

Expanding the digital reach of Indian Science Museums in Social Media Space through crowd sourcing: *Role of Popular Vloggers*

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ABSTRACT

Young museum visitors belong to a generation eager to experience cultural artifacts and museum exhibits through a new lens, one where the experience is enhanced, filtered and shared through personal online social networks. Here, we have scrutinised the case of the social-media impact of the National Council of Science Museums (NCSM), India, and the single largest governmental science museum network in the world. We found that the social media footprint of the Council is very moderate. In our study, we also found that despite our nationwide network and following certain standard rituals of social media broadcasts, our engagement is moderate to poor. We examined the possibility of taking the influencers and vloggers on board to enhance our digital engagement and found it to be a propitious prospect to explore. Through an evidence-based study, the possibility of crowd sourcing is explored so that the digital outreach strategy of the Science Museums in India may be better oriented. A comparison is made between the digital reach of 'museum content' shared directly through the museum's own channels vs the digital reach of similar content presented through most popular crowd sourcing methods like vlogs. We also made an attempt to analyse the likelihood of augmenting the museum content for the audience of digital space over any other content of different cultural connotations.

Keywords: Museum, Digital Reach, Vloggers, Social Media Influencer, Crowdsourcing

Introduction

In the late 1950s, India's science centre movement took root, championed by the National Council of Science Museums (NCSM). This visitor-centric institution aligns seamlessly with India's constitutional aim of nurturing scientific curiosity and creating an informed citizenry. The NCSM, the world's largest network of government-controlled science museums and centres, embarked on a mission of widespread expansion, establishing its presence across all corners of the country. Their objective was clear — to ignite curiosity and make a significant societal impact through interactive science and technology presentations.

Studies like Stevenson *et al.* (1994) affirmed NCSM's approach, highlighting the crucial role of interaction and engagement in long-term cognitive learning. As a champion of lifelong learning, NCSM offers a diverse range of courses and learning opportunities, accommodating learners of all backgrounds and skill levels. They provided flexible scheduling options and personalised learning paths, allowing individuals to tailor their educational journey to personal interests and learning curves.

Ensuring accessibility to learning resources was a pivotal concern. NCSM worked diligently to make resources easily available, user-friendly, and adaptable to various learning preferences, including online, in-person, and hybrid formats.

In the late 1990s and early 2000s, NCSM ventured into the digital realm, aligning its mission with the evolving landscape of technology and education. It recognised the potential of a robust digital presence to extend educational outreach, enrich visitor experiences, and build enduring relationships. Today, NCSM and its 25 units actively engage audiences on platforms like YouTube, Facebook, Twitter, and Instagram. Data [Table I] show that while larger units maintain a steady level of engagement, regional and sub-regional centres are steadily finding their digital footing. True engagement, however, remains at the heart of its mission.

It is apparent that NCSM is not popular in the digital medium, even though some of the centres have shown increasing popularity trends over the past few years. In order to address the challenge of escalating social media popularity, various methods like paid promotion and content creation through professionals

were attempted. Yet, all these methods get saturated with time. Even sustained nudges and pushes do not yield the desired results for a long time. The need is to create a self-sustained architecture for the growth of museums in digital space, and hence the idea of crowd sourcing was introduced by Jeff Howe in an article titled “The Rise of Crowd sourcing” published in *Wired magazine* in 2006. The iStock narrative in the article showed that crowd sourcing has promising potential, especially in the global museum sector, for its ability to spread information rapidly and inexpensively. Still, to ensure museum-class authenticity, rigorous ethical and regulatory controls are needed to avoid the spreading of misinformation.

With the speedy growth of the internet as a medium for communication, internet users now broadcast and receive information, which enables them to experience more autonomy and control than traditional media (Coffey and Woolworth, 2004; Joel *et al.* 2005). Blogs are comparatively new and deliver a scope to their users for two-way interaction (Keng and Ting, 2009). Blogging has been described as one of the most popular networks by Hsu, Lin, and Chiang in 2013. According to them, a ‘blog’ is a media which bloggers use to share their personal thoughts and opinions on various aspects such as particular events linked to their life, holiday experiences or positive or negative feedback on a product that they have purchased and used. These feedbacks by the bloggers are used by readers of a blog or viewers of video blogs (Vlog) for assessing a product or service and making purchase decisions (Park, Lee and Han, 2011; Hsu, Lin and Chiang, 2013). According to Lee *et al.* (2006), blogs can be defined as private journals that are publicly accessible. Blogs have been stated as the new form of electronic Word-of-Mouth (eWOM) by Osman *et al.* (2009). Considering the importance of ‘Word-of-Mouth’ in our traditional museum marketing, this eWOM (vlogs) are selected as one of the potential candidates in digital space marketing.

Since the presence of NCSM in digital social media space is still largely limited to Facebook and YouTube, in our present study we will analyse the importance of vloggers through a case study on Science City Kolkata; National Science Centre, Delhi

Table I: Social Media Engagement Data of NCSM Units				
Sl No.	Name of the centre/unit	Social Media Channel	Subscriber/ Follower	Average Engagement (last 28 days from 15 September 2023)
1	NCSM	Facebook	23,460	53,185
		YouTube	2932	5,171
		Twitter	6,036	304200
		Instagram	174	2022
2	Birla Industrial & Technological Museum	Facebook	3854	10666
		YouTube	3385	637
		Twitter	580	1606
		Instagram	Not Present	Not Present
3	Visvesvaraya Industrial & Technological Museum	Facebook	2120	2222
		YouTube	373	3.7
		Twitter	371	418
		Instagram	96	Not Available
4	Nehru Science Centre Mumbai	Facebook	53914	8499
		YouTube	2834	13
		Twitter	1438	29
		Instagram	2079	49
5	Regional Science Centre Guwahati	Facebook	2353	2321
		YouTube	165	29
		Twitter	127	15
		Instagram	Not available	Not available

(Contd.)

Table I: Social Media Engagement Data of NCSM Units

Sl No.	Name of the centre/unit	Social Media Channel	Subscriber/ Follower	Average Engagement (last 28 days from 15 September 2023)
6	Regional Science Centre and Planetarium Nagpur	Facebook	6708	2980
		YouTube	364	6
		Twitter	326	142
7	Regional Science Centre and Planetarium Calicut	Facebook	1929	428
		YouTube	1.25K	27
		Twitter	228	180
8	Regional Science Centre Bhopal	Facebook	4,939	1895
		YouTube	7,180	195 views
		Twitter	373	3
9	District Science Centre Tirunelveli	Instagram	85	53
		Facebook	4	260
		YouTube	19	Not Available
10	District Science Centre Kalburgi	Twitter	3	Not Available
		Facebook	619	193
		YouTube	135	88
11	Bardhaman Science Centre	Twitter	343	46
		Facebook	3408	1667
		YouTube	31	11
		Twitter	83	76
		Instagram	77	0

(Contd.)

Table I: Social Media Engagement Data of NCSM Units

SI No.	Name of the centre/unit	Social Media Channel	Subscriber/ Follower	Average Engagement (last 28 days from 15 September 2023)
12	North Bengal Science Centre	Facebook	3039	1667
		YouTube	167	16
		Twitter	302	709
13	Shrikrishna Science Centre Patna	Facebook	1411	2524
		YouTube	182	85
		Twitter	46	237
14	Dhenkanal Science Centre, Dhenkanal&Kapilash Science Park, Kapilash	Instagram	32	33
		Facebook	1763	772
		YouTube	150	3.7
15	Regional Science Centre Lucknow	Twitter	621	4.1
		Facebook	4196	3430
		YouTube	273	26.7
		Twitter	34	211.33
		Instagram	67	-

and two Regional Science Centres Bhubaneswar and Kozhikode. Through this case study, we will try to conclude the emerging potential of vloggers in popularising science museums in the digital space.

Vlog suggestions as sacred shortcuts in the digital era of automaticity

Science museums/centres are classified as ‘free-choice’ learning institutions. The efficacy of such ‘learning institutions’ has been and may further be studied elsewhere. But the question of ‘free-choice’ is almost as undisputed as an axiom — science centres thrive on our compliance to the opportunity to learn things at leisure. The question is, why do we comply with such offers and options? What are the parameters that make the vlogs popular options to be co-opted by the science centres?

Characteristics of our quick decision-making in the modern days of automaticity are well-studied in the texts of social psychology. We draw from those texts the relevant reference that justifies our selection of the vlog as an effective medium of influence for the centres of free-choice learning. Because technology can evolve much faster than we can, our natural capacity to process information is likely to be increasingly inadequate to handle the information inputs of the modern world. Abundance of change, choice, and challenge are likely to overwhelm us more and more frequently. Under such cognitive space, we find ourselves in the position of lower animals — with a mental apparatus unequipped to deal thoroughly with the intricacy and richness of the external environment. Unlike the lower animals, whose cognitive powers have always been relatively deficient, however, we have created our own deficiency by giving us an unending multiplicity of options.

The challenge is the same as that of the animals’ long-standing one. When making a decision, we will less frequently engage in a fully considered analysis of the total situation. In response to this “paralysis of analysis,” we revert increasingly to focusing on a single, usually reliable feature of the situation. Evidence of the perceptual and decisional oversimplification produced by cognitive overload is documented in Albarracín & Wyer (2001); Bawden & Robinson (2009); Carr (2010); Chajut

& Algom (2003); Conway & Cowan (2001); Dhami (2003); Easterbrook (1959); Hills (2019); Hills, Adelman, & Noguchi (2017); Sengupta & Johar (2001); and Tversky & Kahneman (1974).

We termed our modern era the Information Age, and it has never been called the Knowledge Age, because information does not translate directly into knowledge. It must first be processed, accessed, absorbed, comprehended, integrated, and retained.

In deciding whether to comply with an option, we frequently pay attention to a single unit of the relevant information in the situation. Several of the most popular ‘single units of information’ we use to prompt our compliance decisions are once again documented in the research literature on the psychology of persuasion. They are found to be the most popular prompts precisely because they are the most reliable ones — those that normally point us toward a correct choice in most cases. These prompts are the factors of reciprocation, liking, social proof, authority, scarcity, commitment and consistency, and unity that sway us automatically in making our compliance decisions (*Influence: The Psychology of Persuasion*, Robert Cialdini, 2006). Each of these identifiers, by itself, provides a highly reliable cue as to when we will be better off saying yes instead of no. We are likely to use these lone cues when we don’t have the inclination, time, energy, or cognitive resources to undertake a complete analysis of the situation. When rushed, stressed, uncertain, indifferent, distracted, or fatigued, we focus less on the available information. Vlog is an emotional influence that addresses this situation exactly, wherein someone with the mark of authority and social proof (suggested by their popularity and number of subscriptions), consistency (maybe they seemed reliable on some other choices) and liking (we may like them for varied reasons) and under the situation of scarcity (very few suggestions available about which science museum to visit), is offering a “lone piece of good information”. It is not only considered important; it borders on being almost sacred for people with less time and inclination to research spending sizable time (Riadh Ladhari *et al.* 2020).

The influence of vlogs on people is not restricted to watching video tutorials, more often than not, the viewers seek

recommendations for visiting places. Vloggers can help to increase the visitors to the Science Museum in two ways. One is to expand the reach of science museums; another is to spread scientific content like facts, myth busters, or the wealth of information published by museums/science centres. In this study, we will discuss the possibility of crowdsourcing, with major focus on the digital reach of museum content directly through museum channels versus most popular content crowdsourcing channels like vlogs. And the likelihood of people choosing museum content in digital space over any other content available in comparable domains for consuming culture. (Irfan *et al.* 2022)

While we have shown above the theoretical background of persuasion compliance, the study of Hsu, Lin and Chiang (2013) and Park *et al.* (2007), and many others have empirically shown that consumers' intention to consume can be influenced by recommenders. Indeed, video bloggers provide information about products and services which get taken by consumers to analyse a product before they make their own purchase decisions. The findings of this study also suggest that consumers rely on the recommendations of video bloggers before they make a decision to consume as a free choice, which is consistent with the study of Corporate eye, 2010 (website). The role of online product recommendations on customer decision-making and loyalty in social shopping communities has been justified by different research. Social Media Framework of Cultural Museums, Advances in Hospitality and Tourism Research (Özdemir, G & Celebi, D (2017)); suggests a hypothesis that social media content can help to propagate the causes of science museums/centres.

Problem statement

In connection with the findings of the literature review, in the present study, we will try to analyse and compare the impact of independent vloggers in extending the digital reach of science centres through independent recommendations vs organisational recommendations.

Why Vloggers?

We particularly consider the vloggers' content because we observe that early forms of brand building via the delivery of

branded content in TV or print media worked well because the entertainment media were oligopolies, so cultural competition was limited. Brands also infiltrated culture by sponsoring TV shows and events, attaching themselves to successful content. Since fans had limited access to their favourite entertainers, brands could act as intermediaries. The rise of new technologies that allowed audiences to opt out of ads — from cable networks to DVRs and then the internet — made it much harder for brands to buy fame. This time, the competition came not from big media companies but from the crowd. We wanted to measure the impact of this crowd content *vis-a-vis* the brand content.

YouTube as a data source

Studies show that vlogs are potentially able to influence online shopping, choices of travel destinations and agencies, etc. (Park, Lee and Han, 2011; Hsu, Lin and Chiang, 2013). Here, we intend to assess the impact of vloggers in popularising science museums and museum content. We start with the premise that most of the visitors that a science museum/centre receives are uninitiated persons in technicalities of advanced science and technology. To match their choice, we chose to collate data from the YouTube platform for its ease of use, even for the uninitiated users. YouTube is also selected as a data source because of its user statistics.

YouTube has more than 2.68 billion active users as of 2023 [Dean 2023]. YouTube Premium has 80 million active users worldwide in 2023. 52% of internet users worldwide access YouTube at least once a month. YouTube Shorts surpassed 50 billion daily views in February 2023. Over 122 million people visit YouTube every day via its Website and Apps. Up from 800 million users in 2012. 42.9% of all global internet users access YouTube monthly [Statista website 2023]. Moreover, there are approximately 467 million active YouTube users in India, making it the network's largest audience by country.

Data collection methodologies

Once the data space is identified, the essential requirement is to find a solution for unbiased data collection. In data collection from physical space, we generally follow manual data collection

methods like questioning, observing visitors, group interaction, etc. The main problem with all these manual methods is that they are time-consuming and cost intensive. Moreover, they are often induced with subjective choices. But in the digital space, we have flexibility of using technology for data acquisition. We developed an automatic bot that can crawl and collect channel-wise data from the net. In this study, we have taken YouTube's video views as our dataset and data are collected for Science City, Regional Science Centre Bhubaneswar and National Science Center Delhi. Three centres are selected from three different places of the country and they span our full scale of science centre sizes. This type of selection will help in removing any bias feature present in the data. In order to compare the data from various channels, we have formulated a Digital Reach factor per Day (DRpD). This signifies the average number of visitors accessing any channel or video per day.

DRpD = (No. of views -/ no. of day since the video is uploaded)... (1)

Calculating this parameter, we can compare DRpD of a video created by any vlogger with respect to the average DRpD of his channel to understand whether the content created on science museums is above or below the average DRpD of that channel. This will help us in justifying that, along with the bloggers, the content on science museums has the prudential opportunity to grow in digital space over other types of content.

Calculating this factor for NCSM or its centre's official channel and comparing them with the DRpD of bloggers will give an idea about the potential of the science centres in reaching more people aided by the bloggers, rather than through their own official channels.

Results

DRpD of 30 randomly selected videos uploaded to NCSM's own channel

Before analysing the reach of NCSM units through vlogs, we calculate the reach of NCSM in digital space through its own YouTube channels.

In order to calculate the digital reach factor, we have collected the number of views for 30 videos uploaded to the NCSM channels [Table II]. The videos are selected randomly by the bot we developed. The randomisation was adopted to remove any subjective data selection bias.

The digital reach factor is around 6.8127 reach/day, which is really not a figure to indicate wide reach and engagement through NCSM's own social media channels. However, Facebook and Twitter, show good engagement. Still, qualitative analysis of the nature of engagement shows a lot of self-engagement where the content from the organisation is being shared and liked by the organisation itself.

DRpD for a randomly selected set of videos uploaded in NCSM's own channel is 6.8127 persons/day.

Now, we embark on calculating DRpD with the data collated from other channels posting content related to science centres under NCSM.

Analysing the data for Science City, Kolkata

Science City, Kolkata, West Bengal, is widely recognised as the largest science centre in India. Spanning an impressive area of approximately 50 acres, Science City offers a diverse range of interactive exhibits, engaging activities, and immersive experiences that cater to visitors of all ages. Established in 1997, Science City holds a special position among the people, and its popularity is reflected in its physical footfall of about 1.6 million people per year. By size and reach, Science City is an iconic science museum in India, having had an average of millions of physical footfalls every year over the last two decades.

In traditional modes of impact assessment, only the physical footfall of science centres is considered. But given the current scenario, digital visitation should also be considered for the total reach assessment of the centre. Even when the digital visitation of a science centre is taken into account, we only consider the view statistics recorded on its own social media channels. But in true spirit, the viewership recorded against any content related to the centre and posted anywhere in the digital media has to be counted for the sake of impact or reach assessment.

Table II: Randomly selected Video Viewership Statistics for YouTube channel of National Council of Science Museum					
SI No.	Title of the video	Number of views	Time of upload	Spreading rate/day	
1	Bardhaman Science Centre	100K views	4 years	68.49	
2	Science Drama	27K views	7 years	10.56	
3	Acharya Prafulla Chandra Ray: Life and Science of a Legend	24K views	7 years	9.39	
4	सरदार पटेल: एक भारत के शिल्पी	23K views	4 years	15.75	
5	Water: The elixir of life	18K views	8 years	6.16	
6	Virtual Tour of Science City, Kolkata	17K views	7 years	6.65	
7	Nehru Science Centre, Mumbai	16K views	4 years	10.95	
8	Acharya Jagadish Chandra Bose — The Doyen of Modern Indian Science	12K views	7 years	4.69	
9	Mathematics Gallery of Birla Industrial & Technological Museum, Kolkata	8.5K views	7 years	3.32	
10	Bubble Show at BITM, Kolkata	7.1K views	7 years	2.77	
11	'Small Experiments, Great Learning' by Prof. HC Verma	7K views	2 years	9.58	
12	Popular Science Lecture at BITM, Kolkata by Prof. HC Verma	6.9K views	7 years	2.70	
13	Quest: Demonstration based Quiz Show (Episode 28)	3.7K views	8 years	1.26	
14	National Science Drama Festival 2019-20 MERA BHARAT Hindi Drama	3.7K views	1 year	10.13	
15	Silver Jubilee Celebration of National Science Centre, Delhi	3.5K views	5 years	1.91	
16	Smart India Hackathon NCSM Problem Statement 2	3.5K views	3 years	3.19	

(Contd.)

SI No.	Title of the video	Number of views	Time of upload	Spreading rate/day
17	Quest: Demonstration based Quiz show	3.4K views	8 years	1.16
18	Bowling by Robot	3.3K views	5 years	1.80
19	Robot performing the Task I	2.8K views	6 years	1.27
20	National Science Drama Festival 2019-20 SARNICHE AWARTAN Hindi Drama	2.8K views	1 year	7.67
21	VANISH: Zero Shadow Day	2.5K views	2 years	3.42
22	Rise of Digital India Exhibition at Jakarta, Indonesia	2.4K views	7 years	0.93
23	Robots playing Football	2.3K views	5 years	1.26
24	What Are Superbugs?	2.3K views	2 years	3.15
25	Electricity Gallery at BITM, Kolkata	2.1K views	7 years	0.82
26	Harbinger of Modern Astrophysics: Professor Meghnad Saha	1.7K views	1 year	4.65
27	Memory Metal: Metal that remembers its shape	1.6K views	2 years	2.19
28	Beyond the limit _S Chandrasekhar	1.4K views	7 years	0.54
29	West Bengal Student Youth Science Fair 2014	1.4K views	7 years	0.54
30	Smart India Hackathon NCSM Problem Statement I	1.4K views	3 years	1.27

For this study, we have taken the case study of YouTube vloggers' content, to make a comparison of the reach through NCSM's own channel and the reach through the influencers' channels. In [Table III], we have shown the video statistics of 34 nos of video content related to Science City, posted by different channels (influencer groups).

YouTube is flooded with vlog posts on Science City, Kolkata. Not only the number of videos posted is huge but also the number of views for those videos is huge. From the data tabulated in [Table III] the rate of spreading (views/day) is calculated as per equation (1). This data is collected from only 34 randomly selected channels on YouTube. The reason for this random selection is to generalise the conclusion from the collected data. After calculating the reach/day for each of the 34 channels, the total cumulative reach of all 34 channels is calculated. It shows a total reach of 7982.5 persons/day for Science City through 34 randomly selected channels only. This is actually more than the average number of visitors physically visiting Science City, Kolkata, per day.

Moreover, this figure was never known before we started this study. Per day per channel viewing average over all the selected channels is around 228 people/day/channel. From the data in Table III, it is observed that for some channels, the per day reach is very high, and for some others, it's less, initial observation indicates a possibility of data outlier. However close inspection of the data in correlation with the number of subscribers shows that channels with more subscribers naturally get more views. Even then, the views are really more than physical visitors and indicate a clear popularity of content on Science City. For a better understanding of the reason behind the popularity of Science City, Kolkata, we have compared the popularity of Science City-related content against other content created by each channel admin. The data is tabulated in Table IV. This data will help us to understand whether these large views happen only because of a popular channel or because people like the content on Science City.

For example, Kolcutta Vloge (Youtube channel name) reach rate is 559.94 persons/day compared to its Science City related content reach of 375 persons/day. Banjaraa Boyz (YouTube

channel name) reach rate is 159.61 persons/day compared to 1760 persons/day for its Science City related content and all other data tabulated in Table IV. This shows that for the same subscriber and content creator, the content on Science City is still popular. The only plausible reason emerging for the large view is people's love of science city as a destination itself.

Thus, it can be concluded that a positive trend of popularity for Science City related content among the users of the internet world is apparent. Scrutinising the reach rate of all selected channels, it may be generally commented that Science/Science City related content is at least equally popular in the internet world as any other content of interest to the vloggers. This corroborates the viewpoint that vloggers can serve a good purpose for the causes of science centres and science in general.

Analysing data of National Science Centre Delhi (NSCD)

The data for National Science Center Delhi in [Table V] shows that the average reach of its own channel is only 145 persons/day. This value is far less compared to the per day physical visit of NSCD. But it is quite possible that a large component of the NSCD visitors are students and they do not have the free (both time and resource wise) and prolonged access to the internet. If we consider only non-student visitors, then the visitation comes around 200 visitor/day which is close to its online visitation.

The higher number of physical visitors, particularly school students, suggests that there is significant value in the in-person experiences provided by the science centre. Still, the disparity between physical and online visitors highlights an opportunity for the science centre to expand its reach and engagement by actively promoting its online resources and virtual offerings to schools, teachers, and students. By developing and promoting educational content, virtual exhibits, interactive tools, and live-streamed programmes, the science centre can extend its educational impact beyond the physical facility and engage a broader audience of students or general people who may not have the means or opportunity to visit in person. And in attempting these strategies, there can be some scope, once again, to take the vloggers on board.

Table III: Popularisation of Science City Kolkata by different YouTube bloggers

Sl No	Name of the video	Date of publication	Views	Spread rate/day	Channel Name
1	Details of Science City, Kolkata	2 years, 10 months	185,198	952	Ghurte Firtte 377k
2	Science City Kolkata: The largest science centre in the Indian subcontinent	5 years, 9 months	1,991,667	953	Explore World Films 254K
3	Science City Kolkata Science City Kolkata tour guide 2021 @MD FILMS 96	9 months	17,203	64	MD FILMS 96 5.07K
4	Kolkata Science City Tour Guide 2022 Science City kolkata Ticket Price 2022 Science City Kolkata	1 Year, 7 months	216,368	375	Kolcutta Vlogs 38.7K
5	Science City Kolkata 2022 All Show Details Ticket Price Do's & Dont's	4 months, 7 days	290,179	1760	Banjaraa Boyz 2.11K
6	Science City Kolkata 2022 All New Show Details Kolkata Tourist Place	2 months, 6 days	9,516	165	The Shining Bong 4.35K
7	Kolkata Science City 2022 Full Details in Hindi Science city Kolkata tour Plan	6 months, 17 days	76,494	424	Ride Riders 48.9K
8	Science City journey in Dark Ride	5 years, 9 months, 23 days	83,245	39	Subham Gunin 0.275K
9	Science City Kolkata 2022: Kolkata Science City Ticket Price Kolkata Science City.	19 days	251	17	Tanzim Babu Vlogs (Contd.)

Table III: Popularisation of Science City Kolkata by different YouTube bloggers					
Sl No	Name of the video	Date of publication	Views	Spread rate/day	Channel Name
10	Kolkata Science City Tour The Largest Science Centre in india BaBu Vlogs	42 days	560	18	BaBu Vlogs
11	Kolkata Science City park Timing, ticket price, places to visit	2 years, 8 months, 18 days	129,957	133	Ruma Dey Baidya – Holiday Story
12	Science City Kolkata Vlog - Full Detailed Video Kolkata Diaries Vlog	53 days	1,107	24	Saurav Gupta Sg
13	Kolkata Science City Tour Guide 2022 Science City Kolkata 2022 Kolkata	2 months, 24 days	2,524	35	REIZEN GALLERY
14	Science City Kolkata: The Largest Science centre in the Indian Subcontinent Science city vlog 2022	1 month, 8 days	823	28	Happy soumen
15	kolkata science city kolkata science city tour science city tour kolkata tourist places vlog	5 months	2,981	20	Sanjiv Jaiswal Vlogs
16	Science city Kolkata full detailed video Mj Vlogs 2.0	32 days	205	7	Mj Vlogs 2.0
17	Kolkata, Science City	1 days	88	88	Imtiaj vlogs
18	Science City Kolkata Science City Vlog 2022 VlogifyAnku	3 months, 22 days	258	2.8	VlogifyAnku
19	Science City Kolkata A Dark Ride Journey Evolution of Life Kolkata Vlog	3 years, 3 months, 27 days	27,434	23	Our Lives by Piu & Sudipto Majumder
20	Science City full tour Malda to Kolkata vlog hamid official vlog	21 days	560	38	Hamid Official Vlogs

(Contd.)

Table III: Popularisation of Science City Kolkata by different YouTube bloggers					
SI No	Name of the video	Date of publication	Views	Spread rate/day	Channel Name
21	Science City Kolkata एकआजबजायगा ! नामथलेपुराईमिस! Vlog 3	3 days	164	54	Omor Vlog
22	Science City Kolkata Science City Tour Kolkata Tourist Places Kolkata 4K	5 months, 28 days	14,068	78	Chiku The Explorer
23	आइये कोलकाता साइंस सिटी के टाइम मशीन में घूमते हैं! Science City Kolkata Time Machine	1 year, 8 months, 10 days	11,592	18	Arush Vlogs
24	Science City Kolkata Full tour & Guide / VS MONU vlogs	3 years, 9 months, 2 days	65,016	8	VS MONU vlogs
25	Science City kolkata Vlog Naresh Blog	9 months, 10 days	4,493	15	Naresh BLOG
26	Kolkata science city panorama show Human Evolution video hd	4 years, 28 days	12,581	105	MD VLOG
27	Science City Kolkata Complete Tour New Version	5 years, 8 months, 17 days	306,976	151	tour travels
28	Science City Kolkata Tour Guide 2022 Science City New Ticket Price & Full Details II	3 months, 21 days	2,902	32	K2L VLOGS
29	Science City Kolkata - Inside Full Video, India's Tourist Attractions Site INDIAN TOURISM	5 years, 1 month, 18 days	12,509	7	Indian Tourism
30	Science City vlog full on Maasti with family	4 months, 12 days	1,165	1.07	Nandini's Space

(Contd.)

Table III: Popularisation of Science City Kolkata by different YouTube bloggers

Sl No	Name of the video	Date of publication	Views	Spread rate/day	Channel Name
31	Science City Kolkata Vlog Kolkata Science City Vlog	7 months, 13 days	1,059	4	Bernard Shaw Vlogs
32	KOLKATA Science City Vlog Ami Vlogs	3 years, 7 months, 29 days	30,240	23	Ami Vlogs
33	কলকাতার আশ্চর্য্য এক শহর Kolkata Science City Vlogs. Science City, Kolkata	4 years, 11 months, 25 days	16,509	9	Rizvi Vlogs
34	Science City Kolkata 2022 New Updates Kolkata Science City Timing, Ticket Price Full Vlog	3 months, 12 days	3,022	33	Vlogs Of IQ

Total Reach/ day considering all the 34 channels is: 7982.5 person/day, whereas Reach rate by different YouTube bloggers is: 228.07 person/day/channel on the average.

Table IV: Viewership Statistics of various content for the YouTube channels that have also shown Science City related content					
	Title	Views	Time	Spreading rate/day	
Channel Name: KolcuttaVlog					
1	Digha Pool Patna Digha Pul Patna Ke Digha Pul Patna Ka Digha Pul Patna Bihar दीघापूलपटना	4.2M views	1 year	11,506.84	
2	India's First Underwater Metro In Kolkata Kolkata Underwater Metro Tour Of Underwater Metro 2022	687K views	2 years	941.09	
3	Chor Bazar Kolkata चोरबाजारकोलकाता	245K views	2 years	335.61	
4	Kolkata Science City Tour Guide 2022 Science City kolkata Ticket Price 2022 Science City Kolkata	216K views	1 year	591.78	
5	Best Shoes Wholesale Market In Kolkata Biggest Footwear Market In Kolkata Ladies Shoes Market	135K views	1 year	369.86	
6	Digha Sea Beach Tour Guide 2022 Digha Sea Beach Tour Budget 2022 New Digha Sea Beach Tour Plan	104K views	1 year	284.93	
7	Babu ghat Bus Stand Kolkata Contact Number Of All Buses Kolkata Bus Stand video Babu ghat bus stop	93K views	2 years	127.39	
8	Metiabruz Wholesale Market kolkata 2022 Metiabruz Wholesale Market Kurti, Saree And Nighty Market	91K views	1 year	249.31	
9	Victoria Memorial Kolkata Vlog Tour Guide 2022 Victoria Memorial kolkata Ticket Price 2022	80K views	1 year	219.17	
10	Howrah Bridge Kolkata Tour 2022 Howrah Bridge Kolkata Night Tour 2022 Kolkata Howrah Bridge 2022	78K views	1 year	213.69	

(Contd.)

Table IV: Viewership Statistics of various content for the YouTube channels that have also shown Science City related content

	Channel Name: Kolcutta Vlog	Title	Views	Time	Spreading rate/day
11	Howrah Bus Stand Kolkata All Buses Routes with Numbers Howrah Bus Stand Video Howrah Bus Stop	Howrah Bus Stand Kolkata All Buses Routes with Numbers Howrah Bus Stand Video Howrah Bus Stop	58K views	1 year	158.90
12	Eco Park Patna After Lockdown Eco Park Patna In Bihar Full Eco Park Vlog #ecoparkpatna	Eco Park Patna After Lockdown Eco Park Patna In Bihar Full Eco Park Vlog #ecoparkpatna	42K views	1 year	115.06
13	Top 10 Largest and Beautiful Shopping Mall In Kolkata Top Most Popular Malls In Kolkata Kolkata	Top 10 Largest and Beautiful Shopping Mall In Kolkata Top Most Popular Malls In Kolkata Kolkata	41K views	2 years	56.16
14	Best Sports Wholesale Market In Kolkata Kolkata Sports Market Maidan Sports Market Kolkata Tour	Best Sports Wholesale Market In Kolkata Kolkata Sports Market Maidan Sports Market Kolkata Tour	39K views	1 year	106.84
15	Botanical Garden Kolkata 225 Years Old Banyan Tree In Hindi Botanical Garden Kolkata Tour In Hindi	Botanical Garden Kolkata 225 Years Old Banyan Tree In Hindi Botanical Garden Kolkata Tour In Hindi	38K views	1 year	104.10
16	Mangla Haat Kolkata Wholesale Market 2021 Kolkata Magla Haat Wholesale Market Mangla Hat Kolkata	Mangla Haat Kolkata Wholesale Market 2021 Kolkata Magla Haat Wholesale Market Mangla Hat Kolkata	34K views	1 year	93.15
17	Dharmatala Bus Stand In Kolkata Full Details Of All Buses Esplanade Bus Stand Kolkata Bus Stand	Dharmatala Bus Stand In Kolkata Full Details Of All Buses Esplanade Bus Stand Kolkata Bus Stand	34K views	2 years	46.57
18	List of Most Popular Places to Visit In Topsiakolkata Top Famous Places In Topsia Kolkata(Topsia)	List of Most Popular Places to Visit In Topsiakolkata Top Famous Places In Topsia Kolkata(Topsia)	28K views	2 years	38.35
19	Howrah Junction Railway Station In Hindi Trains Timing Passing Through Howrah Station Howrah	Howrah Junction Railway Station In Hindi Trains Timing Passing Through Howrah Station Howrah	28K views	1 year	76.71
20	Gaya Bus Stand Contact Number Of All Buses Gaya Bus Stand time table Bihar bus stand #gayabus	Gaya Bus Stand Contact Number Of All Buses Gaya Bus Stand time table Bihar bus stand #gayabus	27K views	1 year	73.97

(Contd.)

Table IV: Viewership Statistics of various content for the YouTube channels that have also shown Science City related content

	Channel Name: Kolcutta Vlog	Title	Views	Time	Spreading rate/day
21	Bodhgaya Water Park Chham Chham 2022 Water Park Bodh Gaya Bihar 2022 Bodhgaya water Park Video		27K views	1 year	73.97
22	Patna City Complete Tour Guide Video 2021 Famous Tourist Place In Patna City In Bihar 2021 Patna		26K views	1 year	71.23
23	Axis Mall New Town - great shopping place in Kolkata Kolkata's First Snow park In Axis Mall		25K views	2 years	34.24
24	Nicco Water Park Kolkata 2022 Nicco Park Kolkata Ticket Price 2022 Nicco Park Kolkata All Rides		24K views	11 months	72.72
25	Gaya Junction Railway Station In Hindi Trains Timing Passing Through Gaya Station गयामंजरी		21K views	1 year	57.53
26	Patna Junction Railway Station In Hindi Trains Timing Passing Through Patna Station पटनामंजरी		21K views	1 year	57.53
27	7 Point Park Circus 7 Wonderful Places Arsalan Park Circus Seven Point Chittaranjan Hospital		20K views	2 years	27.39
28	Gaya City Complete Tour Guide Famous Tourist Place In Gaya City In Bihar Gaya Ji #Gayacity		20K views	1 year	54.79
29	Traditional Village Life Of Jharkhand Mitti Ke Ghar Clay Ka Ghar Mud House		20K views	2 years	27.39
30	Patna biggest & Luxurious Pn mall P&M Mall patna Vlog And Tour P & M Mall Patna 2021 Patna Mall		19K views	1 year	52.05
KolcuttaVlog (YouTube channel name) reach rate is: 559.94 person/day.					

	Title	Views	Time	Spreading rate/day
Channel Name: Banjaraa Boyz				
1	Science City Kolkata 2022 All Show Details Ticket Price Do's & Dont's	290K views	4 months	2416.66
2	Nicco Park Kolkata Ticket Price New Offer A to Z all Details	69K views	3 months	766.66
3	Aqua Marina Hooghly Full Day Fun @300 Only Nice Water Park Near Kolkata	31K views	3 months	344.44
4	Happy Valley Park — Bira Do's & Dont's Cheapest Water Park Near Kolkata	21K views	4 months	175
5	The Indian Museum Kolkata Ticket Price Timing All Gallery Details জাদুঘর ভারতীয় সংগ্রহালয়	17K views	3 months	188.88
6	Biswa Bangla Gate Hanging Restaurant Kolkata Gate বিশ্ব বাঙ্গলা গটে	17K views	6 months	94.44
7	Alipore Zoo Kolkata 2022 All Details অলিপুরচড়িয়াখানা Zoological Garden Kolkata	11K views	4 months	91.66
8	Eco Park Kolkata Tour 2022 New Timing, Ticket Price, All Rides Cost India's Biggest Nature Park	9.9K views	5 months	66
9	Victoria Memorial Kolkata Vlog সাথে কিছুঅজানা তথ্য Inside Tour Full Gallery Details	7.5K views	5 months	50
10	Birla Museum Kolkata Better than Science City?? #BITM Birla Industrial & Technological Museum	3.6K views	3 months	40
11	Eco Park - Part 2 7Wonders Mask Garden Ghum Station Dancing Fountain Sculpture Garden	3.5K views	4 months	29.16
(Contd.)				

	Title	Views	Time	Spreading rate/day
Channel Name: Banjaraa Boyz				
12	1 Day in BANDEL Full Tour Guide ব্যান্ডলে ভ্রমণ A Must Visit Place Near Kolkata	3K views	6 months	16.66
13	City Centre 1 & City Centre 2 Famous Shopping Malls in Kolkata CC1 & CC2 FULL INSIDE VIEW	2.6K views	1 month	86.66
14	Inside View of AIRCRAFT MUSEUM Kolkata 1st Time in West Bengal Ticket Price Timing Location	2.3K views	2 months	38.33
15	OZORA - The Best Rooftop Restaurant in Kolkata at 328 ft. Acropolis Mall 20th Floor	1.5K views	1 month	50
16	Quest Mall Kolkata One of the Best Shopping Mall in Calcutta @QuestMall	1.3K views	1 month	43.33
17	Nandan VS Radha Studio AC Cenema Hall @30 Only Both Inside View All Details	1.1K views	2 months	18.33
18	Purbasthali Pakhraloy Banglar Amazon Chupir Chor এক দিনের সম্পূর্ণ ভ্রমণ গাইড	1K views	8 months	4.16
19	ঘুরে আসুন প্রতিবেশে ভরা Chandannagar কলকাতা থেকে মাত্র ১ঘণ্টা দূরে এক প্রতিবেশিক শহর #strand	773 views	7 months	3.68
20	Nehru Children's Museum Doll House Birla Planetarium St. Paul's Cathedral Church 2022	691 views	5 months	4.60
21	ARANYA Resort East Burdwan অরণ্য প্যাক রিসোর্টও রেস্টুরেন্ট Aranya Park Resort & Restaurant	681 views	7 months	3.24
22	Coffee House Kolkata New Town vs College Street Coffee House NEW vs OLD Coffee House Comparison	617 views	2 months	10.28
(Contd.)				

	Title	Views	Time	Spreading rate/day
Channel Name: Banjarraa Boyz				
23	Mother's Wax Museum Kolkata New Ticket Price Timing মোমের মূর্তির মিউজিয়াম	546 views	5 months	3.64
24	Jagannath Temple Kolkata New Timing Location All Details Khidirpur Jagannath Temple	500 views	2 months	8.33
25	Barrackpore Tour #Mangal Pandey Park #Dada Boudi Restaurant Barrackpur One Day Trip	391 views	2 months	6.51
26	Eden Gardens Park Kolkata New Entry Fee ইডেনউদ্যান #Eden_Udyan #pda	285 views	4 weeks	10.17
27	Mahesh Jagannath Mandir Shrirampur 626 Years Old Temple India's 2nd Oldest Temple after Puri	269 views	3 months	2.98
28	Tallest Durga Puja Pandal 2022 150ft. Kalyani ITI more Durga Puja Theme Malaysia Twin Towers	255 views	2 weeks	18.21
29	Bortir Bill near Barasat ডিভিনীকোভেশমন A Beautiful Day Trip near Kolkata BortirBil Vlogs	271 views	10 days	27.1
30	JorasankoThakurbari Full Inside View Birthplace of Rabindranath Tre Entry Fee - Timing	187 views	3 weeks	8.90
Banjarraa Boyz (YouTube channel name) reach rate is: 159.61 person/day.				

	Title	Views	Time	Spreading rate/day
Channel Name: Explore World Films				
1	Delhi Girl dances with folk tunes at Surajkund Mela, India	13M views	5 years	7,123.28
2	Roadside Ear wax cleaner: Painful way to remove dirt and gunk with a needle??	9.1M views	6 years	4,155.25
3	Women dancing to a Snake charmer's tune at Surajkund International Crafts Mela	8.3M views	3 years	7,579.90
4	Delhi Girl vs Haryanvi Boy on Nagada Dance at Surajkundmela	7.3M views	2 years	10,000
5	Haryanvi folk dance performance by School Girls at Surajkundmela	6.3M views	2 years	8,630.13
6	EAR STONES!!! Roadside Ear cleaner in India	4.2M views	6 years	1,917.80
7	Mickey mouse kids jumper in New Town Eco Park	4.1M views	4 years	2,808.21
8	Girls Dance on Nagada at the largest crafts fair in the World: SurajkundMela 2017	3.7M views	5 years	2,027.39
9	Fun boat rides for children at Surajkund International Crafts Mela	3.1M views	5 years	1,698.63
10	Best of Delhi Zoo I National Zoological Park Delhi	2.9M views	4 years	1,986.30
11	Indian Girls folk dance at Surajkundmela	2.8M views	5 years	1,534.24
12	Nagada dance performance at Surajkundmela	2.4M views	2 years	3,287.67
13	Ramleelamela at the Red Fort, New Delhi	2M views	5 years	1,095.89
14	Girl shake a leg with Nagada Dance at Surajkundmela	2M views	2 years	2,739.72
15	Indian women dance with bean party at Surajkundmela	2M views	2 years	2,739.72

(Contd.)

	Title	Views	Time	Spreading rate/day
Channel Name: Explore World Films				
16	Science City Kolkata: The largest science centre in the Indian subcontinent	1.9M views	5 years	1,041.09
17	Ear Waxing — Traditional ear cleaner in India	1.7M views	6 years	776.25
18	Indian snake dance I Indian folk dance I Suraj kund mela	1.7M views	5 years	931.50
19	Nagada Dance by Delhi Girls at Suraj kund mela	1.6M views	2 years	2,191.78
20	Har Ki Paurighat in Haridwar, India	1.2M views	6 years	547.94
21	Haryanvi folk dance performance at Suraj kund mela	1.2M views	2 years	1,643.83
22	Maa Durga is transported from Kumartuli to Santosh Mitra Square — 40 Crore Pandal	1M views	3 years	913.24
23	Nagada Dance — the major attraction of Suraj kund mela	905K views	2 years	1,239.72
24	Haryanvi folk dance at Suraj kund mela	832K views	2 years	1,139.72
25	Suraj kund mela: The largest crafts fair in the World	816K views	5 years	447.12
26	Roadside Ear Cleaner in India II Is it safe way to remove Ear Wax?	603K views	4 years	413.01
27	Local Train in Kolkata	599K views	5 years	328.21
28	How to Make Candy Floss or Cotton Candy	562K views	4 years	384.93
29	Ropeway to Chandī Devi Temple, Haridwar	518K views	6 years	236.52
30	Mata Vaishno Devi Yatra I Full Yatra video New Delhi to Katra Mata Vaishno Devi Temple	489K views	4 years	334.93
Explore World Films (YouTube channel name) reach rate is: 2,479.10 person/day.				

	Title	Views	Time	Spreading rate/day
Channel Name: Mohit Buddy, Subscriber: 727, Center point of comparison: National Science Delhi				
1	Science Museum Delhi! National Science Centre Delhi! After lockdown! All Information! Full Tour	28K views	5 months	186.66
2	Red Fort Lal Qila Open Or Not Open After lockdown Full Tour All Information 2022	4K views	7 months	19.04
3	Lotus temple! Open Or Not! Full Tour! All Information! Lotus temple delhi! Open After Lockdown	3.6K views	6months	20
4	Delhi Zoo! National Zoological Park Delhi! Delhi Zoo Open After Lockdown! All Information! 2022 1,197 views Jun 4, 2022	1.9K views	3 months	21.11
5	Janmashtami Mahotsav Mela Paschim Vihar 2022! Janmashtami Mela 2022! Paschim ViharMela 2022 1,457 views 6 Aug 2022	1.5K views	2 months	25
6	Qutub Minar! Open Or Not! Historical Place! Qutub Minardelhi! Full Tour! Open after lockdown	0.5K views	6 months	2.77
7	A Purana Qila! Old Fort! Puranaqila delhi! Historical Place! Best couple place! Full Information	0.5K views	7 months	2.38
Mohit Buddy (YouTube channel name) reach rate is: 46.16 person/day.				

SI No.	Title	Views	Time	Spreading rate/day
1	Science Drama "विज्ञाननाटक": Sabuja Manisha "साबुजामनीषा"	12K views	7 months	57.14
2	Unveiling the secrets of Sinauli findings with Dr Sanjay Kumar Manjul	6.2K views	Streamed 1 year	16.98
3	Science Awareness: SAMRAT YANTRA	5.6K views	3 years	5.11
4	National Science Seminar 2015 राष्ट्रीयविज्ञानसंमेली 2015	4.4K views	6 months	24.44
5	Zinc Smelting: Science Awareness	1.9K views	3 years	1.73
6	Science Drama "विज्ञाननाटक": Kaal Chakra "कालचक्र"	1.3K views	7 months	6.19
7	Science Awareness: Our Unique Planet — Earth	1.2K views	4 years	0.82
8	Ram Yantra: Science Awareness	1.2K views	3 years	1.09
9	Science Awareness: Delhi Iron Pillar	1.1K views	3 years	1.00
10	Mishra Yantra: Science Awareness	1.1K views	3 years	1.00
11	Infinity Well: Science Awareness	1K views	2 years	1.36
12	World Environment Day 2020: Online Panel Discussion	902 views	2 years	1.23
13	National Science Seminar 2015 राष्ट्रीयविज्ञानसंमेली 2015	900 views	6 months	5
14	National Science Seminar 2015 राष्ट्रीयविज्ञानसंमेली 2015	880 views	7 months	4.19
15	Science Behind - DNA: The blue print of life	771 views	4 years	0.52
16	Panel Discussion on Artificial Intelligence: Opportunities & Challenges	693 views	Streamed 1 year	1.89
17	Popular Science Lecture on "A Celestial Wonder on the Longest Night" by Dr DP Duari	661 views	Streamed 1 year	1.81

(Contd.)

SI No.	Title	Views	Time	Spreading rate/day
18	International Museum Day 2020	614 views	2 years	0.84
19	Science Drama "विज्ञान नाटक": Urja Ke Saath Pragati Ki Ore "ऊर्जा के साथ प्रगति की ओर"	544 views	7 months	2.59
20	Heavy Water Reactor: Science Awareness	529 views	2 years	0.72
21	Neutron Moderation: Science Awareness	527 views	2 years	0.72
22	Popular Lecture on the topic "Himalaya Adventure"	524 views	Streamed 7 months	2.49
23	Science Drama "विज्ञान नाटक" : Mazhavil Poraalikal (Malyalam)	513 views	7 months	2.44
24	World Environment Day 2020 keynote address by Dr-Anil Prakash Joshi, Padma Bhushan	466 views	2 years	0.63
25	National Science Centre	417 views	4 years	0.28
26	International Yoga Day, 2021: Little Yoga Gurus	406 views	1 year	1.11
27	3D Movie: Science Awareness	392 views	2 years	0.53
28	Is Light Visible क्या प्रकाश दिखाई देता है?: An Exhibit At National Science Centre, New Delhi	387 views	3 years	0.35
29	NSCD TV Official Live Stream	379 views	Streamed 2 years	0.51
30	Endless Tunnel: Science Awareness	370 views	3 years	0.33

NSC Delhi reach rate is: 5.0013 person/day.

Analysing data of RSC Bhubaneswar

Regional science centres get limited footfall compared to the national level centres like NSCD or Science City, Kolkata. RSC Bhubaneswar is one of the regional level centres of NCSM. The physical visitor figure of the centre is currently 1.76 lakhs per year and if we consider only the general visitors excluding students, it comes out to be even less. But an interesting fact is that despite being a smaller centre than the national level centres, there is good amount of YouTube content available for this science centre. The YouTube reach data for RSC Bhubaneswar is tabulated in [Table VI] below. The data shows where the physical visitor per day is about 438, a virtual reach of 7.99 person per day through all the vloggers' channels. The case is similar to that of Delhi, where too, the digital reach is much smaller than the physical reach. This too might have happened because the centre is primarily visited by the students with limited access to free time and internet.

Analysing data of RSC & Planetarium, Calicut

Regional Science Centre & Planetarium Calicut, started operation on 30 January 1997 and subsequently witnessed huge popularity among the people of Malabar region. This centre receives an annual footfall of about 4.5 lakh visitors. With the changing attitude of aspiring and burgeoning city of Calicut and its surroundings, the centre is also reaching out to its digital subscribers over the net. The YouTube reach data for RSCP Calicut is tabulated in [Table VII] below. Physical visitor to the centre per day is about 1232.87. But its virtual visitor figure, though higher than the similar sized centre RSCB, is yet to catch up. For this centre the average virtual reach per day is 20.944. If we consider the total reach through the 10 randomly selected vlogger channels, it would be about 210 per day and that too is far less than the physical visitor figure.

Comparative analysis of data

Comparative analysis of data shows that reach of NCSM's own social media channels is very nominal. By itself, NCSM social media channels are not gaining significant popularity, but vloggers

Table VI: Randomly selected video statistics for YouTube channel of Regional Science Centre Bhubaneswar

Sl No.	Title	Views	Time	Spreading rate/day
1	Vigilance Awareness Week-2019 Poster Making Competition	1.3K views	2 years	1.78
2	Science Drama Competition	861 views	Streamed 6 months	4.78
3	View Of Jupiter And Saturn	452 views	Streamed 1 year	1.23
4	View Of Jupiter And Saturn	400 views	Streamed 1 year	1.09
5	Online Workshop on "Designing of water distribution system through EPANET"	356 views	Streamed 1 year	0.97
6	Astronomy & Space Science Camp Session - A	311 views	Streamed 1 year	0.85
7	Lock Down Science Ep: 1 on Miracle nail Board	308 views	2 years	0.42
8	International Day of Yoga_2020 #Namaste Yoga #One million suryanamaskar	279 views	2 years	0.38
9	View of Jupiter and Saturn	275 views	Streamed 1 year	0.75
10	Swachhata hi Seva Program	246 views	2 years	0.33
11	Jupiter Saturn Conjunction	226 views	Streamed 1 year	0.61
12	Basic Astronomy Awareness Program (Origin & Development of Telescope)	226 views	Streamed 1 year	0.61
13	Maths in Every Fold : ORIGAMI	206 views	Streamed 1 year	0.56
14	View Of Jupiter And Saturn	187 views	Streamed 1 year	0.51
15	Vedic Mathematics	169 views	Streamed 1 year	0.46
16	Today's live view of the moon using telescope	167 views	Streamed 1 year	0.45

(Contd.)

Table VI: Randomly selected video statistics for YouTube channel of Regional Science Centre Bhubaneswar

Sl No.	Title	Views	Time	Spreading rate/day
17	#Celebration of International Day of Yoga #Namaste Yoga	166 views	2 years	0.22
18	Lock Down Science Ep: 2 on Pressure Diver	162 views	2 years	0.22
19	DIY-Electronics By RSC-BBSR	159 views	1 year	0.43
20	The Mythology of BIG DIPPER	154 views	2 years	0.21
21	Astronomy & Space Science Camp Session - D	154 views	Streamed 1 year	0.42
22	Synthesizing Art from Science	151 views	Streamed 1 year	0.41
23	Half of what you know is Wrong	151 views	Streamed 1 year	0.41
24	National Science Day-2021	139 views	Streamed 1 year	0.38
25	View Of Moon	139 views	Streamed 1 year	0.38
26	Wed- Plantation Of Sapling	138 views	2 years	0.18
27	Astronomy & Space Science Camp Session - B	131 views	Streamed 1 year	0.35
28	Chemistry from Kitchen to World	125 views	Streamed 1 year	0.34
29	Synthesising Colours of Holi	122 views	Streamed 1 year	0.33
30	Webinar on "Genome Editing: What, How and Why?"	118 views	Streamed 1 year	0.32

NB: RSC Bhubaneswar reach rate is: 7.99 person/day.

Table VIII: Regional Science Centre and Planetarium Calicut						
SI No.	Name of the video	Date of publication	Views	Spreading rate/day	Channel Name	
1	കോഴിക്കോട് ജനറൽ സയൻസ് സെന്റർ Best tourist place calicut Regional science centre	6 months	11,342	63	Kerala View Finder	
2	നക്ഷത്രബംഗ്ലാവിലെ തിരുനാഥം Regional Science Centre And Planetarium Calicut malayalam	1 year	11,000	31	EK MEDIA TECH by Ramshad	
3	Planetarium Calicut	1 year	4400	12	Journey with Little Star	
4	Kozhikode Regional Science Center & Planetarium Kozhikode Planetarium G-WORLD TECH & TRAVEL	1 year	18000	49	G-WORLD TECH & TRAVEL By Kummimon	
5	കോഴിക്കോട് ജനറൽ സയൻസ് സെന്റർ Kozhikode planetarium day in my life finshashaheer	11 months	6400	19	Finshashaheer	
6	Science centre - Science Park - planetarium - Kozhikode - Kerala - India	11 months	1600	4	James vision 007	
7	Kozhikode planetarium	4 months	2000	16	Aleesvlog	
8	Planetarium Kozhikode Regional Science Centre Nakshatra Banglavu Calicut - ജനറൽ സയൻസ് സെന്റർ	1 year	5200	14	M Fidhal vlog	
9	Regional Science Centre and Planetarium @Calicut	5 months	133	0.88	Shifu Dreams	
10	Visit to Regional Science Centre and Planetarium Calicut	8 months	135	0.56	My little world - Diya	
Average reach per day = 20,944 reach /day						

and influencers are generating good viewership by posting about the institution. Throughout history, cultural innovation sprouted from society's fringes — emerging from unconventional groups, social movements, and artistic/literary/scientific circles that challenged established norms. Institutions and mass media served as conduits, disseminating these fresh ideas to the broader public. However, the data we gathered show that the landscape has shifted with the advent of social media.

Social platforms now connect communities that were once isolated by geography, accelerating the pace and fervour of collaboration. As these previously distant groups interconnect, their cultural impact has gained immediacy and significance. These emergent crowdcultures manifest in two forms: subcultures, nurturing novel ideologies and practices, and interpretations, pioneering groundbreaking forms of entertainment.

This warrants certain actions. Vloggers and influencers know their audience and they always appeal to the subculture niche that they carry with them. These influencers mostly target their content to the regional people in their own languages. Hence, content created by these people can have a better chance of appealing to the local culture. So, it is advisable to reach out to the vloggers and influencers who have shown interest in featuring the institution and establish collaborations. This can include inviting them for exclusive tours, providing them with unique content or experiences, or sponsoring their videos in exchange for promoting the institution. By leveraging their existing viewership and reach, the institution can tap into a wider audience and increase its visibility.

Even if institutions' social media channels are not currently popular, it is crucial to improve their quality and consistency. Our recommendation is to prioritise the creation of captivating, easily shareable content that highlights the institution's distinctive features. Just the news broadcast or some targeted propaganda does not work. Only a minority of audiences actually consider taking action in response to propaganda, which could fuel future research in terms of effect models of communication (Lock *et al.* 2019). Qualitative scrutiny of the channels showed that the content in the NCSM channels were mostly news broadcasts. It lacks any content value for varied interest groups.

Whatever is the case, with reference to the comparatively lower reach but recently high growing engagement level of BITM [Table I] it may not be out of place to indicate that building a strong online community can help create a positive reputation and encourage word-of-mouth promotion. We also find that the BITM engagement curve started peaking since the strategy of crowdsourcing by sharing user photos was adopted by the centre. The strategy of recognising crowd feedback in the form of “#Review Post” has significantly enhanced people’s engagement with the institution.

Conclusion — a strategic roadmap for onboarding the vloggers

Data collected from YouTube show that presently there are many vloggers covering different science centres and scientific content in digital space. But all the vloggers are doing that out of their own interest. Moreover, the contents are mostly popular in a particular language, location and culture. Yet, the reach of science centres is getting enhanced through this network of unorganised crowdsourcing. And that reach is mostly comparable to what NCSM is achieving in the physical space through an organised effort over the last 45 years.

This shows a clear possibility of reaching the unreached through virtual medium if a sustained and strategic effort is planned and executed. Also, this virtual reach can further supplement and reinforce the physical reach.

The data suggests significant scope for expanding physical and digital reach through onboarding of the vloggers. But right now, it seems to be effective for the large centres that are classified as National Level Science Centres. A question however remains — how to leverage their influence. We propose a roadmap here.

Science museums play a vital role in promoting scientific education, curiosity, and engagement. However, reaching a wider audience and attracting visitors beyond their physical location can be a challenge. In the digital age, vloggers (video bloggers) have emerged as influential content creators with a large and diverse following. Leveraging the popularity of vloggers presents a unique opportunity for science museums to

expand their reach and engage with audiences in new and innovative ways.

Vloggers, known for their engaging storytelling, relatable personalities, and visually captivating content, can effectively bridge the gap between the museum and a broader online audience. By partnering with vloggers who have a passion for science and education, museums can tap into their existing subscriber base and benefit from their expertise in creating engaging video content.

Through vloggers, science museums can showcase their exhibits, educational programmes, and interactive experiences to a global audience. Vloggers can film their visits to the museum, providing a virtual tour and sharing their personal insights and experiences. They can create informative and entertaining videos that highlight the museum's unique features, scientific discoveries, and the fascinating stories behind the exhibits. By collaborating with vloggers, museums can tap into their creativity and storytelling skills to present scientific concepts and discoveries in a way that resonates with their online audience.

Vloggers can also facilitate interactive experiences, such as hosting live Q&A sessions with scientists, conducting hands-on experiments, or participating in demonstrations. These interactive elements allow viewers to engage directly with the vlogger and the museum, fostering a sense of participation and connection.

Furthermore, vloggers often have a strong presence on social media platforms, where they can share snippets of their museum experiences, behind-the-scenes footage, and promote upcoming events or special exhibitions. This social media exposure can generate buzz and attract a wider audience to the museum's physical location.

Collaborating with vloggers can also provide valuable feedback and insights for science museums. Vloggers, being connected with their audience, can provide feedback on the museum's exhibits, accessibility, and visitor experience, helping museums improve their offerings and cater to the evolving needs and interests of their audience.

In conclusion, partnering with vloggers offers science museums an effective strategy to expand their reach and engage

with a broader audience. By leveraging the vloggers' creativity, storytelling skills, and online presence, museums can tap into new demographics, generate interest in science education, and create a virtual bridge between their physical exhibits and the digital world. Through vloggers, science museums can inspire and educate viewers, fostering a love for science and encouraging a lifelong interest in scientific exploration.

We would like to conclude the study with the following recommendations for NCSM which, in all probability, is equally applicable for any other similar public institution.

- 1 National level centre will prepare a list of regional vloggers with digital reach factor/day \geq that of the physical reach of the institution.
- 2 National level centres are mostly located in tourist places. Considering the visitors' profile, the vloggers could be selected to communicate with the target groups.

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