ANTECEDENTS TO THE CREATION OF EFFECTIVE AND DISRUPTIVE BUSINESS MODELS FOR START-UPS BY LEVERAGING METAVERSE – AN INTERPRETIVE STRUCTURAL MODELLING APPROACH

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ABSTRACT

The metaverse is an emerging virtual reality environment that offers new opportunities for start-ups to create innovative and disruptive business models. However, the creation of a disruptive business model in the metaverse is a complex, multidimensional and multifaceted challenge that involves understanding the metaverse market, user behaviour, technology trends, regulatory considerations etc. This research categorically aims to explore the key factors and determinants of the metaverse that can bring innovative solutions for start-ups and start-up ecosystems that are aiming to create a disruptive business model. In this context, researchers have used the interpretative structural modelling technique to address this objective, which also shows the novelty of this study. It was found that the key factors that play a key role in the creation of a disruptive business model for start-ups by leveraging metaverse technologies are immersiveness, interface, interactivity, interconnectivity, environmental fidelity, sociability and security. Hence, the novelty of this research study essentially lies in its endeavour to provide valuable and actionable insights for start-ups and other stakeholders looking to create effective and disruptive business models by using Metaverse.

Keywords: Metaverse, Start-ups, Effective and Disruptive Business Model, Interpretative Structural Modelling, Start-up Ecosystem, Business Transformation, Omni-channel Business Approach etc.

1. Introduction

The metaverse, a term coined by science fiction author Neal Stephenson in 1992, refers to a virtual reality shared by millions of users (Giang Barrera & Shah, 2023a). In recent years, there has been a growing interest in the potential of the metaverse to revolutionize industries such as gaming, tourism, education, retail, entertainment, and social media (Dwivedi, Hughes, Wang, *et al.*, 2022; Koohang *et al.*, 2023). The metaverse could revolutionize these industries by creating new and immersive ways for people to interact with digital content and the virtual world and conduct transactions (Brannon Barhorst *et al.*, 2021). A recent report by McKinsey & Company assessed that the marketing opportunities within the Metaverse, via direct-to-avatar transactions, are envisioned as a $54 billion market (Hazan *et al.*, 2022).

The disruptive business models that will be necessary to fully realize the metaverse's potential will likely come from start-ups that can create new technologies, business models, and user experiences that are not possible in the physical world (Sun *et al.*, 2022). Start-ups are often seen as the driving force behind disruptive business models because they can take risks and experiment with new technologies and business models (Ahn *et al.*, 2022). They also have the advantage of moving quickly and adapting to changing market conditions (Bogicevic *et al.*, 2021).

In the context of the metaverse, start-ups can play a key role in developing the technologies and platforms that will be necessary to create immersive and engaging virtual experiences (Hackl *et al*., 2022). However, the metaverse is still in its early stages of development, and it remains to be seen what impact it will have on customer experience, brand engagement, society and the economy at large (Buhalis, Lin, et al., 2023). This research paper aims to explore the concept of the metaverse, its current state of development, its potential impact on start-ups and the opportunities it presents to start-up companies as a whole to create a disruptive business model (Dwivedi, Hughes, Baabdullah, *et al*., 2022). This study endeavoured to explore disruptions that Metaverse can bring or facilitate, in the business model and marketing strategies of start-ups, which are in line with changing consumer behaviour and expectations. A range of opportunities emerging through Metaverse for start-ups (Cespedes, 2022) were identified by conducting the literature review.

In this study, the authors sought to address the following research questions:

RQ1: What are the factors that will act as facilitators for start-up companies to create a disruptive business model in the metaverse?

RQ2: What is the inter-relationship between the factors that act as facilitators for start-up companies to create a disruptive business model in the metaverse?

RQ3: How do the factors that act as facilitators for start-up companies to create a disruptive business model in the metaverse influence each other?

The interpretative structural modelling (ISM) (Sagheer *et al*., 2009) is used to identify the factors that contribute to the successful implementation of the disruptive business model by start-ups in the metaverse. In recent years, India has emerged as the third-largest start-up ecosystem in the world (Kalra & Shubhankar, 2022). According to a report by the Department for Promotion of Industry and Internal Trade (DPIIT, 2022), the Indian start-up ecosystem has seen a significant increase in the number of start-ups, with the number of start-ups in India growing from around 4,200 in 2014 to around 73,000 in 2022. The Indian start-up ecosystem is rapidly evolving and has the potential to make a significant impact on the growth of the Indian economy and employment generation (Bhatt *et al*., 2022). The COVID-19 pandemic and the rise in the application of Artificial Intelligence (AI) powered technologies and disruptive business platforms like metaverse has been a major driver for the exponential adoption of the inclination of consumers towards digitally driven businesses and E-commerce (Guckenbiehl & Corral de Zubielqui, 2022). Hence, this research study aims to establish a solid foundation for determining the factors that contribute to the development of a disruptive business model (DBM) by start-ups in the metaverse by using ISM to examine the relationships between dependent, driving, linked, and autonomous variables and creating a hierarchical interpretive structure (Jolhe & Babu, 2014).

2. Literature Review

2.1 Definition of Metaverse

The term "Metaverse" is made up of two words: "Meta", which means beyond and "Verse", which means universe (Bobrowsky & Needleman, 2022). Metaverse has also been described as "a socio-economic immersive cyber-physical ecosystem which is enabled by digital platforms where the interactions are virtually undertaken and the ecosystem is shaped by the shared values, norms and goals of the users" (Kar & Varsha, 2023). Metaverse as "a massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence and with continuity of data such as identity, history, entitlements, objects, communications and payments.

Koohang *et al*. (2023) described Metaverse as "a virtual platform that uses extended reality technologies, i.e. augmented reality, virtual reality, mixed reality, 3D graphics, and other emerging technologies to allow real-time interactions and experiences in ways that are not possible in the physical world"(Bobrowsky & Needleman, 2022). According to (Sun et al., 2022), "the Metaverse is a highly immersive virtual digital world formed by digital technology in which people can simulate various activities in the real world and interact with the real world". Rauschnabel (2022) has given an operational definition that describes metaverse as "a fully immersive three-dimensional environment that can integrate both physical and virtual worlds and which can be accessed through interfaces such as VR and AR" (Tan et al., 2023).

2.2 Development of Metaverse

The evolution of technologies like AR, VR AI etc. essentially played a key role in the potential creation of a metaverse. These technologies overlay digital objects onto the real world and have the potential to create a seamless transition between the physical and virtual worlds (Han *et al*., 2020; Rauschnabel *et al*., 2018). The interest in Metaverse was triggered when Facebook officially changed its name to Meta in 2021. The years 2021 and 2022 are considered to be the watershed years for Metaverse, with a series of disruptive business models being introduced. Google launched a 3D video calling technology called Starline. In the same year, Microsoft launched Mesh12 and also acquired Activision Blizzard, the world's largest game developer and publisher. Entering this space, NVIDIA launched Omniverse13, a platform for generating interactive AI avatars (Dwivedi, Hughes, Baabdullah, *et al*., 2022; Riar *et al*., 2022). Chipotle and McDonald's have started interacting with their customers through the metaverse (Koohang *et al*., 2023). HSBC has partnered with Sandbox to reach out to e-sports and gaming fans (Gkritsi, 2022). Nike and Gucci are selling virtual products and digital twins in the metaverse using non-fungible tokens or NFTs (Hofstetter *et al*., 2022).

2.3 Disruptive Business Models (DBM) in Metaverse

A disruptive business model is an application that fundamentally changes the way that products or services are provided, creating new markets and transforming existing ones (Taulli, 2022). Metaverse has the potential to revolutionize industries such as gaming, entertainment, social media and education and create disruptive business models (Shen *et al*., 2021). In gaming, the metaverse enables players to participate in massively multiplayer games with realistic virtual environments and characters (Koohang *et al*., 2023). In entertainment, the metaverse allows the creation of virtual concert venues and movie theatres (Giang Barrera & Shah, 2023a). In social media, the metaverse enables people to interact with each other in virtual spaces, rather than through text and images on a screen (Sun et al., 2022; Sung et al., 2021).

In addition to these industries, the metaverse also has the potential to impact other industries such as retail, healthcare, education, training and skill development and even real estate (Sitammagari *et al*., 2021). Healthcare providers can use virtual reality to provide remote consultations and treatments (Taulli, 2022). Real estate companies can use virtual reality to provide virtual tours of properties, which can be especially useful when travel is restricted due to the pandemic (Chakraborti *et al*., 2022; Trunfio & Rossi, 2022). Hence, the whole idea is to develop the business models in or by using metaverse that would equip the start-ups to develop robust customer value propositions and consequently empower them to compete with big businesses or corporate giants. Such business models have helped start-ups to differentiate and distinguish themselves on various practical aspects of business management and market factors. (Talin, 2023)

2.4 Interconnectivity (INCV) and Immersiveness (IMMR) in Metaverse

The Metaverse is built upon a range of supporting technologies that enable its functionality and provide a foundation for the virtual world (Speicher *et al*., 2019). Some of these key technologies include Blockchain, AR/VR/XR, 3D modelling and graphics, Internet of Things (IoT), holography, cloud computing, quantum computing, robotics, artificial intelligence (AI), 5G and Edge Computing, mechatronics and so on (Iyer, 2023; Ullah et al., 2023). For instance, Cloud Computing provides scalable and highly accessible computing resources that support the infrastructure of the Metaverse (Yang *et al*., 2022). 5G and Edge computing provide low latency and high bandwidth connectivity for the Metaverse, enabling real-time interactions and experiences (Koohang *et al*., 2023). These technologies work together to create a highly advanced, integrated and dynamic virtual world that enables a wide range of activities and experiences for users (Hollensen *et al*., 2022). Hence, Metaverse is a highly immersive space created through advanced digital technologies, where individuals can experience activities similar to the real world and interact with them. It seamlessly merges the physical and virtual worlds, enabling avatars to engage in activities such as "creation, display, entertainment, socializing, and commerce" (Nalbant & Aydin, 2023). VR, AR and XR devices are enabling and empowering organisations to provide "immersive, interactive and personalised" omnichannel experiences in the Metaverse (P. Chaudhary *et al*., 2021; P. Chaudhary, Kiran, Kate, *et al*., 2022; P. Chaudhary & Pandey, 2021; Rauschnabel *et al*., 2018).

2.5 Interface (INTF) in Metaverse

The interface of the Metaverse comprises four layers, which are the interaction layer, network layer, application layer and supporting technologies. The interaction layer of the Metaverse comprises the technologies/hardware/devices that allow users to experience the true magic of the metaverse and explore it through dynamic human-computer interaction (HCI). This can be VR/AR/XR headsets, holograms, smart glasses, and haptic technologies where users can navigate digital worlds in real-time (Brannon Barhorst *et al*., 2021; Rauschnabel *et al*., 2018; Ruusunen *et al*., 2023).

The network layer in the Metaverse refers to the underlying technology that enables communication and exchange of data between different parts of the virtual world. This layer is responsible for enabling seamless and real-time communication between avatars, digital assets, and other virtual entities within the Metaverse. The network layer uses advanced technologies such as blockchain, peer-to-peer networking, and distributed computing to create a decentralized and secure infrastructure for the virtual world. It plays a critical role in facilitating the interactions, transactions, and experiences that take place within the Metaverse *(Yang et al*., 2022). The application layer is mainly related "to the content production and maintenance of the Metaverse, including spatial mapping, content generation, and authentication mechanisms. Spatial mapping is the complete real-time mapping based on the real world, which is related to digital twin (DT), holography, and AI" (Kozinets *et al*., 2021).

2.6 Interactivity (INTA) in Metaverse

The Metaverse, a virtual parallel to reality, is characterized by its ability to extend both space and time. The concept of time and space in the Metaverse is composed of data and algorithms, with a particularly notable feature being its expansive virtual space. Unlike traditional virtual worlds in games, the Metaverse allows for interaction and integration between the virtual and real world, leading to a growing connection between human bodies and technology and resulting in the evolution of social activity from solely human to a combination of human and machine, known as a cybernetic organism (Mccracken, 2022). Hence, it presents a unique opportunity for start-up brands and marketers to improve, refine and improvise their marketing strategy, brand communication, and customer engagement across the different touch-points in Omni-channel way (P. Chaudhary *et al*., 2021; Giang Barrera & Shah, 2023a; Taulli, 2022).

2.8 Environmental Fidelity (ENVF) in Metaverse

Environmental Fidelity in the Metaverse refers to the degree of realism and accuracy in the representation of the virtual world's environment, including its physical, sensory, and behavioural characteristics. This includes the realism of textures, lighting, shadows, sounds, and other sensory cues within the virtual world, as well as the accuracy and consistency of the environment's physical laws and behaviours (Giang Barrera & Shah, 2023a; Han *et al*., 2020). For the Metaverse to be highly engaging and believable, it's important to have high environmental fidelity. This creates a virtual world that feels real and allows users to experience a sense of being present. With high environmental fidelity, users can interact with virtual objects and surroundings naturally and intuitively, and participate in activities that resemble those in the physical world (Bogicevic *et al*., 2021; Hennig-Thurau *et al*., 2022). Attaining high environmental fidelity requires a combination of cutting-edge technologies such as VR/AR, 3D modelling, and simulation, along with a thorough comprehension of human perception and cognition. The objective is to construct a virtual space that is indistinguishable from reality in terms of its sensory and behavioural attributes (Wedel *et al*., 2020; Zhang *et al*., 2022).

2.9 Sociability (SOC) and Security (SEC) in Metaverse

The focus of online platforms has primarily been on utilitarian value exchange, such as building networks for purchasing or advertising products and services between individuals or companies and their global audience (P. Chaudhary, 2022; P. V. Chaudhary, 2016). As activity shifts towards the Metaverse, there is likely to be a reduced emphasis on utilitarian exchange and an increased focus on enhancing the hedonic aspects that cater to our human experiences, rather than solely serving as consumers. This shift would place a greater emphasis on sociological aspects, rather than solely technological considerations, as the Metaverse is established (Balis, 2022). Security is a critical issue in the Metaverse as it involves sensitive user information, digital assets, and financial transactions. The virtual world is susceptible to various types of cyber-attacks such as hacking, theft, fraud, and identity theft (Chow *et al.*, 2022). Moreover, the decentralized nature of the Metaverse infrastructure can pose challenges in safeguarding user data privacy and security (Jaipong et al., 2023). To overcome these security concerns, implementing robust security measures such as encryption, secure authentication, and access control is crucial. The implementation of blockchain technology, continuous assessment of security systems and maintenance of high-security standards can also provide a high level of security and transparency, as it allows for secure and transparent transactions and asset ownership (Pooyandeh *et al.*, 2022; Sebastian, 2022).

3. Research Methodology:

A review of the literature has shown that ISM is a systems-thinking method. It is a holistic

Table – 1: Variables Identified for ISM Analysis

Sl No	Abbreviation	Variable	Description	Reference
1	DBM	Disruptive Business Model	Type of business model that fundamentally changes the way that products or services are provided, creating new markets and transforming existing ones.	(Taulli, 2022)
2	IMMR	Immersiveness	Refers to the degree of involvement and presence – user experiences within a virtual environment.	(Giang Barrera & Shah, 2023a)
3	INTF	Interface	The connection between the user and the virtual world determines how easily and effectively users can interact with and experience the virtual environment.	(Sun *et al.*, 2022)
4	INTA	Interactivity	Refers to the ability of users to engage with virtual environments, objects, and other users in meaningful ways.	(Koohang *et al.*, 2023)
5	INCV	Interconnectivity	Refers to the connections between virtual environments and objects within the metaverse, as well as the connections between the metaverse and the physical world.	(Dwivedi, Hughes, Wang, *et al.*, 2022)
6	ENVF	Environmental Fidelity	Refers to the realism and accuracy of the virtual environments within the metaverse. It encompasses various aspects such as the visual and auditory detail of the environment, as well as its physical properties and behaviours.	(Giang Barrera & Shah, 2023a)
7	SOC	Sociability	Refers to the social and communicative aspects of the virtual world, including the ability of users to interact with each other and engage in social activities and experiences	(Giang Barrera & Shah, 2023a)
8	SEC	Security	Security is of utmost importance in the metaverse as it helps ensure the safety and privacy of users' personal information, assets, and activities within the virtual world. This includes protecting against hacking, theft, and fraud, as well as ensuring that users have control over their personal information and data.	(Jaipong *et al.*, 2023)

and versatile process that helps to identify the facilitators or inhibitors of a system and also examines interweaving relationships in complex scenarios (Rajan *et al.*, 2021). According to Warfield (1974), the ISM approach relies on reviews of relevant studies, semi-structured interviews, subjective judgments of industry experts and brainstorming sessions to gather information, identify relevant variables, and establish relationships among them. It essentially seeks to identify the key components, their interconnections and the structural relationships that influence the functioning of the system. The method is used to map out the hierarchy of elements in a system, from the most fundamental to the most complex, and to understand the constraints and limitations that affect the system.

3.1 Identification of Variables

The variables for conducting the study were identified by study of extant literature and conducting in-depth interviews with experts. Reviewing relevant literature provided us the background information and a deeper understanding of the system being analysed.

3.2 Structural Self-Interaction Matrix (SSIM)

The Structural Self-Interaction Matrix (SSIM) is a mathematical representation used in the field of interpretative structural modelling (ISM). It is a matrix that displays the relationships between elements of a system and how they interact with each other. The matrix can be used to analyse complex processes and to visualize the strengths and weaknesses of the relationships between the elements. The SSIM can also help identify areas where changes or improvements can be made to optimize the overall functioning of the system (Dubey *et al.*, 2015). For building the SSIM Matrix, four symbols, namely V, A, X and O have been used to express and establish the relationship between a pair of variables (i and j) in a manner so that it fulfils the following condition:

Based on the contextual relationships, the SSIM table has been constructed and illustrated below:

3.3 Reachability Matrix

The reachability matrix in interpretive structural modelling (ISM) is a table that represents the relationships between different elements in a system, indicating which elements can influence or be influenced by other elements. Each element is represented by a column and a row in the matrix, and cells are filled with either a 1 or a 0 to indicate the presence or absence of a direct relationship between two elements. The reachability matrix is used to identify the most influential elements in the system and the interdependencies between them, helping to better understand the structure of the system

Table – 2: Symbols Used for SSIM Analysis

Symbol	Relationship	Reference
V	"Variable i has a significant impact on variable j"	
A	"Variable j has a significant impact on variable i"	
X	"Variable i and j both have a significant impact on each other"	
O	"There is no relationship between variables i and j"	(Singh *et al.*, 2007)

Table – 3: Structural Self-Interaction Matrix (SSIM)

	DBM	SEC	SOC	ENVF	INCV	INTA	INTF	
IMMR	V	X	X	V	O	V	V	
INTF	V	A	V	V	X	X		
INTA	V	A	X	A	X			
INCV	V	A	X	V				
ENVF	V	X	X					
SOC	V	A						
SEC	V							
DBM								

NB: DBM→Disruptive Business Model, IMMR→Immersiveness, INTF→Interface, INTA→Interactivity, INCV→Interconnectivity, ENVF→ Environmental Fidelity, SOC→ Sociability, SEC→ Security and inform decision-making (Singh *et al.*, 2007). Hence, to construct the reachability matrix, the following rule has been followed:

3.4 MICMAC Analysis

MICMAC (Method for Interpreting and Conceptualizing Acronyms, Methods and Concepts) is a technique used in Interpretive Structural Modelling (ISM). MICMAC helps to understand the interdependence, hierarchy and consistency of the relationships among different elements in the system (Mageto *et al.*, 2022). The driving power and dependence in ISM refers to the strength of the relationships between the elements in the system. Driving power is the ability of one element to affect the behaviour of other elements in the system. This concept is used to understand the elements that have the most impact in a system and the direction of influence between

Table 4: Rules for Constructing Reachability Matrix

Condition	Outcome	Reference
"The (*i*, *j*) entry in the SSIM Matrix is V"	"The (i, j) entry in the reachability matrix becomes 1 and the (*j*, *i*) entry becomes 0"	
"The (*i*, *j*) entry in the SSIM is A"	"The (*i*, *j*) entry in the reachability matrix becomes 0 and the (*j*, *i*) entry becomes 1"	
"The (*i*, *j*) entry in the SSIM is X"	"The (*i*, *j*) entry in the reachability matrix becomes 1 and the (*j*, *i*) entry also becomes 1"	
"The (*i*, *j*) entry in the SSIM is O"	"The (*i*, *j*) entry in the reachability matrix becomes 0 and the (*j*, *i*) entry also becomes 0"	(Singh *et al.*, 2007)

Following the above-mentioned rules, the Reachability Matrix has been constructed and illustrated in Table No. 5:

Table – 5: Reachability Matrix

	DBM	IMMR	INTF	INTA	INCV	ENVF	SOC	SEC
IMMR	1	1	1	1	0	1	1	1
INTF	1	0	1	1	1	1	1	0
INTA	1	0	1	1	1	0	1	0
INCV	1	0	1	1	1	1	1	0
ENVF	1	0	0	1	0	1	1	1
SOC	1	1	0	1	1	1	1	0
SEC	1	1	1	1	1	1	1	1
DBM	1	0	0	0	0	0	0	0

NB: DBM→Disruptive Business Model, IMMR→Immersiveness, INTF→Interface, INTA→Interactivity, INCV→Interconnectivity, ENVF→ Environmental Fidelity, SOC→ Sociability, SEC→ Security

Table – 6: Dependency and Driving Power

	DBM	IMMR	INTF	INTA	INCV	ENVF	SOC	SEC	Driving Power		
IMMR	1	1	1	1	0	1	1	1	7		
INTF	1	0	1	1	1	1	1	0	6		
INTA	1	0	1	1	1	0	1	0	5		
INCV	1	0	1	1	1	1	1	0	6		
ENVF	1	0	0	1	0	1	1	1	5		
SOC	1	1	0	1	1	1	1	0	6		
SEC										1	1
DBM										1	0
Dependency										8	3

NB: DBM→Disruptive Business Model, IMMR→Immersiveness, INTF→Interface, INTA→Interactivity, INCV→Interconnectivity, ENVF→ Environmental Fidelity, SOC→ Sociability, SEC→ Security elements. Dependence, on the other hand, is the degree to which an element depends on other elements in the system. This concept helps to understand the level of vulnerability of the elements in the system and how changes in one element may affect others (Azevedo *et al*., 2013; Sagheer *et al*., 2009).

In MICMAC Analysis, driving power and dependence are used together to understand the structure of the system and the relationships between its elements. Based on driving power and dependence, the various factors have also been classified as autonomous, dependent, linkage and drivers (Azevedo *et al*., 2013; Mageto *et al*., 2022).

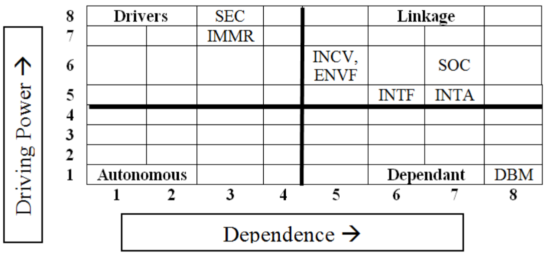

Figure – 1: MICMAC Analysis Matrix

The MICMAC Analysis showed that there are no autonomous factors. Disruptive Business Model (DBM) is the only dependent factor. Five factors act as linkages. They are interconnectivity (INCV), environmental fidelity (ENVF), interface (INTF), interactivity (INTA) and sociability (SOC). These are factors that have high dependence as well as high driving power. Immersiveness (IMMR) and security (SEC) are the drivers. They have low dependence and high driving power.

3.5 Level Partitions

In ISM, levels can be created by using an antecedent set. The creation of levels helps to focus on the most critical elements or variables and prioritize the efforts to achieve the desired goal or outcome more effectively (Sagheer et al., 2009). Using an antecedent set to create levels in Interpretive Structural Modeling (ISM) involves identifying the minimum set of elements or variables required to achieve a certain goal or outcome and organizing these elements into different levels based on their importance and interdependencies. The process starts by identifying the goal or outcome the researchers want to achieve. The next step is to identify the minimum set of elements or variables that are required to achieve the goal or outcome. This is the antecedent set (Singh *et al*., 2007) and based on it, the elements or variables are organized into different levels as per their importance and interdependencies. Elements that are critical to achieving the goal are placed in higher levels, while less important elements are placed in lower levels. In the final stage, the different levels are analysed to understand the interdependencies between elements or variables and to identify critical elements that need to be addressed first (Digalwar & Giridhar, 2015).

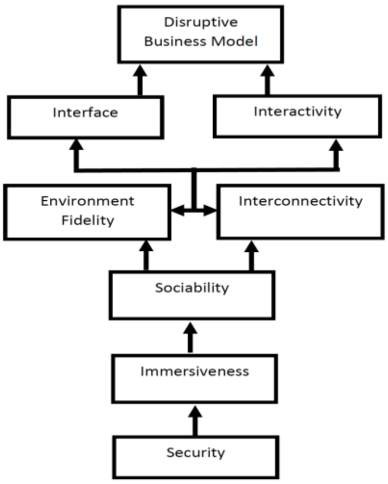

Figure – 2: ISM Model

Table – 7: Partitioned Reachability Matrix

Parameter	Reachability Set	Antecedent Set	Intersection Set	Level
DBM	DBM	DBM, IMMR, INTF, INTA, INCV, ENVF, SOC, SEC	DBM	1
INTF	INTF, INTA	IMMR, INTF, INTA, INCV, ENVF, SOC, SEC	INTF	2
INTA	INTF, INTA	IMMR, INTF, INTA, INCV, ENVF, SOC, SEC	INTA	2
INCV	INCV, ENVF	IMMR, INCV, ENVF, SOC, SEC	INCV	3
ENVF	INCV, ENVF	IMMR, INCV, ENVF, SOC, SEC	ENVF	3
SOC	SOC	IMMR, SOC, SEC	SOC	4
IMMR	IMMR	IMMR, SEC	IMMR	5
SEC	SEC	SEC	SEC	6

4. Findings and Discussion:

It was observed that several key factors contribute to digital disruption by start-ups in the metaverse, including interface, interactivity, environmental fidelity, interconnectivity, sociability, immersiveness and security. There exist strong interrelationships between these factors, and addressing one factor may have a snowball impact on several others.

The interface in the metaverse is crucial as it serves as the gateway for users to interact and navigate within the virtual world. A user-friendly and intuitive interface can greatly enhance the user experience and make the metaverse more accessible to a wider audience. It also plays a crucial role in shaping the overall look and feel of the virtual world and in providing a sense of immersion and presence for users (Dhargalkar, 2020). Additionally, an engaging interface can provide valuable data and insights that can be used to further improve and evolve the metaverse (Gonzalez-Moreno et al., 2023).

Interactivity is a key factor in the metaverse, as it allows users to actively participate and engage with the virtual environment and other users. The level of interactivity determines how users can experience and interact with the virtual world and its contents and has a direct impact on the level of immersion and sense of presence within the metaverse. High levels of interactivity can lead to more engaging and dynamic experiences, while also enabling the creation of new forms of entertainment, education, and commerce. Additionally, interactivity can foster social connections and a sense of community within the metaverse, further enhancing its value as a platform.

Environmental fidelity is a key factor in the metaverse as it directly impacts the user experience, creativity, and the potential for various use cases. High environmental fidelity creates a sense of immersion and presence in the virtual world, making the experience more believable and engaging. Accurately representing real-world environments makes it easier for users to understand and navigate within the metaverse. A high level of environmental fidelity enables the creation of virtual environments that are more imaginative and believable, leading to a wider range of creative possibilities. Environmental fidelity is also important for certain use cases, such as simulation and training, where a realistic representation of physical environments is crucial.

Interconnectivity is essential in the metaverse as it enhances accessibility, collaboration, scalability, and integration, enabling a more dynamic and interconnected virtual world. Interconnectivity enables users to easily move between different virtual environments and platforms within the metaverse, expanding the range of experiences and opportunities available. Interconnectivity enables users to work together across different virtual environments, fostering collaboration and creativity. Interconnectivity allows the metaverse to scale and grow as more virtual environments and platforms are added, creating a larger and more diverse virtual world. Interconnectivity enables the integration of different virtual environments and real-world systems, creating a seamless experience between the physical and virtual worlds.

Sociability is a crucial aspect of the metaverse, as it enables the formation of virtual communities, increases user engagement, enables collaboration, and has significant commercial potential. Sociability enables the formation of virtual communities and social networks, fostering a sense of belonging and social connection within the metaverse. Sociability can increase user engagement and the level of participation within the metaverse, leading to a more dynamic and active virtual world. Sociability enables users to work together, collaborate, and share experiences, fostering a sense of community and creating new opportunities for creativity and innovation. Sociability also has significant commercial potential (P. Chaudhary, Kiran, & Shimpi, 2022), as it can drive user engagement and enable new forms of social commerce within the metaverse.

Immersiveness is a crucial factor in the metaverse as it directly impacts the user experience, presence, engagement, and creativity, enabling a more dynamic and believable virtual world. A high level of immersiveness can greatly enhance the user experience, making the virtual environment more engaging and believable. Immersiveness creates a sense of presence, allowing users to feel as if they are physically present within the virtual world. Immersiveness can increase user engagement and the level of participation within the metaverse, leading to a more dynamic and active virtual world. Immersiveness can also foster creative expression and imagination, enabling the creation of new and innovative experiences within the metaverse. (Yadav & Pavlou, 2020; Yim et al., 2008).

Security is a critical concern in the metaverse, as the virtual environment is used to store and transmit sensitive information, such as personal data and financial transactions. Ensuring the security of user data and transactions is crucial to protect against unauthorized access, theft, and other types of malicious activity. Maintaining the security of the metaverse is essential for building user trust and ensuring the long-term success of the platform. The metaverse may also be subject to regulations and laws that require compliance with certain security standards, such as data protection and privacy laws. A breach of security can have a damaging impact on the reputation of the metaverse and its stakeholders (including the start-ups), making it difficult to attract and retain users. Security is an essential aspect of the metaverse as it helps to protect user data, maintain user trust, ensure compliance with regulations, and protect the reputation of the platform.

In conclusion, this research demonstrates the usefulness of ISM in identifying the important factors that play a key role in the subject area of creating disruptive business models by start-ups in Metaverse. By using ISM, the authors of this study tried to gain a deeper understanding of the interrelationships between various factors that contribute to the creation of disruptive business models by start-ups in Metaverse (Weking et al., 2023). All these factors, when integrated and incorporated in the right manner can help the start-ups to create a disruptive business model in the Metaverse that will help them to edge out the competition and forge ahead with sustainable competitive advantage. (Sherman & Craig, 2019).

5. Managerial Implications:

Based on the findings, it is suggested that the disruptive business model must have immersiveness, sociability and environmental fidelity to create a sustainable and impactful business proposition. Hence, to create a disruptive business model in Metaverse, start-up companies need to focus on creating immersive applications with the help of these technologies (Hollensen *et al.*, 2022). Interactive, immersive, creative and engaging digital spaces are essentially part of the evolution of technological advancements and adoption by people. This is reflected by the increasing preference of customers for virtual experiences. Metaverse certainly brings many opportunities for start-ups and start-up ecosystems but the advantage is likely to sustain only for those which could utilise these technologies to strengthen their business model and build robust products. Besides that, the start-ups need to take into account crucial factors like environment fidelity, interface, interaction and social value in the metaverse. Security is a key concern that must be addressed while creating a disruptive business model by start-ups in the metaverse. The introduction of Metaverse in the business process was found to be increasing customer engagement and excitement. Hence, technologies like Metaverse foster innovation and rekindle the imagination. In the nutshell, Metaverse essentially blends the virtues of physical and virtual worlds and thereby enable the start-ups to curate, create and communicate the value proposition, seamlessly. (Buhalis, Leung, et al., 2023).

Hence, creating a disruptive business model in the metaverse by start-ups can have several critical implications, both positive and negative (Park & Kim, 2022). A disruptive business model in the metaverse has the potential to completely change the existing market dynamics and disrupt established players in the industry. A disruptive business model can also create new markets and opportunities for growth for start-ups within the metaverse (Bousba & Arya, 2022). A successful disruptive business model in the metaverse can provide a significant competitive advantage, enabling start-ups to gain a significant market share and attract a large user base. Hence, it is the need of the hour to focus on developing physical, digital and social infrastructure to strengthen the start-up ecosystem. However, disruptive business models can also face significant resistance from established players and traditional market structures, who may see the disruption by start-ups as a threat to their business. Disruptive business models in the metaverse may also face challenges from regulators and policymakers, who may be concerned about the impact of the business on the existing market and society as a whole (Anshari et al., 2023). In summary, creating a disruptive business model by start-ups in the metaverse can have significant implications for the market, competition, and regulation, and must be approached with caution and a thorough understanding of the potential risks and challenges (Giang Barrera & Shah, 2023b).

6. Limitation and Future Direction:

This research work encountered several limitations related to data availability, complexity, market uncertainty, user behaviour, ethical considerations, and regulation. As the metaverse is a relatively new and emerging technology, there is limited data available on the topic, making it difficult to conduct comprehensive research. The metaverse is a complex and multifaceted environment that encompasses many different elements, including technology, business, and social aspects. This complexity makes it difficult to fully understand and research the topic. The metaverse is still in its early stages of development and the market is highly uncertain, making it difficult to accurately predict future trends and developments. User behaviour within the metaverse can be difficult to predict, as it is influenced by many factors, including technology, psychology, and culture. Research in the metaverse may raise ethical considerations, such as data privacy and the protection of user data. The regulation of the metaverse is still evolving and may impact the ability of a start-up to create disruptive business models. Hence, further research is needed to validate our findings and to explore the implementation and impact of these solutions. Future research in this area could focus on market analysis, user behaviour, technology trends, collaboration and partnerships, regulation, and ethical considerations about Metaverse. The scholars must also address ethical considerations related to user data privacy, intellectual property, and other important issues in their future research work.

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