



International Journal of Networking and Virtual Organisations

ISSN online: 1741-5225 - ISSN print: 1470-9503

<https://www.inderscience.com/ijnvo>

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DOI: [10.1504/IJNVO.2025.10073092](https://doi.org/10.1504/IJNVO.2025.10073092)

Article History:

Received:	04 July 2024
Last revised:	08 March 2025
Accepted:	13 June 2025
Published online:	05 November 2025

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Abstract: In the Metaverse technology, also known as MVTECH, individuals connect with one another via the use of avatars. This technology creates an immersive virtual environment. With the MVTECH, a lot of opportunities were promised to be made available to a variety of industries, including higher education. A research model was developed by combining the essential elements of the 'unified theory of acceptance and use of technology' (UTAUT) with the variables of 'perceived curiosity' (PC) and 'extraversion' (EXT). 'Effort expectancy' (EE), 'performance expectancy' (PE), 'social influence' (SI), and 'facilitating conditions' (FC) are a few of these components. The information came from an online poll that was sent to 422 kids in Jordan schools. The 'structural equation modelling' (SEM) study showed that students' feelings about the Metaverse were greatly affected by their involvement in PE, FC, and EXT. The PC construct had a big effect on the EE construct.

Keywords: metaverse; social sustainability; UTAUT; extraversion; curiosity; developing nations; environmental awareness; developing countries.

Reference to this paper should be made as follows: Kakade, K., Varma, C., Sonavane, U.S., Chitranshi, J., Brahmane, J.S. and Shinde, S.C. (2025) 'Social media for climate action in developing countries', *Int. J. Networking and Virtual Organisations*, Vol. 33, No. 1, pp.1–13.

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Urmila Sandesh Sonavane is an accomplished academician with a PhD in Management Studies and has qualified both UGC-NET in Management Studies and SET in Commerce. With over 15 years of teaching experience, she has demonstrated excellence in higher education through effective teaching, curriculum development, and student mentorship. Her core teaching areas include HR & General Management and she is known for integrating theoretical knowledge with real-world applications in the classroom. She has contributed to Academic Research through publications in Scopus, Reputed national and international journals. She actively participates in Faculty Development Programs, Seminars, and Academic Conferences, and is passionate about fostering an engaging and research-oriented academic environment.

Jaya Chitranshi is currently associated with Symbiosis Institute of Management Studies, Symbiosis International (Deemed University), Pune. A PhD in Organizational Psychology; she has a Masters' degree in Business Administration and in Organizational Psychology. She was a UGC Fellow and the recipient of the Kali Prasad Memorial Award for her PhD work. She has a rich teaching experience of 25 years. She was associated with the University of Lucknow and with Jaipuria Institute of Management, Lucknow in the past. She is an avid researcher. She is the recipient of the Emerald Literati Award (Outstanding Reviewer) and AIMS International Outstanding Woman Management Teacher Award.

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1 Introduction

Climate change is a very big problem, especially for countries that are still growing. Global meetings like the Conference of the Parties (COP26) (Wamsler et al., 2020) in 2021 talked about ways to fight climate change, such as setting carbon goals and using green energy sources. However, changing people's minds and actions is what really needs to be done. Using Egypt as an example, the goal of this project is to look into how digital solutions can help poor countries become more sustainable and create a circular economy. Due to its heavy reliance on agriculture, the African continent will be disproportionately affected by climate change. An excellent illustration of this is the Nile Delta in Egypt, which has been identified as very vulnerable by the Intergovernmental Panel on Climate Change (IPCC) (https://www.globalsupportprogramme.org/sites/default/files/resources/naps_in_focus_lessons_from_egypt.pdf). The UN Secretary-General's Special Advisor Selwin Hart brought attention to how Africa is disproportionately affected by global warming (Jalali et al., 2023). This was particularly

true when it came to the detrimental effects of global warming on agriculture. According to Schilling et al.'s (Schilling et al., 2020; Doyle, 2009) predictions, Egypt, Morocco, Tunisia, and Algeria may see big temperature increases that will cause drought and make it hard to get water. In the same way, Driouech et al. (Driouech et al., 2020; McNaught et al., 2014) said that changes in the climate in North Africa and the Middle East would be very bad. The primary factors contributing to the destruction of Morocco's cedar forest are higher temperatures and less precipitation, according to research by Hamelin and Nwankwo (Hamelin and Nwankwo, 2013; Liu et al., 2020). Egypt is experiencing the full effects of climate change at the national level, much like many other countries. Egypt is dealing with a variety of domestic issues, such as degraded soil that makes it harder for the nation to practice agriculture, increasing sea levels that endanger the vital Nile Delta, and changed rainfall patterns that lead to more extreme weather events (Mostafa et al., 2021; Giusto et al., 2018; Barr et al., 2011). Abuzaid and Abdelatif (2022), who used satellite images to study the 8607.13 km² north Nile Delta area of Egypt, recently validated this.

Their study findings were published in the Arab Journal of Science. According to the results of their analysis, 72% of the region may be categorised as very sensitive to desertification, 70% as highly crucial, and 2% as moderately essential. Egypt's expanding population, which is predicted to reach 109.3 million in 2022, is another significant issue that is exacerbating the country's continuous water scarcity, which is projected to be over 20 billion cubic metres Dawoud et al. (2023). A firm basis of knowledge and understanding has been formed as a result of extensive research undertaken on climate change in industrialised countries. This foundation has made it possible to build communication methods that are broader and more thorough, and that address a larger variety of audiences and concerns. Developing countries often have limitations in terms of infrastructure, resources, and conflicting goals as compared to affluent ones. As a result, there is a downturn in research, a lack of comprehension of climate change (Giusto et al., 2018), and eventually there is a loss of communication on climate change and its problems. Considering these situations makes it evident that more specialist communication methods are needed. More specifically, in order to meet the particular issues involved with tackling climate change, strategies that customise messages, approaches, and platforms are needed.

Non-governmental organisations (NGOs) usually take the lead in bringing attention to the issue of climate change in developing countries, especially in the absence of significant actions taken by the government (Doyle, 2009; Driouech et al., 2020; McNaught et al., 2014). The efforts of these organisations to educate people and raise awareness about climate change are very important and play a significant part in the fight against it. There is a significant amount of social media use among young people in these locations, which presents a potential opportunity for digital solutions to increase their exposure and impact. As a result of limited resources, developing nations often encounter difficulties when it comes to promoting sustainable practices and increasing awareness about environmental issues. Utilising digital technologies offers a potentially beneficial solution since they may reach a huge number of people at a cost that is usually less than that of traditional methods. This enables non-governmental entities to operate on a tight budget and optimise their impact. This study seeks to determine the most effective emotional framing for social media messages and the lowest cost reach in order to improve public involvement and pro-environmental behaviour (PEB) about climate change in Egypt.

2 Related work

One of the most important roles that communication plays in sustainable development is it. It acts as a kind of development while also making the process of development easier to do (Tran et al., 2020).

The development paradigm is always changing, which causes development communication to change and take on new roles. Sustainable development, which emphasises discourse more than other development paradigms, requires community participation in communication.

At all three levels—personal, institutional, and organisational – the development of human ability and partnerships are inextricably linked to the process of development communication (Kader Jilani et al., 2020).

Increasing the amount of information that is shared and the amount of cooperation that takes place in order to enhance institutions, organisations, and individuals depending on their priorities and qualities is indicated by this. In social and economic growth, communication should be seen as a process of conversation and involvement that is essential to fostering knowledge sharing and understanding, rather than just a way to get or distribute information.

One example of participatory communication is the act of sharing one's knowledge (Ebrahimi et al., 2021; Giotis and Papadionysiou, 2022). Regarding the field of development communication, it functions as both a strategic and methodological notion. The exchange of information is a kind of egalitarianism that fosters conversation and interaction among the participants. Sharing information has emerged as a crucial component that will contribute to the accumulation of knowledge within a community in order to facilitate progress. Additionally, it creates opportunity for interaction and discussion among the many individuals involved in growth.

Literacy in digital media is a fundamental component that is necessary for the progression of the digital age (Giotis and Papadionysiou, 2022). The expansion of information and communication technology in this digital age has brought about changes in several aspects of life, such as the manner in which individuals communicate with one another. The use of social networks and social media is quite widespread and has the potential to transform everyday life, particularly for younger people. Even young individuals utilise social media on a regular basis using their devices. When it comes to accomplishing these development objectives, information and communication technologies (ICTs) are a suitable catalyst that may assist poor nations skip through the phases of development that are emphasised.

The fact that social media provides a variety of benefits makes it an intriguing platform (Fosu et al., 2021).

To begin, it has been shown to be successful for tasks that involve the exchange of information. Second, the usage of social media may help users break the cycle of isolation in the learning process, as well as reach a larger audience and allow them to reply more quickly. Thirdly, it also provides its users with chances for participation in conversations and interactions.

ICT, which includes social media, is a technology that may be used for activities related to social change and other forms of development communication. This technology is significant because it can accelerate development and increase accessibility to opportunities (Shwartz-Asher et al., 2020). The effectiveness of using social media for information transmission depends on a number of important aspects, including the

environment, human skills, regulations, and infrastructural readiness. The realisation of this readiness will come with the closing of the digital divide.

Information sharing on social media has been the subject of several studies, most of which concentrate on business communication (marketing and customer satisfaction). The following studies are among them (Fayyaz et al., 2021). Research has been done on the literature about the use of social media to spread knowledge. EBSCO, Web of Science, and Scopus were the information sources used in the literature database.

In the framework of social change and development communication, we will examine the information-sharing practices on social media platforms. This research has excellent planning. This research aims to expand and enhance existing knowledge in many contexts (Gane and Beer, 2008). In this research, the terms ‘Use of social media for development communication and social change’ and ‘Use of social media for knowledge sharing’ have the same meanings (Lee and Tao, 2022).

With the addition of reviews not found in any of the previous studies, this update aims to improve the study.

In addition, this study’s goal is to find research gaps and possible places for further analysis into topics similar to book research (Lister et al., 2008). The first part of this paper discuss about the background of the study. Finally, it talks about what the literature review cannot do, what it did, the conversation, the results of the study, what those results mean, and what they were not able to do. It was talked about how the research changed from one year to the next, the social media sites that were looked at, the many study sites, the people who were studied, the theories, the factors, and the research methods.

3 Research methodology

3.1 Study sample and data collection

Within the parameters of this study, the suggested theoretical framework was investigated using quantitative research. An online questionnaire including 23 items was sent to a convenience sample of Jordanian university students. Throughout the data collection process, respondents are allowed to end the interview at any time. University students in Jordan who demonstrated their understanding of how cutting-edge information technology and information systems may be used for instruction were deemed qualified to be included in the sample. These responders are more qualified to answer the questions, which improves the researcher’s ability to fulfil the goal of the present investigation. Since Jordanian colleges and universities are still learning how to use this cutting-edge technology (or may not use it at all), the people who took part could be future users of MVTECH. There was a 1-min movie on the first page of the online poll that showed how this technology is used in schools. This was done to make sure that the people who took part in the study knew that it was about MVTECH, a type of virtual learning environment that is used in Jordanian universities. There was also a short summary of the Metaverse based on research that had already been done. The people who filled out the online poll went on to the next parts after making sure they knew what the Metaverse was and how it could be used to help people learn.

Demographic profiles of study respondents

According to the data in Table 1, the gender breakdown was as follows: The population, which ranged in age from 18 to over 50, was made up of 49.9% women and 50.1% men. In terms of their educational background, 87.2% of the survey participants were enrolled in undergraduate programs, 8.5% in master's programs, and 4.3% in doctoral programs. The bulk of participants, or 51% of the total, were from computer technology and business administration institutions. Table 1 not only demonstrates the high level of education of the majority of survey participants, but it also demonstrates that they possess the necessary expertise, experience, and understanding to manage MVTECH and other virtual technologies.

Table 1 Participants' demographic profile

<i>Demographics</i>	<i>No.</i>	<i>Percentage (%)</i>
Gender		
• Male	215	50.1%
• Female	207	49.9%
Age		
• 18–29	346	82%
• 30–39	37	8.8%
• 40–49	30	7.1%
• +50	9	2.1%

3.2 Measurement

The scores used in this study came from existing research on UTAUT and on perceived curiosity (PC), extraversion (EXT). Keeping the dependability and truth of the tools used was the point of this. The UTAUT's job is to judge the four original constructions below: EE (three items), SI (three items), PE (three items), and FC (four items). Changes were made to these parts, and relevant study papers were read. Three factors were used to measure social longevity, and the scale was changed based on the results of the study. Four more measures that were made from the work of and were used to judge how well the computer worked. Lastly, three parts of the tests were changed to get a more accurate reading of EXT. A numeric measure was made to rate the responders' age, gender, and level of schooling, among other things. The online survey was first made in English, but since Arabic is the official language of Jordan, it was turned into Arabic by a professional who speaks both Arabic and English. A pilot study is an initial, smaller-scale investigation that helps plan and tweak the main study. It is the first step in any research process. Pilot studies are usually the first step in any method. This research aimed to demonstrate the content validity and reliability of the online survey in addition to examining and modifying its questions. An assessment was also conducted during the pre-test to ascertain the suitability, clarity, and comprehension of the research instrument. A handful of the instrument's pieces have had minor wording changes applied to them to improve comprehension. These modifications were made in response to recommendations from the participants in the pilot study.

4 Results

There were 289 real responses, and 168 were from women (58.13%) and 121 were from men (41.87%) (see Table 2 for more details). Most of them were between the ages of 18 and 25 (80.28%), with 9.34% being between the ages of 26 and 30. 41.87% of them had a master's degree, while the majority (51.21%) had a bachelor's degree. They were both well educated. As a result, our members are highly educated, with over 90% having at least a bachelor's degree. Their employment consisted mostly of full-time training course enrolment (61.59%). 19.38% of workers were in the business sector. Over half of the participants earned more than RMB 5000 each month, with the majority of them (17.13%) earning between RMB 7001 and 10,000.

Table 2 Descriptive statistics ($n = 289$)

<i>Frequency</i>	<i>Percentage</i>		
Gender	Female	168	58.13%
	Male	121	41.87%
Age	18–25	232	80.28%
	26–30	27	9.34%
	31–40	12	4.15%
	41–50	13	4.50%
	51–60	5	1.73%

4.1 Data analysis

Not everyone in our study had lived a green, sustainable life for more than a year. Some had never done it before. Another third lived in a green way of life for one to four years. Only 33 people, or 11.42%, have been living environmentally friendly for more than 10 years. The volunteers were also asked to share the number of times they live in a way that is safe and good for the world. The average number they got was 43.86%, which means that 30.45% of them said they lived a green lifestyle between 21% and 40% of the time.

Table 3 shows their social media use patterns. LINE, WhatsApp, WeChat, and other instant applications were the most popular, followed by YouTube and Bili Bili, which are sites that share videos.

Table 3 Social media use (289)

<i>Social Media Types</i>	<i>Mean frequency rating</i>	<i>SD</i>
Social media platforms (such as Facebook, Twitter, Weibo, and Redbook)	4.85	1.789
Instant Messengers (e.g., LINE/WhatsApp/WeChat)	6.17	1.092
Video-sharing platforms (e.g., YouTube/Bili Bili)	5.25	1.565
Podcasts (e.g., Broadcast, FM)	2.59	1.511
Blogs (e.g., Tumblr/Zhihu/Douban)	3.34	1.709

4.2 Validity of survey instrument

The findings of the factor analysis are shown in Table 4. Due to the fact that the variables connected with our models have a score that is more than 0.7, the Kaiser-Meyer-Olkin test score of 0.925 suggests that these variables are reliable. In the event that the p-value of the Bartlett test is less than 0.001, component analysis may be used to any variable that is included within those dimensions. Prior to doing further analysis, every variable in the regression study underwent a series of tests, including the test of variance inflation factors (VIFs, with values below 5), as well as Harman's one-factor test, which yielded a result of 41.62%, which is less than 50%.

Table 4 Factor loading

<i>SMC</i>	<i>VC</i>	<i>SMI</i>	<i>SNSM</i>	<i>SND</i>	<i>SGL</i>	<i>Cronbach's Alpha</i>	<i>Composite reliability</i>
SMC1	0.78						
SMC2	0.78						
SMC3	0.88						0.83
SMC4	0.88						0.83
SMC5	0.73						
SMC6	0.80						
VC1		0.87					0.89
VC2		0.91					0.90
VC3		0.85					
VC4		0.67					

Convergent validity has been achieved since all of the factor loadings' t-values are significant ($p < 0.01$) and their Cronbach's α values are more than 0.70. Every instrument item had loadings over 0.7 on the associated variables after VC5, VC6, and SGL1 were removed. These products also perform badly when it comes to other variables. It follows from this that discriminant validity has also been attained. Based on the square root of the average variance that was taken out of each hidden construct, Table 5 shows that there is less of a relationship between the significant construct and the other constructs in the model. This is true since there is a bigger difference between the two.

Table 5 Correlation matrix

<i>SMC</i>	<i>VC</i>	<i>SMI</i>	<i>SNSM</i>	<i>SND</i>	<i>SGL</i>	
SMC	0.81					
VC	0.40	0.83				
SMI	0.52	0.50	0.78			
SNSM	0.42	0.52	0.49	0.82		
SND	0.55	0.40	0.50	0.75	0.79	
SGL	0.45	0.45	0.57	0.54	0.59	0.78

4.3 Regression analyses

The information that was gathered was subjected to a multiple regression analysis procedure. Before the interaction terms in the moderated regression models were created, the continuous independent variables in these models were average-centred. Through participation in this activity, participants were able to get a deeper comprehension of regression coefficients. The number of years (collectively referred to as ‘green years’) and the percentage of years (collectively referred to as ‘green percentage’) that our participants self-reported as having lived a sustainable green lifestyle were included as control variables in these regression analyses.

In order to determine whether or not VC served as a mediator in the interaction between SMC and SGL, as indicated by Hypotheses 1 through H2c, this research first used the four-step strategy that was suggested. Table 6 presents the findings of our inquiry, which was created in order to assess Hypothesis 1.

$$SGL = \beta_0 + \beta_1 SMC + \beta_2 \text{green percentage} + \beta_3 \text{green years} \quad (1)$$

Table 6 The mediating role of value co-creation

Equation (1) (H1)	Equation (2) (H2a)	Equation (3) (H2b)	Equation (4) (H2c)	
Dependent variable	SGL	VC	SGL	SGL
<i>Independent variables</i>				
SMC	0.234***	0.415***	–	0.121**
VC	–	–	0.337***	0.273***
<i>Control variables</i>				
Green percentage	0.008**	0.003	0.008**	0.007*
Green years	0.068	0.040	0.059	0.060
Constant	3.636***	2.704***	3.014***	2.898***
R^2 adjusted	0.202	0.264	0.257	0.273
F-value	25.31***	35.35***	28.23***	28.01***

Equation (2) was used to test H2a. The study’s positive and significant coefficient of SMC ($\beta = 0.415$, $p < 0.001$) supports the validity of hypothesis H2a. This is because the SMC coefficient indicates that VC rises as SMC increases.

$$VC = \beta_0 + \beta_1 SMC + \beta_2 \text{green percentage} + \beta_3 \text{green years} \quad (2)$$

We came up with equation (3) to look at the effect that VC has on SGL (also called H2b). It was concluded that Hypothesis 2b (H2b) is also supported in light of the facts. The positive coefficient of variance (VC) ($\beta = 0.337$, $p < 0.001$) explains this. This suggests that a greater VC corresponds with a higher SGL performance.

$$SGL = \beta_0 + \beta_1 VC + \beta_2 \text{green percentage} + \beta_3 \text{green years} \quad (3)$$

Equation (4) was created to investigate VC’s possible mediating role. Strong correlations were found between the coefficients of SMC ($\beta_1 = 0.121$, $p < 0.01$) and VC ($\beta_2 = 0.273$, $p < 0.001$), indicating that VC had a role in mediating the association between SMC and

SGL. Based on the Sobel test result of $t = 5.762$, the indirect effect was 0.113, meaning that it fell within the range of 0.234 to 0.121.

$$SGL = \beta_0 + \beta_1 SMC + \beta_2 VC + \beta_3 \text{green percentage} + \beta_4 \text{green years} \quad (4)$$

Multiple regression was used to investigate whether or not SMI had a moderating effect in the relationship between SMI and VC (also known as H3a). Results of the regression are shown in Equation (2) is the equation that represents the baseline model with just the major impacts. Both the SMC and the SMI are included in equation (5), and Equation (6) also contains the interaction between the SMC and the SMI.

$$VC = \beta_0 + \beta_1 SMC + \beta_2 SMI + \beta_3 \text{green percentage} + \beta_4 \text{green years} \quad (5)$$

$$VC = \beta_0 + \beta_1 SMC + \beta_2 SMI + \beta_3 SMC \times SMI + \beta_4 \text{green percentage} + \beta_5 \text{green years} \quad (6)$$

5 Conclusions

Research on ecologically responsible methods has drawn more and more attention from researchers worldwide. The influence of social media is greater than it has ever been because of its explosive expansion. Though it has been restricted in the past, this is still the case. We decided to carry out this investigation to examine the effect that social norms and social media influencers have on the regulation of value co-creation while embracing a green lifestyle. This choice was taken in response to prior studies showing the impact of social norms and social media influencers on user behaviour. The use of quantitative approaches was conducted with the intention of finding empirical data that supports our paradigm.

In spite of the fact that this study follows a thorough research approach, it is important to point out that there are some limitations to the research. As a first step, the collection of samples for this investigation was limited to a single time point. According to our recommendations, other researchers should carry out time-series observations of the homogenous sample in a thorough manner in order to analyse the transition from early use to long-lasting effect. Considering that the COVID-19 epidemic has altered the ways in which we work, learn, and get information, this is an essential point. As a result, this worry should be addressed in the transmission of knowledge about ecologically friendly practices in the future study.

On the other hand, there is no impact of synergy between the two parties. In light of this, it is recommended that future study go beyond the obvious major impact of SMC and investigate additional contextual circumstances that have the potential to modify the connection between SMC and SGL performance.

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