



University of St.Gallen

Institute of Information Management

Virtuelle Welten – reale Auswirkungen: Wie Unternehmen im Metaverse Nutzen schaffen können

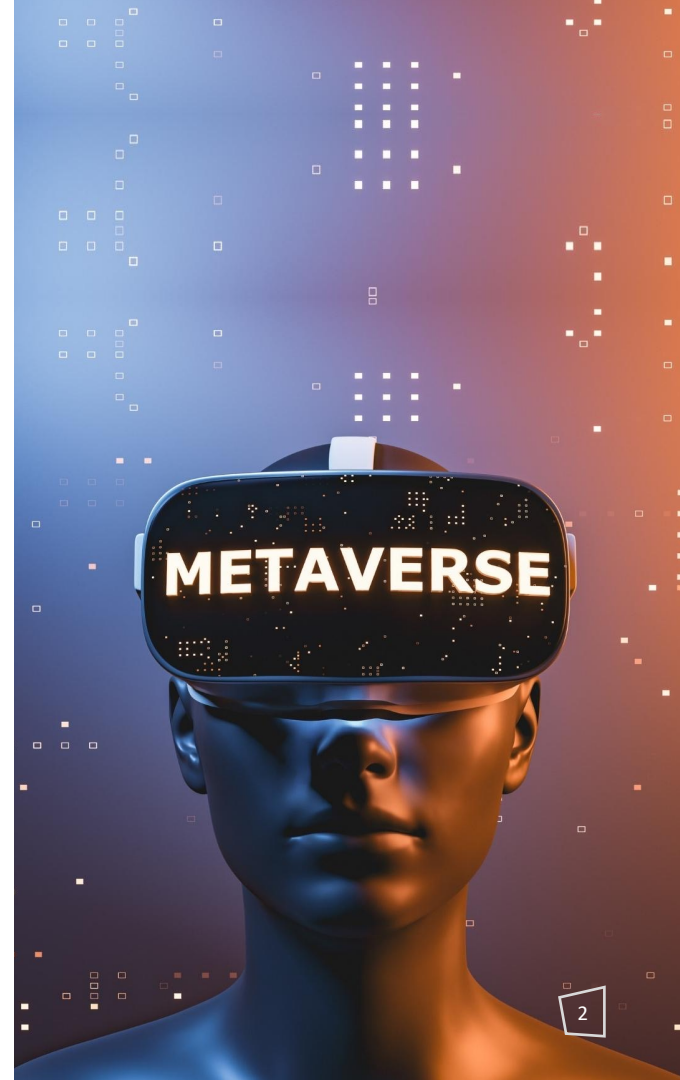
Dr. des. Edona Elshan & Fabian Tingelhoff



From insight to impact.

Agenda

1. Was ist dieses Metaverse?
2. Das Metaverse aus Unternehmer-Perspektive
3. Outlook: Das Metaverse und die Informationssicherheit



Was ist dieses 'Metaverse'?

Was verstehen die Medien als Metaverse?

Research | Research and Analysis

Metaverse may be \$800 billion market, next tech platform

Bloomberg Intelligence December 01, 2021

Forbes

MARKETS

The Metaverse Is A \$1 Trillion Revenue Opportunity. Here's How To Invest...

19 JULY, 2022

The metaverse will impact all sectors of the economy

Forbes

INNOVATION

Five Industries That Will Be Transformed By The Metaverse

TECH · METAVERSE

Citi says metaverse economy could be worth \$13 trillion by 2030

WORLD ECONOMIC FORUM

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THE METAVERSE

71% of executives say the metaverse will be good for business. Here's why

Apr 5, 2022

BCG

How the Metaverse Will Remake Your Strategy

☰

🔍

How the Metaverse Will Remake Your Strategy

Was versteht die Wissenschaft als Metaverse?

Paper	Definition (direct quote)	Technical Components					Social Components				
		VW	P	DI	SM	I	SE	ES	PS	SI	E
Akour et al. (2022)	Metaverse is a kind of imagined world with immersive digital spaces that increase, allowing a more interactive environment in educational settings. The metaverse is an expansion of the synchronous communication that enhances an effective number of users to share different experiences. (p. 1)				X	X				X	
Ayter (2022)	Metaverse(s) are collective, online, persistent, three-dimensional virtual worlds in which (unlike their gaming counterparts) all content is user-created. (p. 206)	X	X			X	X				
Boughzala et al. (2012)	Metaverses are usually used for sharing information, creating personal virtual images (avatars), and manipulating virtual objects. They are immersive virtual worlds (VWs) in which avatars interact with each other and with software agents. (p. 715)	X				X	X			X	
Bourlakis et al. (2009)	Metaverses [...] are virtual worlds extending our physical universe by adding new dimensions and domains for economic, social and leisure activities. (p. 117)	X						X		X	X
Braud et al. (2022)	Metaverse is characterized as a collection of persistent virtual worlds over which users can share experiences at the intersection between physical and digital. (p. 3)	X	X								
Davis et al. (2009)	Metaverses are immersive three-dimensional virtual worlds (VWs) in which people interact as avatars with each other and with software agents, using the metaphor of the real world but without its physical limitations. [...] Metaverses provide virtual team members with new ways of managing and overcoming geographic and other barriers to collaboration. [...] Metaverses go beyond the tool metaphor of information technology to being a model of the real world and an extension of users as actors. Metaverses exemplify this concept by allowing for a wide range of activities, including play, information seeking, team interaction, and commerce. (p. 91)	X				X	X	X	X	X	X
Di Pietro and Cresci (2021)	Metaverse is a combination of persistent, multi-user, shared, 3D virtual spaces that are intertwined with the physical world and merged together to create a unified and perpetual virtual universe. Users enter the metaverse with avatars, who can interact with each other and with the items, applications, services, and businesses that the metaverse contains. (p. 281)	X	X	X	X	X	X	X	X	X	X
Dionisio et al. (2023)	[Metaverses] are persistent online computer-generated environments where multiple users in remote physical locations can interact in real time for the purposes of work or play. (p. 34-1)	X	X		X						
Falchak et al. (2018)	We use the term metaverse with the same semantics as in Wikipedia: "a collective virtual shared space, created by the convergence of virtually enhanced physical reality and physically persistent virtual space, including the sum of all virtual worlds, augmented reality, and the Internet." We use the term social metaverses to describe the above sorts of virtual realities in which a central purpose is socialization and interaction with other avatars—including both players and non-player characters (NPC's). (p. 83)	X	X	X		X	X		X	X	
Gadalla et al. (2023)	No definition provided	X				X		X		X	

quote)

VW

are converging on a multitude of virtual worlds that can be says as there are human beings enabling and interacting with coming to be called "The Metaverse". (p. 4)

dimensional, immersive virtual world that allows real time action and content creation by users. (p. 282)

an interpersonal persistent network of shared virtual people can interact synchronously through their avatars with it. (p. 142)

ers to an immersive, three-dimensional digital space, a virtual world where people can live, work, and play. (p. 1)

an alternative platform for human interaction in the virtual domain holds few restrictions in changing the surrounding appearance of the avatars, it can serve as a platform that lets or even dreams at least in the **metaverse** world. (p. 1)

Metaverses are 3D computer-generated environments which users, often called residents, populate through the proxy of an avatar. They allow people to interact socially and express themselves in new ways. [...] Residents are free to imagine their own activities and engage in pursuits which run the gamut from setting up their own business through staging a collaborative theatrical installation to simply playing a traditional computer game. (p. 202)

Metaverse has been defined as a digital, or electronic representation of our real world. In these representations people can interact freely using the metaphor of their real lives in a non-limited world by physics, age, sex, or other real world characteristics. (p. 1)

Metaverses are immersive three-dimensional virtual worlds (VWs) where people interact with each other and their environment, using the metaphor of the real world but without its physical limitations. (p. 74)

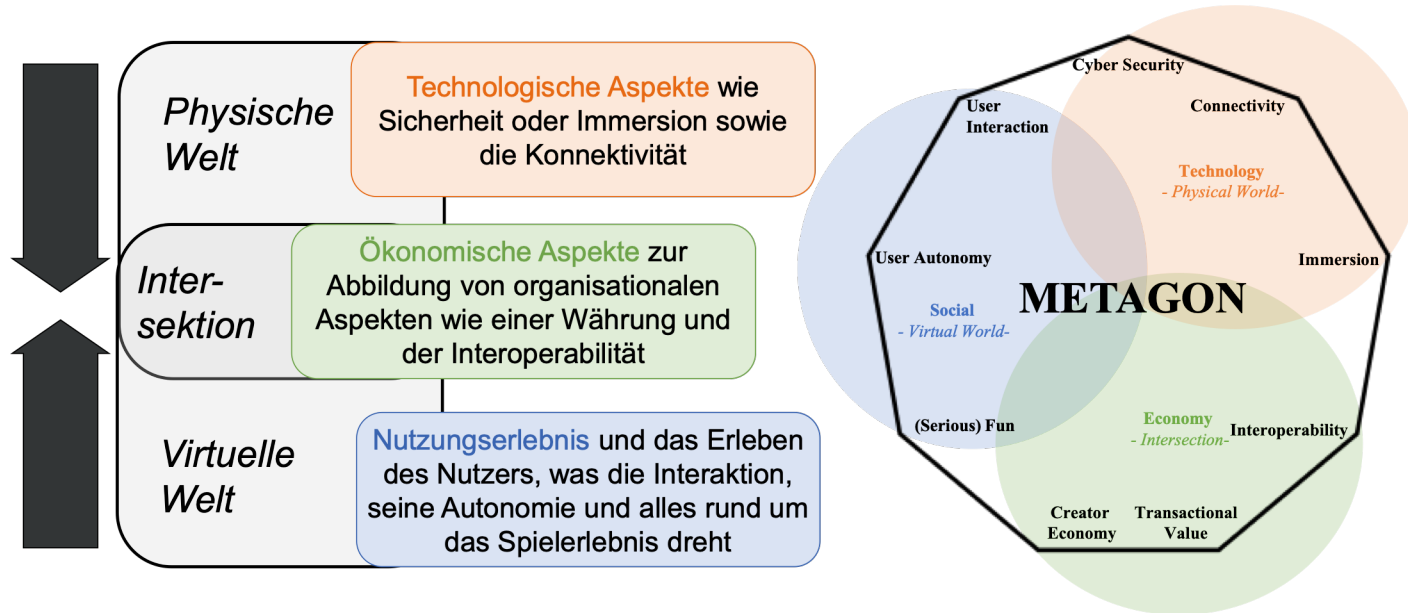
No definition provided

Metaverse is best defined as a 3D-virtual space, in which numerous people can inhabit, migrate, and make use of as a virtually physical environment. (p. 4211)

Paper	Definition (direct quote)	Technical Components					Social Components				
		VW	P	DI	SM	I	SE	ES	PS	SI	E
Shin (2022)	Metaverse refers to a kind of virtual reality that provides users with experiences to become part of extended worlds. [...] It is generally viewed that metaverse is a current XR as metaverse is designed as an extension of the real world. (p. 69)	X				X					
Shin and Kim (2022)	Metaverse is best defined as a 3D virtual space, in which numerous people can inhabit, migrate, and make use of as a virtually physical environment. (p. 2)	X			X	X			X	X	X
Tava and Güllüçü (2010)	No definition provided	X	X	X		X		X	X	X	X
Tayal et al. (2022)	Metaverse is a podium of user mesmerizing interactions in the virtual world with the support of the Internet, software, and hardware required to create the exceptional immersive user experience. (p. 1077)					X				X	
Vernaza et al. (2012)	Metaverse is a computer-generated world in which people can share and interact as if they were in the real world. (p. 320)	X								X	
Vidal-Tomás (2022)	Metaverse is defined as an immersive and shared virtual world that allows different activities for its users, which are represented by avatars. One of its main features is economic governance and metaverse commerce, since this virtual world has its own economy and currencies with which users can trade any item. (p. 2)	X		X		X	X	X	X	X	X
Wang et al. (2021)	Metaverse is a collective virtual shared space, including the collection of virtual worlds, expanding reality and the Internet. It uses a variety of new generation information technologies to achieve the multi-dimensional and deep integration of technology, individual, organization, production, culture, social interaction, entertainment, economy, and constructs a new immersive network social form, which is parallel and intermingled with human society, and can be shared continuously. (p. 882)	X	X	X		X	X	X	X	X	X
Yang et al. (2022)	Metaverse is the internet accessed via VR and AR glasses, which has been increasingly acknowledged, and is considered as a manifestation of next-generation mobile computing platforms. (p. 2)					X					
Yue (2022)	Metaverse is a new sort of technological revolution that connects science and human awareness. Metaverse [...] is the possibility for a new economic space to arise, and it is critical to social networking. (p. 41)								X	X	
Zhao et al. (2022)	Metaverse is a virtual world that blends the physical world and digital world. (p. 26)	X									
Total percentage (count) of papers discussing the respective component		88%	28%	32%	22%	72%	36%	48%	15%	93%	19%
		(248)	(9)	(7)	(7)	(23)	(53)	(13)	(4)	(28)	(5)

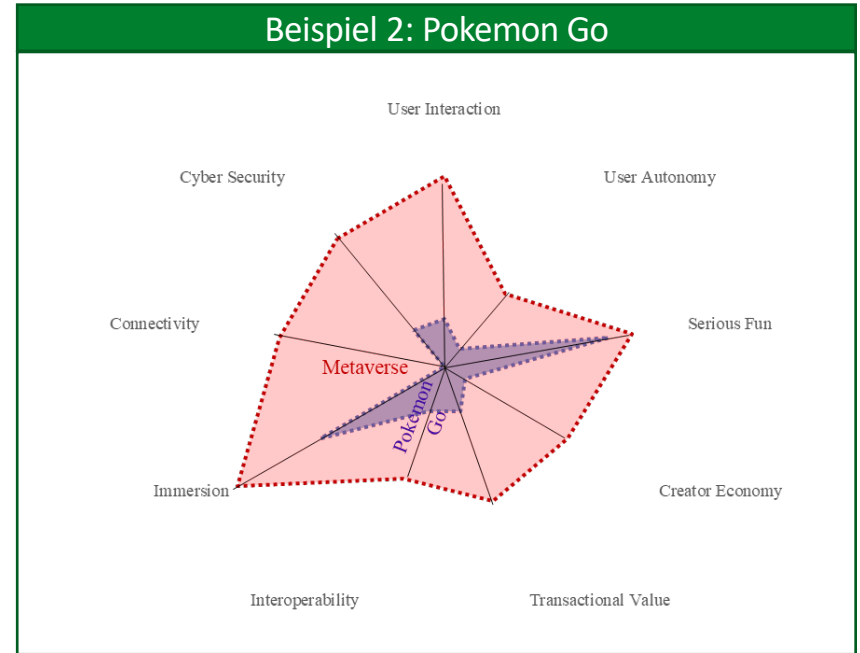
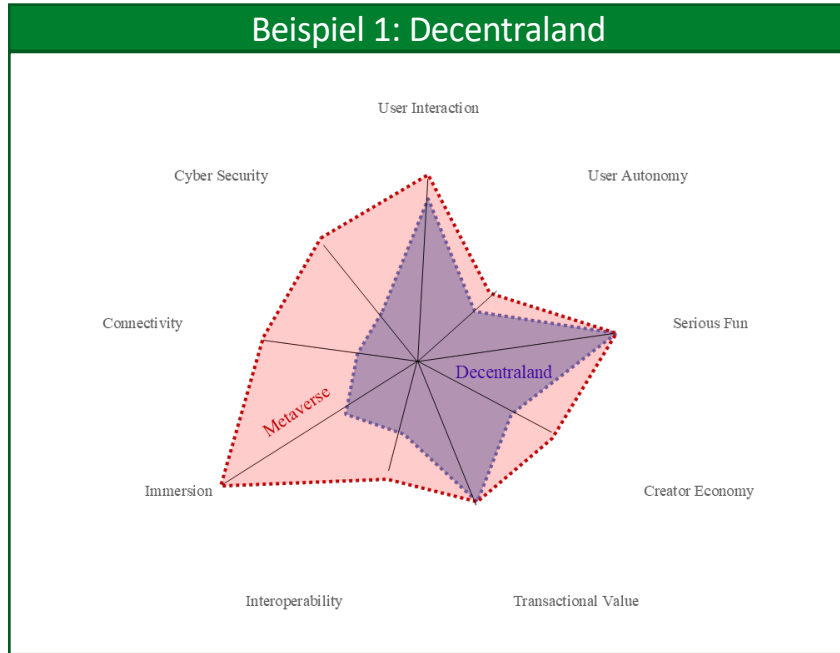
Table 1. Augmented Concept Matrix,
Dimensions (left to right): Virtual World (VW), Persistence (P), Distributed Infrastructure (DI), Synchronous Multi-User Facilitation (SM), Immersion (I); Self-Dependent (SE), Economic System (ES), Political System (PS), Social Interaction (SI), and Entertainment (E)

Ein möglicher Lösungsraum: Eine Technologie-Perspektive



Basierend auf: 30 Interviews, 29 Umfrage-Teilnehmern und der Evaluation aus 31 Plattformen

Aber wie kann man diesen Lösungsraum füllen?



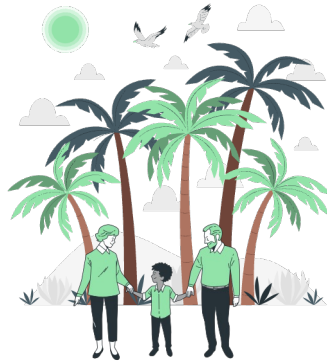
Wie stiften Unternehmen
Wert für End-Nutzer
im Metaverse?

Was für Nutzer-Werte können im Metaverse entstehen?

→ Nutzer-Perspektive



**Emotional
Value**



**Social
Value**



**Functional
Value**

Basierend auf: 69 YouTube Videos (22:19h länge, >67 Millionen Aufrufe)

Was für Nutzer-Werte können im Metaverse entstehen?

→ Nutzer-Perspektive



**Emotional
Value**



**Social
Value**



**Functional
Value**

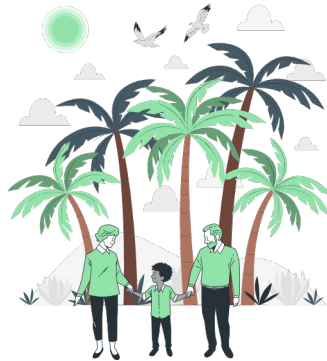
Manager sollten die Entwicklung von **zugänglichen und benutzerfreundlichen Schnittstellen** priorisieren.

Was für Nutzer-Werte können im Metaverse entstehen?

→ Nutzer-Perspektive



Emotional
Value



Social
Value



Functional
Value

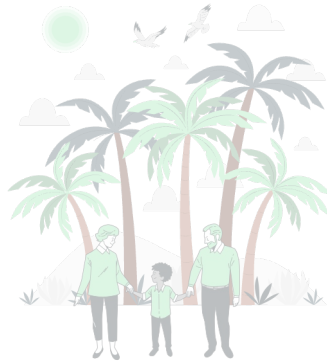
Manager sollten Funktionen und Werkzeuge schaffen, die die soziale Interaktion und Kommunikation verbessern und ein **Gefühl der Zugehörigkeit und des Engagements** fördern.

Was für Nutzer-Werte können im Metaverse entstehen?

→ Nutzer-Perspektive



Emotional
Value



Social
Value

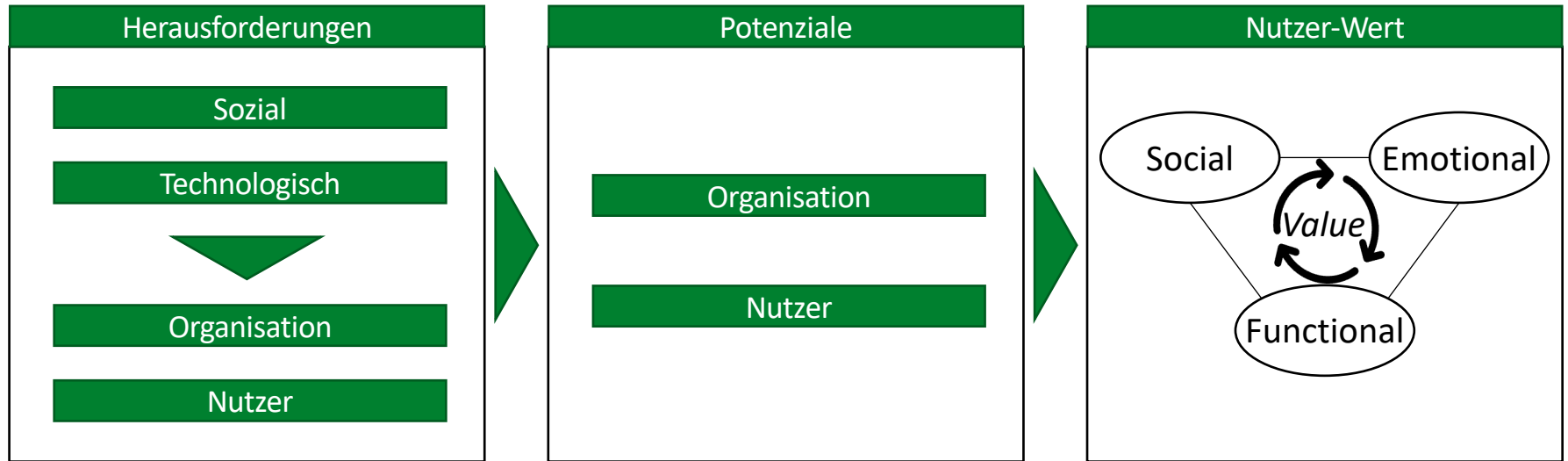


Functional
Value

Manager müssen proaktiv **ethische, rechtliche und regulatorische Herausforderungen** angehen, um eine funktionierende Umgebung sicherzustellen.

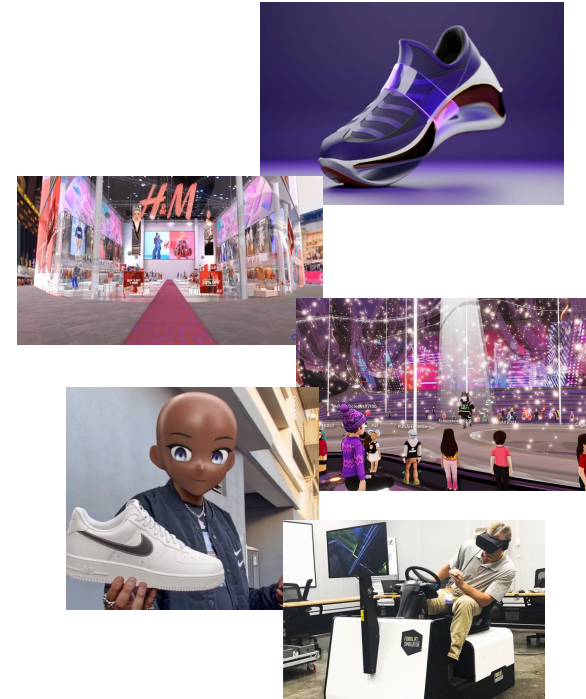
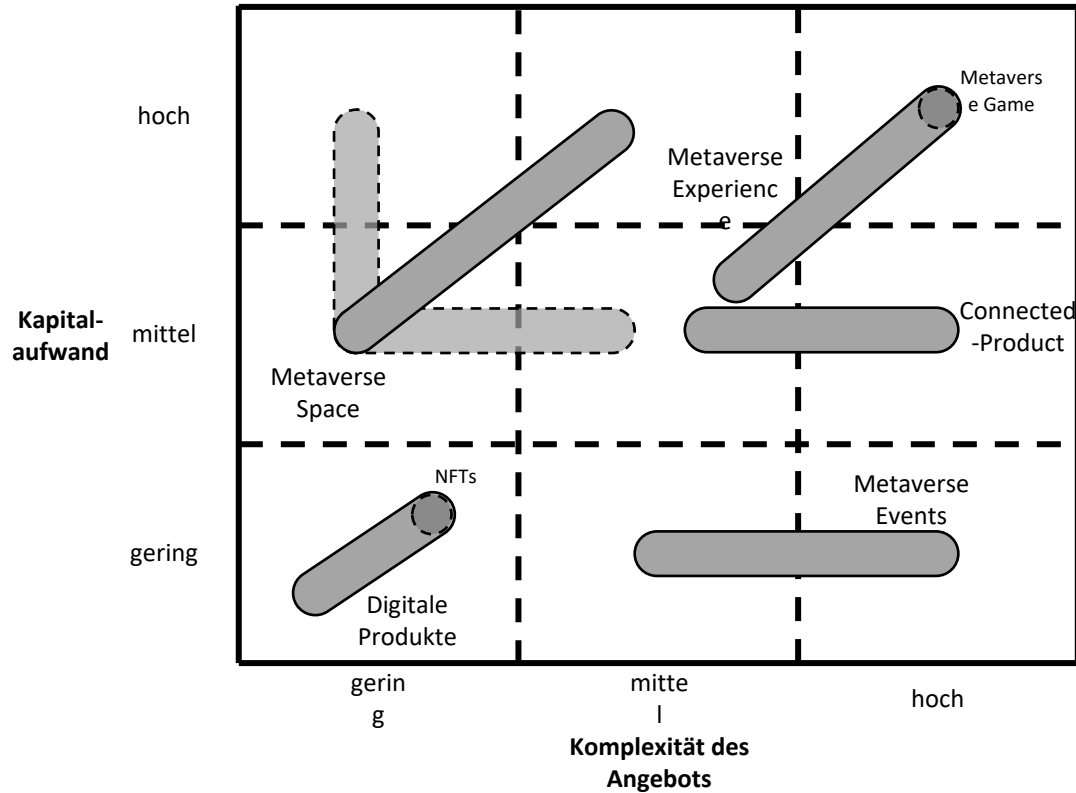
Was für Nutzer-Werte können im Metaverse entstehen?

→ Unternehmens-Perspektive



Wie können Unternehmen
erfolgreich ins Metaverse
expandieren?

Wie können Unternehmen ins Metaverse eintreten?



Basierend auf: 65 Metaverse Business Cases

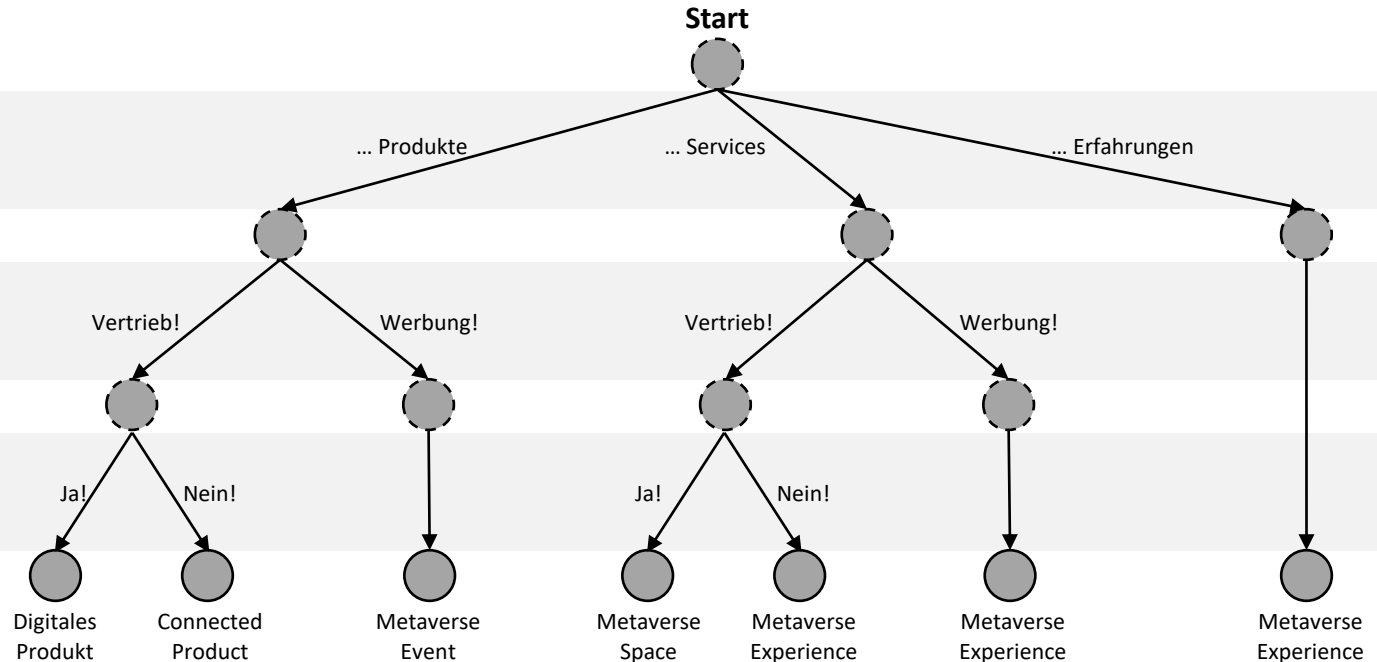
Wie können Unternehmen ins Metaverse eintreten?

Schlüsselfragen

Das Unternehmen erzeugt Wert durch...?

Steht der Vertrieb oder die Werbung im Vordergrund?

Ist das Angebot simpel in die virtuelle Welt übertragbar?



Basierend auf: 65 Metaverse Business Cases

Lohnt es sich für Unternehmen
ins Metaverse zu
expandieren?

Ist ein Metaverse-Engagement für Unternehmen wertsteigernd?

JA!

Abnormale Aktienkurse-Veränderung nach Pressemitteilung über:



E-Commerce Channel

CAAR: + 0.71%



Metaverse Channel

CAAR: + \$ 1.775 bn



Voice Channel


CAAR: + 0.32%

Basierend auf: 531 Public Metaverse Announcements



Doch was bedeutet
das Metaverse für die
Informationssicherheit?

Disclaimer:

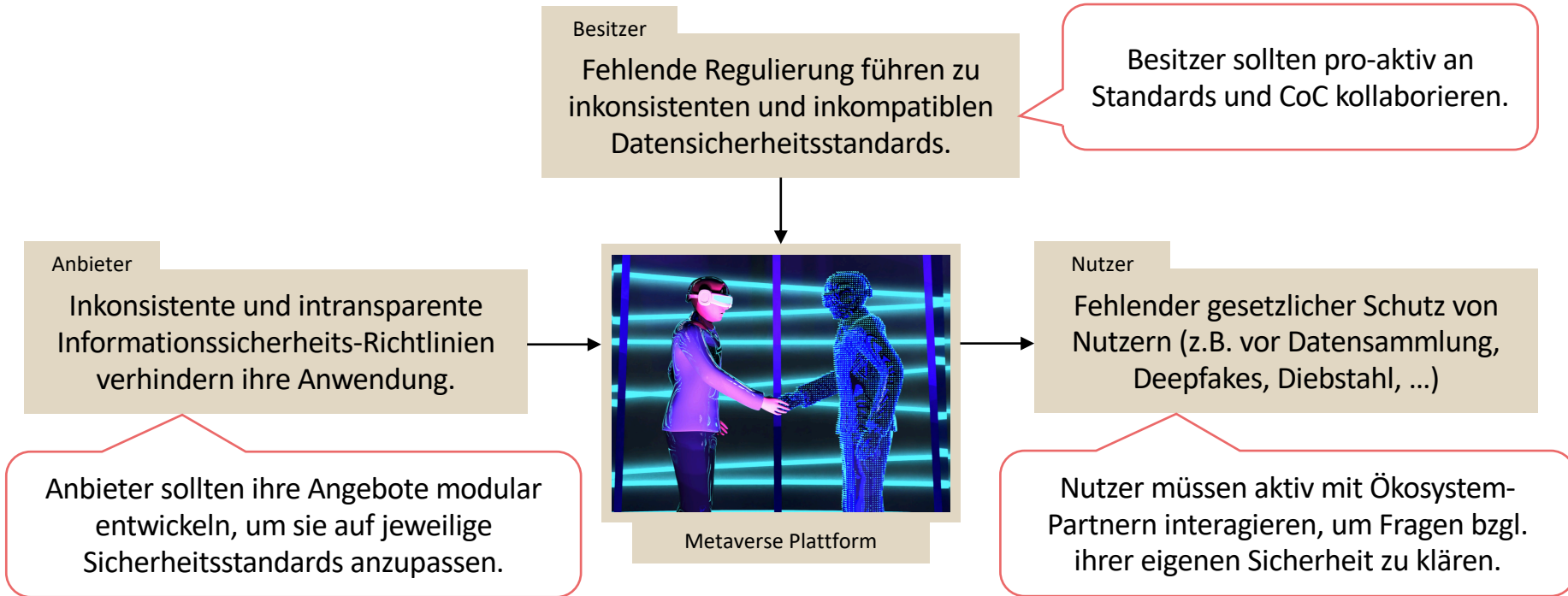
- Informationssicherheit ist nicht unsere Kernexpertise!
 - Während vorherige Folien auf unseren Forschungsergebnissen beruhen, sind die folgenden Folien **basierend** auf einer Vielzahl verschiedener **wissenschaftlicher und populärer Literatur-Quellen**.
- 

Challenges im Metaverse für Informationssicherheit

- **Authentifizierung:** Wer steht mir gegenüber?
- **VR & AR:** Hacking-Target mit Zugriff auf intime Nutzerdaten
- **Privacy:** Wer hat Zugriff und Speicherrechte zu Nutzerdaten?
- **Blockchains:** Kriminelle Handlungen sind unumkehrbar
- **Verantwortung:** Wer ist für Datensicherheit verantwortlich?
- **Moderation:** Wer hilft nach kriminellen Handlungen?



Schlüssel-Hürden in der Informationssicherheit (aus Forschungssicht)



Treten Sie doch gerne mit uns in Kontakt!



Egal ob Informationssicherheit oder unternehmerische Fragen,
wir freuen uns, uns mit Ihnen auszutauschen!

Treten Sie doch gerne mit uns in Kontakt!



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Treten Sie mit uns
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Akkreditierungen

