.
2. **Photography** – Each urn variant was physically produced, placed in the studio, and photographed individually. Minor adjustments in lighting or positioning were often necessary to maintain uniformity across the catalog.
3. **Colour correction** – Captured images were imported to a computer and manually adjusted for colour balance, contrast, and tonal consistency. This step aimed to match the digital representation to the actual appearance of the physical product.

4. **Cropping** – Images were cropped to remove background elements and standardize framing.
5. **Addition of reflections** – Subtle reflections were manually created in 2D image editing software to simulate the impression of a product placed on a reflective surface. This was a labour-intensive step, often repeated for every product image.

Figure 2: Capturing a photograph of a single urn as an example.

In the 3D visualisation pipeline, the following steps are involved, as illustrated in Figure 1:

1. **Modelling**,
2. **Texturing and adding motifs**,
3. **Scene setup**, and
4. **Image rendering**.

Most of the steps are carried out within the Blender environment, with step 2 being the most complex because it utilises the material node system, as illustrated in Figure 3. Additionally, a reflection had to be included. To achieve this, we needed to adapt Blender's built-in shadow catcher function to also capture the reflection of the urn while rendering. Both the rendered urn image and its reflection were then combined in a final image of an urn, which can be seen in Figure 4.

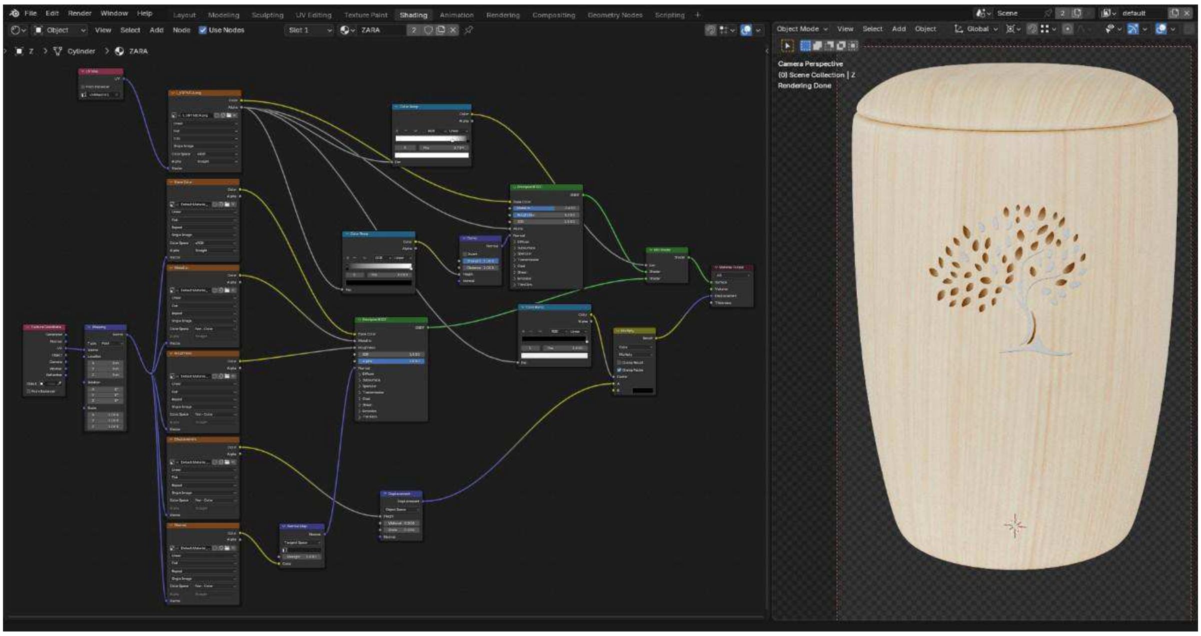

Figure 3: Incorporation of motifs through the material node system in Blender.

Figure 4: Example of the rendered image of an urn with a rose motif.

4.2. Production Time

Urnes offers six distinct series of urns in its catalogue, each featuring a different number of designs. The series includes Classic Natural, Classic Painted, Trend Natural, Trend Painted, Crystal, and Borders. The production times for each series vary within the traditional catalog production process, as shown in Table 1. The average production time is 174.74 minutes per urn.

Table 1
Production times for each series of urns included in the catalogue within the traditional production process

	Production time [min/unit]	Painting/oiling time [min/unit]	Motif application time [min/unit]	Number of urns in the catalogue	Total production time [min/series]
Classic Natural	118	12	135	6	810
Classic Painted	118	54	177	24	4248
Trend Natural	118	12	133	6	798
Trend Painted	118	54	175	42	7350
Crystal	118	54	242	6	1452
Borders	118	54	177	9	1593

After completing the urns, they needed to be photographed. The total time required for equipment setup and studio preparation was 45 minutes. Taking photographs of all 93 urns took an additional 46.5 minutes, followed by 93 minutes dedicated to colour correction. Finally, 279 minutes were needed to add reflections and crop the images. In total, the average time required to prepare each urn image for the catalogue using this traditional method was approximately 179.72 minutes per urn.

In contrast, the implementation of a 3D visualization pipeline required about 50 hours. This time included modelling the urn, preparing basic textures and material nodes, and setting up the scene. On average, creating the final texture and rendering the image took approximately 4.2 minutes per urn. The entire process of creating the images needed for the catalogue took 56.51 hours, or 36.46 minutes per urn, making it 4.93 times faster than the traditional method. The time savings will be even more substantial when we create the next catalogue, as the existing 3D visualization pipeline can be reused, potentially reducing the time required by 97.6% (see Table 2).

Table 2
Time comparison between photographic and 3D workflows (n = 93 urns)

Workflow	Time breakdown [h]	Total time [h]	Savings vs. photography	Improvement factor
Photography (baseline)	$2.98 \cdot 93$	277,5	-	-
3D Initial (with setup)	$50 + 0.07 \cdot 93$	56.5	79.6%	4.9
3D Steady State (no setup)	$0.07 \cdot 93$	6.5	97.6%	42.6

4.3. Cost Implications

The photographic method incurred costs for physical prototypes, studio equipment, materials, and post-production labor. These costs scaled linearly with the number of product variations. By contrast, the 3D workflow required an upfront investment in asset creation but enabled the reuse of digital models across all future variants. This significantly reduced operational costs, particularly in catalog updates and personalized orders.

4.4. Visual and Customer Evaluation

An interview with 38 catalog users, representatives of Urnes' usual business partners, indicated that the 3D-based images were judged to match or surpass the photographic versions in terms of color fidelity and wood texture detail, see Figure 5. Furthermore, 61% of respondents reported faster response times when ordering personalized urns, suggesting that the 3D workflow improved not only efficiency but also customer experience.

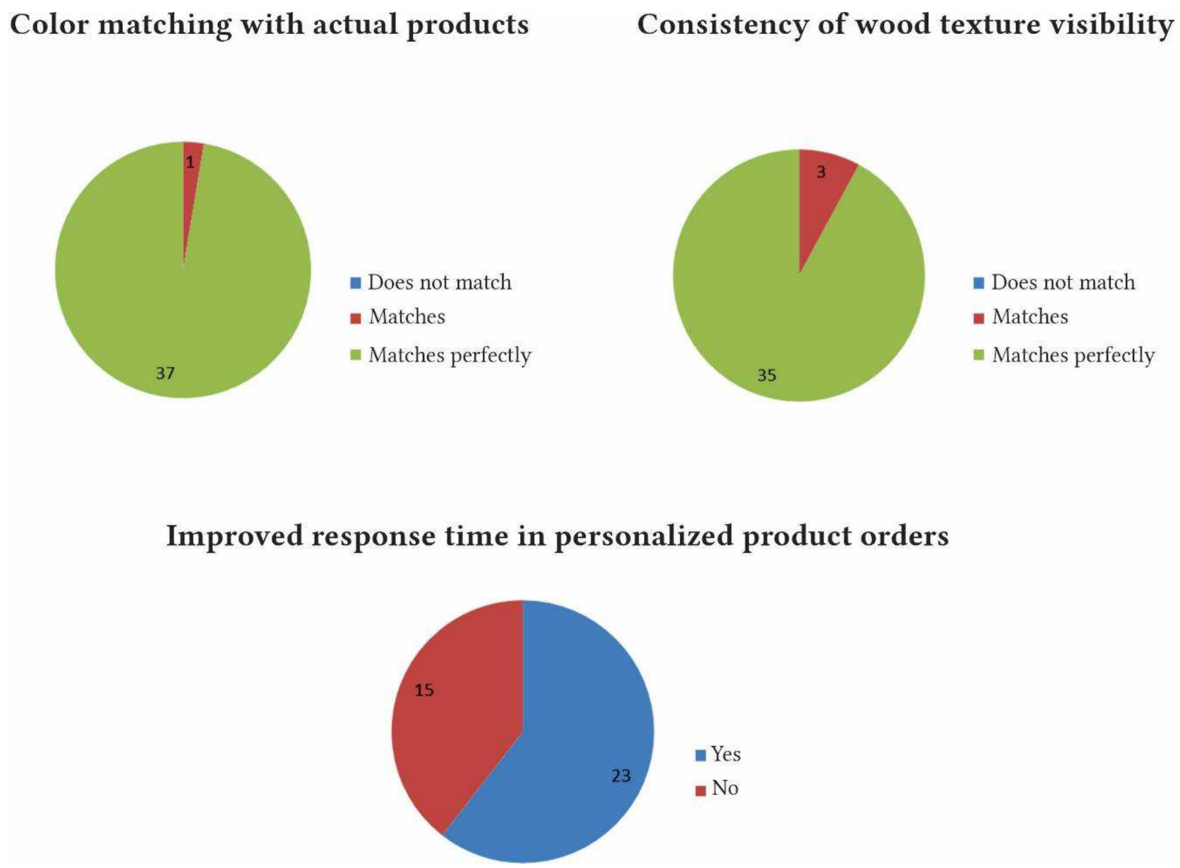

Figure 5: Results of the interviews with the catalog users.

5. Discussion

The results of this study demonstrate that a 3D visualization workflow can effectively replace traditional studio photography in the production of product catalogues. The most significant benefit lies in the drastic reduction of preparation time: once the digital pipeline was established, the average preparation time per urn variant decreased from 179 minutes to just 4.2 minutes, representing a 42.6-fold improvement and a 97.6% time saving. Even when the one-time setup investment of 50 hours is included, the 3D workflow proved more efficient after approximately 18 product variants. This finding highlights the scalability of 3D methods—initial costs are offset quickly in contexts where numerous variations or frequent catalogue updates are required.

These results align with industry reports indicating that CGI workflows reduce image creation costs by up to 85% [9] and are several times faster than photography [10]. Our findings extend this body of knowledge by providing a quantified, real-world case study that compares both methods under controlled conditions. The break-even analysis provides a practical benchmark for other firms considering a transition to 3D visualization.

In addition to efficiency gains, the interview with 38 catalogue users confirmed that the 3D-generated images were perceived as highly accurate, particularly in terms of colour fidelity and wood grain representation. This supports previous research showing that CGI can achieve visual authenticity comparable to photography [6], [8]. 61% of respondents also reported faster response times when ordering personalized products, suggesting that the flexibility of digital assets contributes to improved customer experience and decision-making speed. This echoes findings from e-commerce research that highlight the role of visual fidelity and responsiveness in consumer satisfaction [7].

Nevertheless, the study also reveals certain limitations. The accuracy of colour reproduction across different print and digital media remains a challenge, particularly when dealing with subtle tones and specific surface finishes. This reflects a broader issue in digital visualization workflows, where calibration between devices and media can affect user perception. Future research should examine methods of standardized colour management to close this gap.

Finally, while this case focused on a single product line within a niche industry, the implications are broadly applicable. Sectors such as furniture, fashion, and consumer electronics, which involve numerous product variations and frequent updates, are likely to benefit most from the adoption of 3D workflows. Moreover, the reuse of 3D assets across catalogue design, online retail, and immersive platforms such as augmented and virtual reality could further amplify cost savings and customer engagement.

6. Conclusions

This study confirmed that a 3D visualization workflow can serve as a viable alternative to traditional studio photography in catalogue production. Beyond efficiency, the approach supports flexibility in personalization and offers a scalable foundation for future product communication strategies.

The findings encourage companies that manage frequent product updates or numerous variations to consider transitioning toward digital pipelines. Although some challenges remain, particularly in colour management, these are outweighed by the long-term advantages in adaptability and sustainability.

Future research should address technical refinements, such as standardized workflows for print fidelity, and explore the integration of 3D assets into emerging channels, including augmented and virtual reality.

Declaration on Generative AI

During the preparation of this work, the author(s) used ChatGPT-5 and Grammarly in order to: Grammar and spelling check. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the publication’s content.

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