CAN VIRTUAL TECHNOLOGIES INCREASE THE EXPORT OF DANISH DESIGN?

EXECUTIVE SUMMARY

Denne evalueringsrapport er udført af Virtual Stage Projektet med ambitionen om, at løfte den danske livsstilsbranche inden for mode og møbelindustrien, ved at anvende virtuelle teknologier. Projektets formål er at undersøge om digitalisering kan øge salg i en tid, hvor covid-19 er årsag til, at den danske livsstilsbranche bliver udfordret. Som en del af projektet, blev der udvalgt syv møbel- og tre modevirksomheder fra den danske livsstilsbranche til et samarbejde om, hvordan virtuelle teknologier kan styrke den digitale eksportevne.

Igennem projektet, er der blevet udført 52 interviews med det formål, at observere og fange værdien for brugen af virtuelle teknologier i den danske livsstilsbranche. De 52 interviews er fordelt på henholdsvis møbel- og modevirksomhederne samt på designere, producenter, forhandlere, eksperter, teknologiudbydere og VR-modtagere. Derudover, er der blevet observeret otte præsentationer, 15 workshops samt udsendt en survey ud til 49 deltagere fra uddannelsesforløbet.

Virtual Stage projektet har identificeret output inden for to kategorier, herunder teknisk output og organisatorisk output. De 10 deltagende virksomheder har hver især udviklet virtuelt indhold i form af 30 3D modeller, 13 360-graders videoer og 9 virtuel studieproduktion, som er blevet integreret ind i syv VR-headsets, og udgør hermed det tekniske output. VR-headsettet er blevet sendt ud til syv modtagere verden rundt. Organisatorisk output er blevet observeret ud fra den læring, som de 10 deltagende virksomheder har opnået igennem forløbet samt de udviklingsevner, som de har tilegnet sig, ved at være en del af Virtual Stage projektet. De deltagende virksomheder har forstået de muligheder samt begrænsninger, som virtuelle og augmenteret teknologier kan føre til. Virksomhederne har også set potentialet i at udvikle digitale evner til anvendelse af virtuelle og augmenteret teknologier.

Brugen af virtuelle og augmenteret teknologier har i høj grad medført nogle og positive synlige resultater. Resultaterne fra dataindsamlingen er blevet evalueret ud fra to målinger: brugbarhed og anvendelighed. Resultaterne har vist en positiv respons på den tekniske oplevelse af VR-headsettet, og modtagerne fandt oplevelsen meget inspirerende og unikt, de gav ydermere udtryk for, at danskere er firstmovers på markedet. Baseret på evalueringen af resultaterne fra både modtagerne samt de deltagende virksomheder, blev der i alt identificeret 11 potentielle use cases for brugen af VR-headset, som vil berige resten af branchen på længere sigt, da de kan bruge de identificerede use cases som best practice.

Virtual Stage har påvist at virtuelle teknologier har en indvirkning på de danske design brands' eksport og salg, men det er stadigt for tidligt at fastslå, hvorvidt det har haft en positiv indvirkning på eksport og salg. Dog, ser vi at 94% af de adspurgte i uddannelsesforløbet, forventer at, virtuelle teknologier vil have positiv indflydelse på eksport. Vi kan se, at projektet har rykket grænserne for, hvad der er muligt med virtuelle teknologier. Projektet har i særdeleshed åbnet op for nye muligheder. Der er et stort potentiale for, at virtuelle teknologier kan komplementere fysiske events på forskellige måder. Den største indvirkning kan ses på deltagernes engagement, som nu er klar til at tage denne rejse videre og dermed inkorporere brugen af virtuelle teknologier i deres forretning.

INTRODUCTION

ROWTH

This evaluation report summarizes the evaluation of output, outcomes and impact of the Virtual Stage project. Overall, the project had as ambition to lift the Danish furniture and fashion industries in the use of virtual technologies to enable export and eventually increased sales. The project was framed by the Covid-19 global lockdown and consequently working within the assumptions of virtual technology use during substantial disruption to physical events and fairs that were previously dominating export and sales.

To this end, the Virtual Stage project developed a range of virtual content (3D models, WebAR, 360-degree videos and virtual studio productions) that where integrated into a virtual experience in a VR headset. The project also engaged in developing the virtual technology competence in the industry through collaboration with ten participating companies and a wider range of actors taking part of an educational track.

To evaluate the outcome and impact of the work done, the empirical basis of this report consists of more than 70 qualitative data items (interviews and observations) and a survey. This data was collected with four distinct focal points:

• First, to validate the VR headset solution and the virtual content, the headset was sent to seven receivers representing the intended user group who were all interviewed about the usefulness and usability of the headset and its content.

• Second, to capture the producer perspective on the headset and its content, as well as the learnings the work produced within the participant companies, we documented the journeys of the ten companies over 15 recorded workshops, and through 31 in-depth interviews.

• Third, to further examine the usefulness of virtual technology, 11 interviews with ecosystem participants (architects, digital solution providers, retailers, buyers etc.) were conducted.

• Fourth, to document the impact of the educational track we conducted a survey of participants which generated 49 responses.

OUTPUT

The Virtual Stage project produced a range of documented outputs, here presented within the two broad categories of technological output and organizational output.

TECHNOLOGICAL OUTPUTS

Technological outputs were within the scope of virtual technologies. As an integrated presentation, a VR headset (Oculus Quest 2, Enterprise edition) was used as projection device. The headset comprised a navigation home space and seven brand spaces with (see Table 1). Eight instances of the headset were acquired within the project and loaded with the portal software and virtual content. Seven of the headsets were shared with potential end users, the VR headset receivers. Some participant companies decided to acquire additional headsets themselves to continue testing and development.

TABLE 1: Virtual technology development

Participant company	*Virtual Technology development*
ASTEP	4 3D models 1 360 video 1 Virtual Studio production
CARL HANSEN & SØN	6 3D models 1 360 video 1 Virtual studio production
GANNI	1 360 video
GODSKE	2 Virtual studio prodcution
KVADRAT	3 3D models 2 360 video 1 Virtual studio production
KVIK	3 3D Models 1 360 video 1 Virtual studio production
LENE BJERRE	3 3D models 1 360 videos 1 Virtual studio productions
MINIMUM	3 360 videos 1 Virtual studio productions
TAKT	8 3D models 2 360 videos 1 Virtual studio productions

Participant company	Virtual Technology development
WENDELBO	3 3D models 1 360 videos
INTEGRATED	Integrative VR reality experience Total content development: 30 3D models 13 360 videos 9 Virtual studio productions

Content-wise, 30 Photorealistic 3D models were developed as virtual reproductions of existing products. The 3D models represented in a visually attractive way a range of products (lamps, cabinets, rugs, etc.) and materials (wood, metal, textiles, etc.). The code for using these 3D models for WebAR was created and shared with all the participants.
13 360-degree videos were recorded at locations fitting to give additional information about the production, craftmanship or brand identity of the participating companies.

ORGANIZATIONAL OUTPUT

The organizational output, referring to the output in terms of learnings, capability development, attitude changes and interests is accounted for relating to participant companies and companies in the educational track respectively.
10 participant companies all went through a journey that allowed them to explore the prospect of applying virtual technologies. The participant organizations report that they have developed their understanding in relation to virtual technologies but also in relation to their own capacities to exploit the technology.

Most of the participant companies were exposed to a series of virtual technologies, which enabled them to learn more about the current technological possibilities (and limitations) and the options within each technology.
This technical learning enhanced the virtual technology knowledge in several ways:
• Maturity and constraints of specific technologies (e.g. ability to generate reflections in glass)
• Standards and format differences
• Commonalities and shared resource base (e.g. reliance on 3D model)
• Cost structures and realistic costs for different technologies.
• Future developments (e.g. standardization of WebAR)

Several of the companies also report that the project enabled them to further their capacities to exploit potential in virtual tech.
Such capacities included but were not limited to:
• Assessment of status of internal knowhow
• Implementation of structures and responsibilities
• Improved leadership capacity in virtual technologies
• Understanding of customer and partner readiness
• Sourcing capabilities needed to get the most out of a virtual tech developer

100 companies in the fashion and furniture industry were through the educational track exposed to a total of 9 hours of educational material relating to virtual technology and the design industries. The material included technical presentations, industry viewpoints and real world use cases. Finally, 7 international receivers (architects and retailers) have been exposed to Danish designer brands, hundreds of individuals have watch the content produced and demonstrated on websites and Youtube, and thousands of visitors have explored the produced material through social media or through the project website

OUTCOME

The VR headset including its portal and virtual content was evaluated by the participant companies and by a specifically identified receiver group for its usability and usefulness.

The identified receiver group represented a set of actors that the participating companies would interact with during events and fairs. These receivers represented two type of specifiers: architects and retailers. They were queried with specific focus on usability. Usability was examined broadly as the effort needed to explore the headset and the content provided. Two dimensions of usability were explored. The first was the technical experience, how the technical design features allowed to interact with the virtual technology and its content. The other was enjoyment experience associated with use. Enjoyment includes the aesthetic perception of salient visual elements and the playfulness that comes from engaging in activities.

The receiver group was also asked to about on the usefulness of the solution develop in consideration of cancelled physical meetings and associated export challenges. The receivers were asked to evaluate the VR headset loaded with content to holistically as a product aimed at presenting Danish design in the absence of physical events and fairs. They were asked questions about their own perception as well as considering other users and uses of the content. In doing so, the receivers were also asked to reflect on the technological barriers to use.

The 10 participant companies who had explored different virtual technologies and evaluated them based on their business context were inquired more broadly about the usefulness of the technologies. Usefulness was explored as perceptions of when the virtual technology and its content would be valuable and to whom. Usefulness here primarily relates to extrinsic value, in which the technology or a part of it could be identified to have impact. The usefulness identified is here reported as eleven distinct use scenarios.

VR RECEIVERS VIEWS

TECHNICAL DESIGN FEATURES

Generally, comments about usability were very positive. The seven receivers found the technical experience intuitive and user friendly which made the VR headset easy to use. The seven receivers immediately understood how to use it and according to the Canadian Architect, Matei Rau, it seemed straightforward.

The design and the quality of the content seemed impressive to the seven receivers that in various degrees has experience with VR tools:

"I have tried VR headsets earlier on and I think these were pretty low-quality headsets. So, this experience was kind of amazing, even the way the sound is integrated into the headset as you move your head was amazing" (Arjaan de Feyter, Architect).

The good quality of the content in the VR headset was a common denominator mentioned in the evaluations by all seven receivers which made the whole experience seem high-level. The Canadian Architect, Matei Rau, emphasizes the difference from previous experiences with VR headsets: *"[That] was nowhere near the level of quality of this one."*

The quality of the VR headset enhanced the experience as it gave the receivers the feeling of standing in a real showroom. The Norwegian Product Designer, Nadine Fumiko Schaub, was impressed by how much the actual physical exhibition could be simulated in a VR headset and highlights how the simulated exhibition experience is a good way of getting to know the different brands. The features of the VR headset support this experience as the nice design and the controllers enabled a smoother navigation through the showrooms which strengthened the user friendliness of the VR headset.

The build-in sound effect is also a feature that was pervasive in the evaluations. The videos and the sound effects were integrated well into the whole experience which gave the seven receivers the feeling of not being completely alone in the VR experience: *"I felt more guided through the journey, which was very helpful to understand the products better because it was designed in a certain way whereas in an online platform, you would not have the same connection." (Nadine Fumiko Schaub, Product Designer).*

ENJOYMENT EXPERIENCE

Across the receivers, it was a general perception that the intrinsic value was well addressed in the production. The VR headset experience came across as a fun, emotional, and exciting experience for the seven receivers. It was a different way of experiencing products compared to what they were used to, but the seven receivers were positively surprised of the production and were appreciative of having had the opportunity to experience the VR headset. The seven receivers received a package containing the VR headset and a 'brand sensory box' with elements to add on to the virtual experience. In the sensory box, each participating brand was represented in a physical format to encourage the seven receivers to touch, smell and taste in the virtual stage experience. The seven receivers found the sensory box to increase their curiosity of the experience without having tried the VR headset and it came across as a good way to establish the first contact to each brand which made it a more emotional experience. The elements made it helpful to sense the material of the products while being present in the virtual experience and listening to the stories from the brands:

> *"I really liked when someone was talking to me and actually showing the products. I understood the products 100% which was nice and when they got connected to the little sensory box, I then understood what it meant." (Nadine Fumiko Schaub, Product Designer).*

The sensory box complemented the VR headset and according to the Swiss Purchaser, Anna Berg, the sensory box could be another step in the direction of being able to try out a product live: *"It may just, as the VR experience, makes me want to get in contact with a company to try out the product live – to find out if that product is for me."*

What made the VR experience fun for the seven receivers was the ability to click into new showrooms and new places and experience something different in each showroom. The receivers found the VR experience to give more insights into the production of the products which cannot always be expressed at a physical fair where networking plays a bigger role. The English Purchaser, Cecilia De Giglio, found it interesting and fun being able to experience different spaces and sense the production and the brand story in a more authentic way. One of the fun elements that Cecilia De Giglio was excited about was seeing simulated people being integrated into the production and as they were walking around, the experience became more intimate.

The Belgian Architect, Arjaan De Feyter, shares the same perception of the VR headset as the local environment in the VR headset made it more tangible and gave it an element of real-life: *"Suddenly you are in Copenhagen in a shop where you see the street and moving cars – I think it was really nice and impressive to experience that."* Arjaan De Feyter sees this as a great possibility to use the VR headset to show products from Denmark to his clients without being physically present; *"You can give it to them and say; let's go to Copenhagen to a showroom"*.

Another factor that seemed pervasive was the level of detail in the visualization of products. The virtual 3D element enabled scalability and another dimension of the products compared to seeing products on websites or in catalogs. All seven receivers found the visualization of products as being one of the most impressive elements of the whole experience as they could see and sense the materials and proportions of the products in a different way. The receivers found the level of detail and precision higher than expected and the scale of the products gave them a feeling of almost being able to touch the products while the simplicity of the showrooms brought much attention to the level of details in the products.
The Belgian Architect, Arjaan De Feyter, imagines this replacing the fairs as the virtual experience gives more efficient information on the products.

The Norwegian Product Designer, Nadine Fumiko Schaub, also sees great potential in using the VR headset to grasp information on products as the information seems more concentrated compared to retrieving the same information when attending physical fairs:

> *"If I am honest, when I am on a fair and I am in Milan for instance, I will not be able to grasp so much information at time so I thought it was quite smart because I need only one hour of maximum attention and I think I have learned or seen more than I would in a physical exhibition."*

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USEFULNESS AND THE IMPACT ON DANISH EXPORTS

The three architectural companies do not only see the VR headset replacing physical fairs in terms of product exhibitions, but the three companies have expressed **that the Danish design brands are leading the way into a virtual future for the industry.** As indicated by the three architectural company, there is a great potential and future for the use of virtual reality. The architectural companies are convinced that the Danish design brands are first in the design industry to experiment with virtual technologies. According to the architectural companies, there is more to it than just a VR headset:

"If you have the latest technology, it says more about your company. It is because you are into new things and that is actually important to know." (Arjaan de Feyter, Architect). Researching and investing into virtual technologies places the Danish design brands on top of it which can give the Danish design brands future advantages".

The architectural companies also recognize the VR headset as a great service tool as they have been introduced to brands that they did not known before. The Danish design brands can provide the VR headset as a service to relevant customers that could be interested in exploring them as a brand which will change the way of buying furniture in the future. Another recognition of the VR headset's usefulness is that it can justify the purchasing decision of a product both for the architects, but also for their clients, and it would be a useful tool to integrate the VR headset in the last step of the purchasing process. The architectural companies are confident that such way of buying will eventually happen even beyond the pandemic situation, but in order to reach that step the technology must become more cost effective. The architectural companies also see great potential in replacing physical exhibitions with virtual exhibitions, but they do not see the element of networking in physical fairs being virtually replaced yet.

The retail receivers also see the VR headset having an impact on Danish exports and see great value in using the VR headset as virtual exhibitions. For the English Purchaser, Cecilia De Giglio, the VR headset will make great value as virtual exhibitions for the Danish design brands to show products that the retailers do not have. The English purchaser see great potential in utilizing the VR headset as a storytelling tool to increase authenticity of the brand and the handcraft of the products. However, Cecilia De Giglio did not see her as being the direct customer that needs to be convinced of buying a product.

Integrating the VR headset as an interior design tool seemed to make the most value for the retail companies as interior design, to a varying degree, make up a large part of their business. The VR headset seems to also have potential in substituting the physical fairs, but the retail companies do not see it replacing the physical fairs. However, Cecilia De Giglio sees the value of the VR headset being released in countries that are further away from Denmark; *"If you have a brand or a company based in Australia, it makes sense to see the products virtually as you then do not have to travel to Denmark."*

BARRIERS AND LIMITATIONS

The receivers have also indicated that the usefulness of the virtual content requires further consideration. The VR headset comes with certain design challenges for the seven receivers as it requires them to accustomed to it. For the recievers, the VR headset was easy to use and easy to navigate, but it also had some physiological discomfort such as dizziness and headache. What also came across in the evaluations was the heaviness of the VR headset that could feel discomforting as they had difficulties of adapting their eyesight to the virtual reality. The receivers also had difficulties with understanding the full potential of the VR technology and how it could benefit their business. To implement and integrate the VR headset into their business, it was a general perception that the technology and the VR headset should become more common use across the industry, and it should become easier to incorporate into the business. The lack of resources and knowledge limited the seven receivers in buying the VR headset.

Another limitation that came across the receivers was the "danger" of becoming disconnected from the real world. Being in the virtual universe disconnected them from the real physical world which made the VR headset a one-time experience that could be difficult to translate to the physical world: "You are standing and moving around and after a while you forget yourself because you are virtually somewhere else." (Anna Berg, Puchaser). The English Purchaser, Cecilia De Giglio, shares the same perception and expresses that one of her concerns with the VR headset is to remember the whole experience after it ends: *"You forget the experience when you take them of – it is a one-time experience, and it makes it difficult to remember the information as you cannot write things down."*

However, the seven receivers see the innovative potential in the VR headset, but they see it playing a more supporting role in the physical reality as the need for touch of products still plays a significant role in the purchasing process. As the receivers do not perceive themselves as the end consumer, it is their clients that need to be convinced of the final purchase. The seven receivers see potential of the VR headset being integrated as the starting point in the purchasing process as an intermediary between them and their clients to explore new products. However, a common denominator for the seven receivers is that the WebAR technology could enable more advantages for them. The ability to interact with the content from the brand websites seemed more appealing to the seven receivers and their clients. The ability to easily share AR experiences over the internet into the physical worlds is perceived more attractive and beneficial to the receivers as it would reduce the need for resources while making the experience more efficient.

In conclusion, although these specific user groups greatly enjoyed the experience, they did not see themselves as the right users appreciating the VR headset. The architectural companies saw great potential in replacing physical exhibitions with virtual exhibitions, but the retail companies did not see this way of representing Danish design as replacing physical events yet. However, taking the perspectives of other actors in the related industries they pointed to several use scenarios that potentially could combine the intrinsic and extrinsic benefit of the virtual experience. These scenarios are further elaborated below in relation to the identified use cases.

PARTICIPANT VIEWS

Similarly, to the receiver groups, the participant companies generally commented on the usability very positively. They were positive to many of the technical aspects, impressed with how far virtual technology had evolved. They also thought that the esthetic experience were pleasing and company representatives generally thought that the level of enjoyment was high.

USE SCENARIOS

Beyond the specific use case of replacing physical events and fairs by distributing a VR headset presenting the brand and its products, evaluations with participants, VR headset receivers and other ecosystem actors proceeded to identify alternative impact scenarios in which virtual technologies could positively impact export and sales of designer goods.

These impact scenarios have been summarized in Table 2 and graphically displayed in Figure 1 as 11 virtual technology use cases emergent from the project development and testing activities. Several of these use cases corresponds to activities that would take place in relation to an event or fair (e.g. new B2B customer acquisition or the establishment of brand identity), but use cases where tightly delimited to activities that would take place during an event to not rule out the identification of entirely new ways of working.

Table 2. Virtual technology use scenarios

Use case	Associated Virtual Tech	Description
BRAND IDENTITY	Virtual studio	Storytelling about brand identity, production process etc. Virtual studio allows for interactive presentations that are easy to modify and customize.
NEED FOR TOUCH	360 video, VR headset, WebAR	360 videos were developed to capture the attention of the viewer, either in an enclosed VR headset or on a handheld device. Rather than convincing the customer about a specific product, the purpose would be to create an emotional experience influencing the perception of the product.
B2B CUSTOMER ACQUISITION	VR headset, 360 video	Intended to be used at a physical event, such as an industry fair, the VR headset with pre-recorded messages about brand values and design intention can delivered as a consistent message tailored to prospective new partners.
VIRTUAL DESIGN PROTOTYPE	3D models	3D models can be used early in the design process, perhaps even before physical prototypes are made, to solicit customer impression and avoid development of unwanted products.
VIRTUAL PHOTO SESSION	Virtual studio	Because of cost reasons or due to continued travel restriction, the virtual studio forms an additional opportunity to avoid having to travel to exciting locations, with associate high costs and high emissions.
SALES CONVERSION	WebAR	In an online store, posting 3D models can help convince the prospective customer about the product by de-risking the purchase by providing an richer representation of the product, and thereby convert interest to actual purchase. WebAR
EXTERNAL PARTNER TRAINING	VR headset	For reseller, agents and other partners the VR headset provides an opportunity to train staff with a consistent message from designers about the collection and reduction in samples. Also for select partners to 'make visits' to design and production facilities in hours rather than days.

Use case	Associated Virtual Tech	Description
INTERNAL TRAINING	VR headset	In the training of sales people and/or onboarding of new employees, through a prerecorded consistent message.
ENABLING DESIGN VISUALIZATION	3D models, design software	3D models in asset libraries allow architects and interior designers to visualize products in order to engage with space and convert interest to actual purchase.
SHOWROOM VISITS	VR headset	Using the VR headset to visit virtual showrooms instead of attending physical showrooms. This can possibly give a more personal experience than just browsing through a catalogue of pictures.
INTELLIGENT RETAIL	WebAR	Using AR in relation to a physical meeting either in store or at the customer to be able to explore further designs and visualize ideas, with the purpose of getting more customers to initiate the transaction.

Figure 1. Virtual technology use cases and furniture and fashion industries
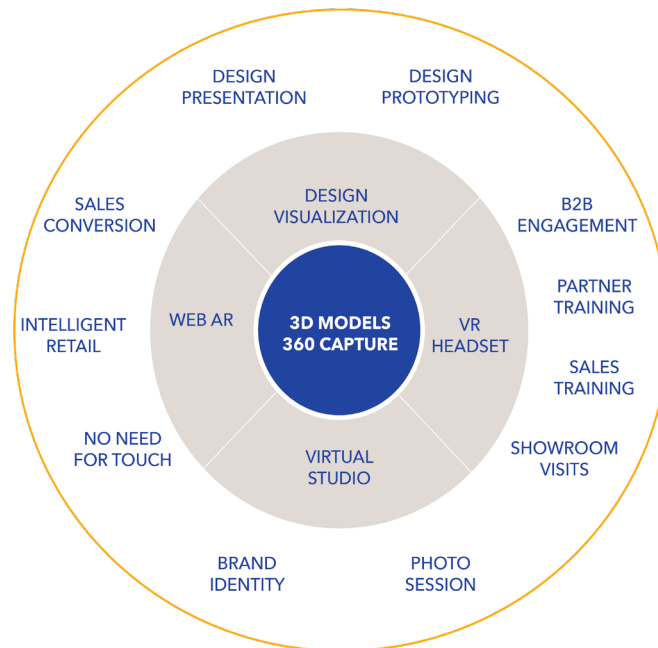
BARRIERS AND LIMITATIONS

The participants indicated that the VR technology come with certain barriers which can seem to limit the use of it. What seemed as the most general limitation across the participating brands was the cost of the technology. The participating brands expressed that the technology for now seems costly and the need for frequent content change and the distribution of the VR headsets to customers will take up a lot of resources. Relevant cost were not only the direct purchase price of the VR headset but the cost associated with production of content that would only reach a handful recipients.

3D product models and AR seems closer to commercial adoption than VR technologies in the furniture and fashion industry. The reason is that here the infrastructure exists, or is expected to exist in 6-12 months, as handheld devices are getting built in tools for this purpose at the same time as the major shopping platforms are implementing AR functionality as a standard feature. 3D models are also increasingly used in the B2B context as architects and interior designers are using producer created 3D models to present their designs to their clients. Here, however, developments are partly barriered by a lack of development, exchange and storage platforms that allows pushing 3D models in all relevant channels, including to online shopping platforms and to architect's design software.

The participating brands also expressed concerns to the digital maturity of the industry and whether the industry is ready to receive the VR headset. Communicating the content of the VR headset and what it can do for the end consumers seems like a challenge for the participating brands as the VR headset has not yet become a commonly used tool across the industry. However, when the VR headset has become more scalable and more widely used, the brands seem confident that it will create value in both ends. The participating brands also indicated that there is still more exploring to do on a strategic level with VR and AR technologies to fully understand the potential value of the technologies and how it can benefit their business.

Throughout the virtual stage project, the participating brands experienced challenges with the overall project timeline that they believe requires further consideration. Difficulties with understanding the possibilities with the VR headset seemed most pervasive in the evaluations. For the participating brands, the possibilities of the VR technology did not seem to be defined from the very beginning which in the end limited them to explore the full potential of virtual technologies. Some of the participating brands experienced that some of their products simply could not be made into 3D versions due to technical constraints with the technology which seemed to slow down the production process and, in the end, pushed the delivery dates. Due to the scale of the virtual stage project, there was not much time to experiment with other products and to explore more possibilities with the VR and AR which now seems to be the next step for the brands.

IMPACT

The Virtual Stage project was framed by the lockdown of society in response to the Covid-19 pandemic that forced cancellation of physical events like industry fairs and partner meetings. In particular international travel was challenged and in effect export threatened. In this light, virtual technology was approach as a possibility to overcome physical restrictions, to boost the danish design industry in the export and sales that previously had been reliant on physical events and meetings. The vision was to lift the danish design industries in the utilization of virtual technologies towards this end. Project partners, advisory board, case stories and participants from events have all gain insights and knowledge about how virtual technologies can support the challenges of meeting you customers but also insights to the limitations, barriers and the extend of time, competencies needed to succeed.

IMPACT ON EXPORT AND SALES

The ultimate evidence of impact would be movement in export and sales figures. However, the answer to the question if the virtual technologies trialed in the Virtual Stage project has proven to positively impact export and sales is "Not yet". The project has largely been focused on exploring the possibilities within the industry, creating proof of concept solutions and exposing them to relevant parties in the quest of finding out what will provide value and for whom. The focus has not been on execution and implementation at scale. To actually move sales figures in a detectable way, they virtual technology solutions would need to be extensively used in the processes of establishing new partnerships, acquiring new customers, transforming interest to actual purchase and so on. This is currently happening as participating companies are moving in this direction, but within the project timeline the impact on export and sales is not measurable.

However, while not proven yet, the message from both the 7 receivers of the VR headset, from most of the participating companies and from the companies taking part of the educational track that is consistent in that there is potential for virtual tech to complement physical events and to in many different ways catalyze export and sales. There is a profound expectation in the industry that virtual technologies will be part of a new normal post-Covid.

IMPACT ON REVELATION OF VIRTUAL TECH POSSIBILITIES

AND BARRIERS IN INDUSTRY

As a qualifying condition to be able to impact sales the Virtual Stage project has focused on revealing the possibilities and barriers for applying virtual technologies in the design industries. Clearly, this has been achieved on both a general level and particularly for the context-specific situations of the participating companies. The overall understanding of the impact scenarios that exists in the industry are summarized above in the use case overview. In reflection of the project, all participating companies are able to articulate the potential and barriers of virtual technologies with direct consideration of their own business situation.

While use cases are many, it is worth noting that not all of them are equally attenable at the moment given the technological state of virtual technology. Concretely, the use scenarios that are linked to AR in the B2C setting and the use of 3D models in the B2B setting are most accessible and prone to commercial use. Here, the critical development is the inclusion of AR projection possibility as standard features in handheld devices (smartphones and tablets). While right now a fraction of the end consumers possesses such devices, the relevant customer base for designer products can be expect to appropriate such technologies in 6-12 months. VR solutions on the other end suffers from a high cost of consumptions, which limits the current reach through these devices. VR-based use scenarios that are within reach seem typically to be direct to select key users, such as potential new B2B customers, agencies and onboard of new hires within the company. Paradoxically, VR is expected to be relevant in combination with a physical encounter in a showroom, at fair or during a visit to give the viewer a deeper understanding of the company.

IMPACT ON INDUSTRY VIRTUAL TECHNOLOGY CAPABILITIES

To lift the industry in its use of virtual technology, 10 case companies have developed their capabilities in relation to virtual technologies. They report having gained better understanding of technical possibilities and limitations, as well as both better understood and improved in their own capabilities to seize virtual technology possibilities.

Interestingly, several of the case companies also report that participation in the project has given a central positive and exiting possibility to focus on during hard times. Thus, and unanticipated indirect impact of the project has been on employee morale and well-being. For the 100 participants in the educational track, 84% report that the course have increased their insights into virtual tech at least somewhat and 69% report that the course increased their virtual tech competences somewhat or more. After being part of the education, 90% intend to use virtual tech for sales, and 92% will specifically use the proposed virtual tech solutions for sales activities.

IMPACT ON ATTITUDES TOWARDS VIRTUAL TECH IN THE INDUSTRY

Additionally, the project has managed to transform attitudes in the 10 participating companies and in the companies taking part of the educational track. In the participating companies, these attitude changes have taken the shape of four transforming views of virtual technologies:

• From FEAR to OPPORTUNITY
• From COVID workaround to NEXT NORMAL complement
• From FUN addition to SERIOUS business concern
• From OPERATIONAL to STRATEGIC top management

Overall, most of the participating companies agree to that virtual technologies is assuming a position that is at the core of their business, in particular in the interaction with customers in the sales process.

Also, within the companies taking part of the educational track we can see a transformation of attitudes. While such effects can be expected to also be influenced by other contextual factors and experiences, 94% of the participants that took the survey said that the course specifically had increased their interest in virtual technologies to some degree, 72% agreed to this statement strongly. In reflection of this transforming attituded, 92% of respondents expect that virtual tech can be used to increase export to at least some degree. It is thus with high interest and high expectations that the course participants disconnected from the educational experience.

IMPACT ON FUTURE ACTIONS

As indicated above, the project managed to develop and test virtual technologies within the design industries. The project managed to explore a brand new territory where now one had gone before to the extent that this project has lifted the industry's capabilities to harness this value. What was not achieved within the scope of the project was the realization of this potential at scale. Hence, a particularly relevant aspect of the impact of the project is to what extent the participants of the project and in the educational track are moving forward to seize the potential.

Among the participants in the educational track, 88% reported that the course increased their likelihood to invest in virtual tech at least to some degree. They do so, because they perceive that virtual technologies have the capacity to in the future enhance the industry in a range of different ways. Specifically, respondents 'strongly agreed' with the prospect of virtual technology to in the future (percentage of respondents that strongly or very strongly agrees to the prospect):

- Increasing empathy (41%)
- Enhance computing environments (87%)
- Reduce costs (79%)
- Increase coordination (63%)
- Standing out from competitors (88%)
- Increase collaboration (90%)
- ncrease communication (86%)
- Reduce the need for non-mobile devices (61%)
- Enabling physically incapable participants (68%)
- Understanding proximal positioning (53%)
- Facilitating additional information (67%)
- Overcoming time/space limitations (71%)
- Reducing physical risk (62%)
- Improving video recording of day to day tasks (61%)
- Depict things that don't exist physically yet (85%)
- Reduce environmental impact (94%)
- Exciting customers and sales people (83%)
- Filter information (59%)
- Improving training (67%)
- Reducing emotional/mental risk (67%)
- Amplifying real environments with 3D objects (79%)
- Inspiring new creative ideas (92%)
- Allowing physical interaction with digital objects (77%)
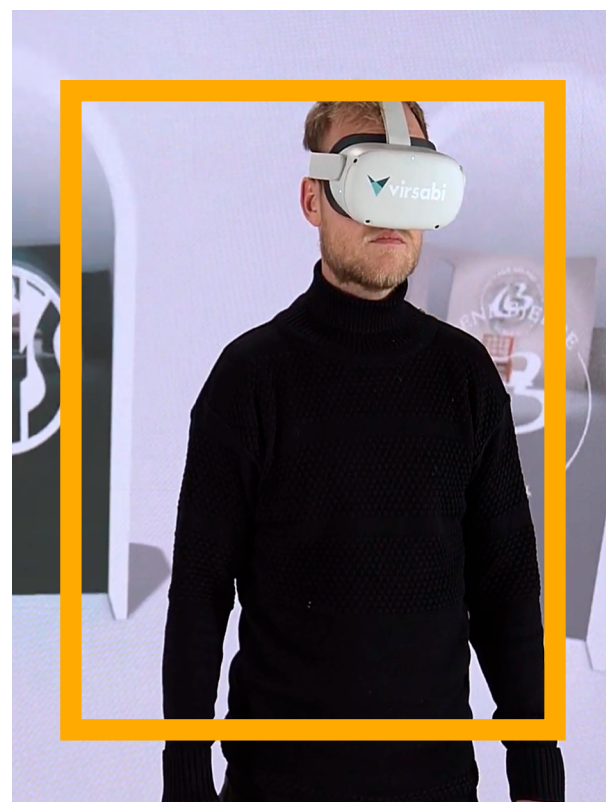
Among the project case companies, eight express plans to continue developing or investigate further their use of virtual technologies, while two case companies retain a hold position waiting for some key technologies to mature and gain wider adoption among customers. Select statements provide snapshots of these plans:

• "Investigate feasibility of Virtual Studio photoshoot"
• "Get executive board commitment to 3D asset library"
• "Use Virtual Studio and 360 videos for annual event"
• "VR headset for new customer acquisition and collection experience at next industry event"
• Push 3D models on our website"
• "Distribute VR headsets to contract market"
• "Investigating if virtual tech can be part of given a personal touch to next gen online showrooms"
• "Use VR to rebrand company identity"

Interestingly, the eight companies who will move forward immediately have raised specific interest in different projection devices that will enable them to interact with a distinct user group (new customers, existing customers, end consumers, internal staff, commercial partners). However, there is also convergence in the plans in that all companies are looking at finding a justifiable balance between cost and benefit. Its recognized that costs around VR are relatively high and reach a small group of user, its not a solution that scales easily yet and is therefore to a less extent part of future plans. For 3D models, there is a burgeoning recognition that future plans need to include the operationalization and industrialization of 3D model creation. Rather than seeing the creation of 3D models as an ad-hoc service, the companies are investigating what capacities are required to do this at scale and to be able to push the same models through many different channels directed towards different user groups. It is recognized that a single use case is likely not covering the costs of production and therefore to move forward towards actually having an impact on sales, companies are investigating the infrastructures, platforms and elaborated capabilities required as the next steps into the virtual future.

In conclusion, the strongest impact displayed in the project is the commitment of participants in the project to continue the journey to incorporate virtual technology in the commercial activities. This commitment can only be explained by that the project have been successful in its ambition to expose the applicability of the technology in this particular context, and to contribute to that industry actors are forming the critical capabilities to leverage these possibilities. This has formed an initial, but critical step towards lifting the whole industry in the use of virtual technology.