The adaptive science communication model in the middle of VUCA era in Indonesia: Study of startup Kok Bisa

Syora Alya Eka Putri
Universitas Indonesia, Indonesia
Email: syora.alya91@ui.ac.id

Ricardi S. Adnan
Universitas Indonesia, Indonesia
Email: ricardi.s@ui.ac.id

Abstract

This article analyzes the adaptive science communication model in the VUCA era. Previously, the model of science communication developed by scientific institutions and journalists in Indonesia tended to be challenging to understand by the public. Finally, in the development of technology, the model of science communication developed marked by the emergence of various creators who utilize social media. Nevertheless, due to dynamic conditions, the development of science communication models has not been fully adaptive. In previous studies, these conditions due to dynamic challenges due to the lack of public confidence in science and community participation to curate science tend to be slow in the rapid dissemination of information. This study uses a qualitative approach with case studies of digital data analysis. This study shows that the science communication model can develop more adaptively during disruptive conditions with innovations in social media from the form of presentation and inviting cooperation with other parties, as well as to conduct transformative

strategies by building organizational resilience, developing valid information, restructuring, and conducting experiments following organizational capabilities.

Keywords: *science communication models, innovation, transformation, social media, VUCA*

INTRODUCTION

In an uncertain and complex dynamic challenge, innovations and transformations are growing in various fields, one of which is the science communication model. In Indonesia, the science communication model is still managed by scientific institutions and journalists. Nevertheless, science communication conducted by scientific institutions or other media in science tends to be difficult for non-specialists to understand. This difficulty makes the community have not participated and have an awareness of information related to science. In addition, the problem of science communication is also hampered because the science institute has a bureaucratic pattern inherited since the Dutch colonial era. Continuing until after Indonesia's independence, science did not develop rapidly because of the systemic silencing of institutions. Non-specialist societies only passively receive information related to science from channels provided by the government.

In the development of reform-era technology, people can choose the information available. Information is available through many options on mass media, such as magazines, radio, television, and books. With technological innovations, especially information technology, people began to adapt information as a source of knowledge and into a lifestyle (Dalyono, 2014). Therefore, science institutions began to utilize mass media to disseminate research results to be accessible to the public. Previously, science communication was only done through scientific journals, but the information in scientific journals contained languages that tend to be challenging to understand by non-specialists (Indonesian Institute of Sciences, 2015).

In 2015, the science communication model also began to be developed and the rapid use of social media. Seeing the high number of internet users in Indonesia, there is the potential to develop science communication through social media. At this time, content creators began to appear that channeled educational information interesting to the public through Youtube and Instagram, such as Kok Bisa, Sains Bro, Hujan Tanda Tanya, and Wow Fakta.

The most commonly used medium, including by Kok Bisa, is motion graphics because interesting depictions of information can attract the public to science. Another reason, mediums such as scientific journals tend to be bombarded and consumed by non-specialists. Visualization is also done with short videos to share tips and information related to science. This medium is quite widespread for the public because it is shorter in duration (Editor Kompas.com, 2020). One of the most famous creators is Kok Bisa, which creates educational content with the most followers of 2.5 million followers on Youtube. In addition to Youtube videos, Kok Bisa also has an initiation of a science discussion called Antero. Then, during the pandemic, Kok Bisa built the initiation of increasing educational content through videos on Youtube through the Educational Academy in collaboration with the Ministry of Education and Culture, Youtube Learning, and LIPI (Kasih, 2020; Antara Editor, 2020).

Even so, the science communication model developed has not been adaptive because it has dynamic challenges. The challenge is the lack of policy on science communication in Indonesia because science communication is held in the education system. According to Law No. 20 of 2003 on the National Education System, education is known in three systems: formal education (elementary, secondary, and higher levels), non-formal education, and informal education (in families and environments). Furthermore, other challenges occur due to uncontrolled information spread without accompanied by education. The cause is that generating new science by the public tends to be slow, so it requires relevant stakeholders to control the accuracy of the information for an extended period (Chapman et al., 2019). The dissemination of information in social media can make public trust in science low (Retzbach and Maier, 2017).

In addition, the challenge faced is that the science communication model is still sporadic and not yet following the needs of the community. According to the Director of Communication of the Indonesian Academy of Young Scientists, it is argued that science communication is still sporadic and has not been systematically conducted on macro policy because it is based solely on the initiative of actors who conduct science communication. In addition, public participation in information related to science is still relatively low because stakeholders have not adapted it to the community's needs, and there are societal and institutional boundaries (Martin, 2017; Jia and Liu, 2014). Then came the question in the study: how to develop an adaptive science communication model during dynamic challenges?

Adaptive science communication models can be developed leveraging innovations on social media platforms and dynamic challenge transformation. Innovations made in the platform can take advantage of two approaches: visual literacy and narrative explanation (storytelling). These approaches are relatively effectively used as a medium of information related to science (Padian, 2018; Fox, Nakhata, and Deitz, 2019; Finkler and Leon, 2019). Nevertheless, in the development of innovation, it takes intervention through technology and encouragement of organizational creativity to directly follow the objectives in cultural society. In addition to innovation, transformation can also be done with various strategies such as building resilience in innovating, developing credible information, restructuring networks, and conducting experiments to reduce ambiguity. The strategy is also encouraged by the development of initiation by actors based on knowledge and capabilities. This study aims to analyze how adaptive science communication models in Indonesia utilize social media platforms driven by one of the new media organizations.

LITERATURE REVIEW

Science Communication Model

Media startup organizations can develop science communication innovations by involving several activities in the form of awareness, enjoyment, interest, opinions, and understanding of science (Burns, O'Connor, and Stocklmayer, 2003). This activity is vital because it makes science more attractive for modern society. Media used in science communication is diverse in communication in mass media, government communication to the public, and communication conducted by the science community. According to Burns, O'Connor, and Stocklmayer (2003), the science communication model used by specialists (parties with knowledge) is transferred to others as a non-specialist society. Science communication can be done in several ways: [1] structured, through seminars, science education in schools, school textbooks, presentations/dissemination of research results, and distance education materials, and [2] informally, through television/radio programs, museums, CDs, internet forums, science clubs/communities, magazines, popular science books, festivals, and open day research organizations, theater performances. This medium is used as part of the contextual communication of modern science to share public knowledge. Science communication media is growing

into a medium that is one-way and packaged in one-way dissemination and invites public participation. The forms of science and media communication used are tailored to the shape of the audience and its science communicators. In conducting science communication, participation and dialogue are the priority but the use of jargon that is only spread among certain circles needs to be avoided in science communication.

Innovation and Transformation in VUCA era

Bennett and Lemoine (2014) mentioned that in the VUCA era, there had been a disruptive situation in the world of globalization filled with volatility, uncertainty, complexity, and ambiguity. This condition becomes a difficult challenge to be faced by leaders in running their organization or company. The condition causes innovation and a transformation process. Disruptive changes, especially during the digital industrial era, result in restructurings that make the infrastructure and industry actors involved in the more complex so that in the process, adaptive capabilities of social actors and institutions are needed to facilitate transformative change (Kenney, Rouvinen, and Zysman, 2015; Barnes, 2017). In the field of communication, science undergoes a transformation process catalyzed by changing information and communication technology systems and social agents. Social agents' social transformation can occur due to accelerated social platforms, which are then maximized usage by actors both micro-scale to macro (Letaifa, Edvardsson, and Tronvoll, 2016). Science is a driver of community activity and social reality. The massification of science in community activities makes social processes that occur increase complexity, organize social order, and give birth to norms (Popova, Moiseenko, and Beavitt, 2017).

Nevertheless, the transformation will lead to anomie that leads to adaptation in the form of innovation. Innovation, according to Merton, is one form of adaptation to anomie to achieve the goals of society in a way that other institutions have not legitimized. However, eventually, innovation will become conformity when other groups have made the same innovation because innovation also has a positive response if the innovation product can be helpful to or have a positive impact in daily life and the condition has also been institutionalized (Heckert and Heckert, 2004).

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METHODS

This study uses a qualitative approach with case studies. The case study analyzes science communication innovations conducted at one of the organizations engaged in science communication in Indonesia, Kok Bisa. Kok Bisa has the most significant following in Indonesia at 2.65 million people on Youtube channels as of May 2021. The data gathered comes from documents related to the phenomenon of science communication conducted by media startups available on social media from 2015 to May 2021. The data sources used are transcripts of interviews with research subjects both internally Kok Bisa organization, external parties who have worked with Kok Bisa, and individuals as audiences and online news articles/portals about the field of science communication in Indonesia the period 2010-May 2021. The process to gathered the data until analysis are (1) identifying research problems with a focus on the science communication model conducted by Kok Bisa and in Indonesia (2) began to identify in detail in the case of science communication in Indonesia, (3) conduct data collection through interviews and secondary data collection, (4) interpret the findings, analyze phenomena in studies and make conclusions. The validation strategy used is to triangulate the source by testing its credibility through several different source documents such as interview transcripts from all respondents, news articles, and scientific journal.

RESULTS AND DISCUSSION

Communication of science in Indonesia can be a bridge to build a scientific culture for both policymakers and the public. Nevertheless, during this time, the development of science communication reaped various challenges since the Dutch colonial era, which finally made non-specialist society challenging to understand information related to science. The scientific findings are only done in the same direction by researchers to the public. Non-specialist societies only passively receive information related to science from the channels provided. Sometimes, research and publications conducted by research institutes spread among certain circles only. It does not reach the public (Basuki, 2020).

In the development of reform era technology, people began to be able to choose the information available. Information is available through many options on mass media, such as magazines, radio, television, and books. Therefore, science institutions began to utilize mass media to disseminate research results to be accessible to the public. In the 2015s, content creators

who took advantage of the growth of social media began to conduct science communication. There began to appear several content creators who produced educational content developed into media startups, such as Kok Bisa and Hujan Tanda Tanya through Pahamify. In other words, science communication in the era of social media managed by scientists or mass media and the initiation of content creators who create casual and exciting educational content. Content choices for communicating science in the age of social media are also diverse. In addition to books and scientific journals, science communication is also done by visualizing various mediums according to the platform. The platforms include Youtube, Instagram, Twitter, Facebook, and Tik Tok.

One of the most used platforms is Youtube. According to Google Indonesia's Head of Consumer, in 2018, there are 1,700 Youtube channels with 100,000 followers, although there is still some educational creator content that has not focused on the education category (Jemadu, 2018; Rinanda, 2018). Among various creators, until 2018, Kok Bisa became one of the creators of educational content characterized by animated videos with the highest number of followers. Other educational Youtube channels such as Hujan Tanda Tanya, Sains Bro, Kamu Harus Tahu, Ayo Mikir, and Nous ID have tens to hundreds of thousands of followers on Youtube Kok Bisa have one million followers on the Youtube channel.

Compared to other content creators, educational content creators are not included in the 10 Youtubers with the most followers because the majority is dominated by entertainment content creators such as Atta Halilintar, Ria Ricis, and Raditya Dika (Saintif, 2018). Seeing a reasonably small amount of educational content, Youtube itself has its policy of creating playlists called learning playlists to increase video traffic created by educational content creators and have funding to support educational content (Fauzia, 2018; Wisesa, 2019). In 2019, there is a prospect for the continuity of startups engaged in education because it is in line with government policies to improve the quality of human resources (Jatmiko, 2019). This year, there began to be a trend in educational content in short video mediums. The creator of content that still stands out and consistently shares science content is Kok Bisa.

The content created by Kok Bisa can reach all circles because the information provided is general (Sadiyah and Warsito, 2019). In 2019, Kok Bisa can also be a bridge between science communicators from the side of journalists and scientists. Kok Bisa carried out this innovation to bridge Tempo (from the journalist side) and LIPI (from the scientist's side) in creating science content. In

this case, Tempo has a role in socializing information, and LIPI has the resources to provide research-based information. This bridge can socialize science content simply to the general public. This form of collaboration between the two parties is seen in the development of communication innovation in Kok Bisa. Finally, the innovations made by Kok Bisa can bridge the interests of actors who play a role in the ecosystem of science communication, namely between journalists and scientists, although only limited to collaboration.

Entering the pandemic in 2020, awareness of science communication from the mass media and scientists is growing. This information related to Covid-19 tends to be challenging to understand by non-specialists. Eventually, the community does not get well educated before the Corona pandemic. Similarly, with social media, information related to science cannot be easily found by the public because the sources of scientific articles are the opposite.

There was a significant change in this pandemic during this problem due to the increasing demand for educational content. This challenge happened because of the need for content for learning from home. According to The Managing Director of Google Indonesia, there is an 80% increase in educational content, including content about science, humanities, and business (Tesalonica, 2020). Despite the high demand, according to the Ministry of Education and Culture, the amount of educational content on the Youtube channel is still limited compared to music and entertainment content. To respond to the problem, Youtube, the Ministry of Education and Culture, and the Institute of Sciences collaborated with media startup Kok Bisa to reproduce educational content on Youtube channels through the Edukreator Academy program. In this case, until 2020, Kok Bisa is one of the organizations that have a role in popularizing science communication in Indonesia through various innovations developed.

In the innovations that Kok Bisa has done in science communication, Kok Bisa can use the model of science communication with motion graphic and storytelling presentations starting from 2015 in Youtube channels starting in 2015 and developing other information channels from Instagram. Some of the innovations made by Kok Bisa bring a message to communicate science by way of storytelling and animation in each video. This way of conveying a storytelling style and animation presentation is quite effective to be understood by the community, especially students and students. This communication strategy aligns with the community's goal of obtaining digital learning materials with easier delivery. The language used by Kok Bisa is tucked into humor

and entertaining through analogy and inserting jokes that are familiar to the public. In addition, the topic brought by Kok Bisa is an incident experienced by everyday people. New to the discussion of the video, Kok Bisa slipped the theory related to the incident.

In addition, the innovation of science communication made by Kok Bisa was supported by the use of social media platforms, namely Youtube, and by the existence of a network of actors to build a science communication ecosystem in Indonesia. In addition, Kok Bisa also has a network of external actors who have considerable resources and influence in society, such as Google and government agencies such as the Ministry of Education and Culture. Kok Bisa was also constantly pivoting, especially at the starting point of success after the viral video about the recession in 2015 and entering the year 2020. Kok Bisa made the most prominent innovation in 2020 because it was directly involved in bridging the interests of journalists (Tempo) and other agencies, such as LIPI, the Ministry of Education and Culture, and Youtube Learning initiation of the Educational Academy. In other words, the innovations made by Kok Bisa are enough to change the social structure in developing science communication, namely to make educational information can be understood easily by the public and also using digital platforms, such as Youtube. Kok Bisa offers alternative content that is educational for the community but also entertaining.

The innovation only comes from the initiation of actors to invite others to collaborate and involve the community as an audience to participate in developing innovations. Various innovations by Kok Bisa have changed the structure in science communication, which journalists and scientists have held. The variety of innovations has made Kok Bisa a hub to make science popular among the public. The methods used by Kok Bisa are in line with the concept of Merton, namely that it has not gained legitimacy because the science communication ecosystem has not been formed. However, in the end, the innovations made by Kok Bisa can be in line with the cultural goal of making science more accessible and understandable because of its attractive presentation. However, it is not easy for Kok Bisa to develop innovations because it faces challenges that initially form motion graphic video is not familiar to the public and the absence of an integrated science communication ecosystem in the form of policies. Because each party initiates sporadically and lacks educational content in digital platforms, especially Youtube, people tend to consume entertainment and music content.

Even so, Kok Bisa continues to run innovations since 2015 to gain legitimacy to develop science communication in Indonesia. The innovation such as having discussions with agencies, creating online classes, and interacting with audiences as a form of an invitation to the audience is also to be involved in developing science communication. The form of legitimacy can be seen when Kok Bisa gets awards at international events, gets a Gold Play Button from Youtube, can collaborate with central agencies, and has many followers on his Youtube channel. It shows that the innovation has developed into conformity, thanks to the legitimacy and some groups that follow the innovation Kok Bisa seen in the Academy of Educators and science video challenge.

In this case, the innovation of Kok Bisa is in line with Merton's concept that the innovations made by Kok Bisa have changed the structure when it can collaborate with various parties and use non-conventional means for other parties, with the presentation of animation and presentation with language understood by the community in everyday life. However, Kok Bisa's innovations have also faced some challenges due to disruptive and dynamic changes. Dynamic and disruptive changes are unintended consequences that require anticipation measures from the organization. Because the sustainability of the development of science communication depends on the organization's capabilities, the innovations that Kok Bisa has done can be developed in line with uncertain and complex conditions until finally compiled with transformative strategies.

The volatile, uncertain, complex, and ambiguous conditions faced by Kok Bisa can hinder scientific communication innovations. In the volatility of Kok Bisa, such as rapid changes during the Covid-19 pandemic, the lack of educational content was used for home learning. From We Are Social data (2020), about 88% of people use Youtube, which is still predominantly used for entertainment and music. However, there was a rapid change when learning during the pandemic was held from home, resulting from which people began to adopt learning content from Youtube. Unfortunately, educational content in Youtube media has not been so much because science communication on social media has not been done systematically. Finally, it causes a small amount of interactive educational content to be available compared to music content, especially on Youtube. It was mentioned by the Ministry of Education and Culture, which is aware of the amount of learning content in the digital space during the pandemic. As a result, learning content still refers to learning books in schools and has not been transferred using other platforms, such as videos or podcasts.

In addition, the volatility occurs due to algorithm changes on the platform. Algorithms become one of the policies of Youtube as the main navigation for the audience to find video material and other information relevant to its interests. If the resulting content is unpopular and liked by the audience, then the platform will not provide similar content recommendations to the audience. It is an obstacle because this algorithm does not optimize academic goals. This algorithm problem was also an obstacle experienced by media startup Kok Bisa because the audience got the content through the Youtube platform's recommendations. The science content produced by Kok Bisa is not popular enough compared to other content such as entertainment. This vulnerable condition is seen when the public hangs information produced by the media, but the media is also vulnerable to following the changes in society.

In the uncertainty faced by Kok Bisa, information overload is caused by momentum, information overload, and no expert as an information gatekeeper. Certain momentum, such as the Coronavirus pandemic, causes the situation to become a crossroads. During the pandemic, there were widespread infodemic events and information that was distorted and claims made not based on scientific facts. The amount of hoax content at the beginning of the pandemic until May 2020 was found by the Ministry of Communication and Information as many as 1,401 content, making it difficult for the public to get official information. In addition, the claims were made on a misleading scientific basis, for example, when circulating viral information claims from Hadi Pranoto about herbal medicine and the formation of Covid-19 antibodies discussed in the Youtube channel of one of the musicians (Sumartiningtyas, 2020). Changing government policy is the change of face-to-face learning system to online due to emergencies during the Covid-19 pandemic (Public Relations Secretariat of the State, 2020). The change is quite challenging due to the limited amount of educational content in digital media. According to the Ministry of Education and Culture, the amount of educational content on the Youtube channel is still limited compared to music and entertainment content (Antaranews Editor, 2020).

However, this information disclosure makes anyone who comes from a different circle beside the mass media also present his thoughts. Then, the information circulating becomes overloaded. As a result, access to essential information needed amid momentum is also challenging to find. In addition, the current information overload is ineffective because the existence of social media platforms such as Youtube makes it easy for users to make the

information as accessible as it is without control accuracy. It is coupled with the limited number of experts who play a role in curating information. The number of science communicators in Indonesia is also still limited, the impact of educational content is also limited. The number of experts (scientists) as gatekeepers is also limited, so credible information only reaches a specific circle.

In addition, there are conditions of complexity there are some challenges faced by Kok Bisa, such as the differences of interests between actors involved in the field of science communication and movements that are sporadic, the bureaucracy that is too long, and rigid conventional systems that cause science communication to take place to tend to be complex. For example, during the pandemic, complexity is seen when dealing with various kinds of hoaxes and disinformation because the way of communication from the government and scientists has not changed using language that is poorly understood by the public because it has not seen the importance of science communication in the media compared to using international publications. In addition to complexity, innovations are initiated; one of them is Genose that is sentimental between the government and scientists due to differences in interests (Dzulfikar, 2020; Souisa, 2021).

Furthermore, the condition of ambiguity occurs due to differences in perception between information producers and audiences due to the belief of different societies, the impact of simplification of language, and the difficulty of translating jargon language into the language used by everyday people. In this challenge, ambiguity occurs because of the limitations of knowledge and tradition of communication of science owned by the producers of information about people's beliefs. For example, the amount of scientific jargon used in each field of science can not be understood by people who are not familiar with and within the scope of the jargon. Kok Bisa's internal team conveyed it in making video content in cooperation with one of the agencies. There is one scientific jargon, sovereign wealth fund, which is commonly known in economics. The agency has a view to being able to explain sovereign wealth funds from this form of jargon only, but this language is considered less common by Kok Bisa to be understood by non-specialists. Finally, the language is still delivered in the form of jargon but adapted to the analogy to still be understood by non-specialists. The condition of ambiguity is seen when using this jargon. It can be interpreted differently due to the limitations of audience knowledge.

These conditions make the sustainability of innovations carried out can be hampered. However, instead of being hampered, the condition can be used

to develop scientific communication innovations. Each dynamic and disruptive condition has its transformative strategy. These transformative strategies include building resilience, developing valid information, restructuring, and conducting various experiments. The condition of vulnerability due to rapid changes in the pandemic faced by the organization can be overcome by building organizational resilience. Conditions of uncertainty caused by excessive and uncontrolled information can be addressed by finding valid information based on credible sources. The complexity of the many networks of actors involved and having differences in interests, bureaucracy, and organizational systems can be overcome by restructuring by becoming a bridge between parties, flexible bureaucracy, and providing space for organizations to develop innovations. The condition of ambiguity due to cultural differences with society, the difficulty of translating scientific jargon can be overcome by conducting experiments.

In this case, each case has a settlement with the relevant strategy. In volatility, a rapid change due to the Covid-19 pandemic can be overcome by a corporate ecosystem. There is a change in the way people learn that can be overcome by developing innovative things. The existence of capabilities can overcome algorithm changes as digital natives. In the condition of uncertainty, there are problems such as the momentum that can be overcome by [1] finding valid sources, [2] the existence of information overload that can be overcome by curating, and [3] the absence of experts as gatekeepers. It can be overcome by the existence of editorial policies as the organization's capability to become an information gatekeeper and include references so that the audience can do fast checking. In conditions of complexity, some challenges are differences of interest overcome by the joint initiation in the hub built by the organization, and the existence of a long bureaucracy. It can be overcome by restructuring the bureaucracy of media startup organizations more flexibly, and the existence of a rigid conventional system in communicating science can be overcome by creating organizational values to keep the content simple. Lastly, in ambiguity, there is a challenge that differences in perception with society can be overcome by presenting analogies that are easy to understand by society, the difficulty of translating jargon language into colloquial language by the perpetrators of previous science communication. It can be overcome by choosing words that are easy to understand by the community, using humor, and popular culture references, as well as the problem of simplification of language circulating in digital media. The chassis presents contrast narration as a step to provide brief and detailed information.

The strategies that the organization has developed can be used as an opportunity to develop transformative innovations. Innovations made by organizations can help with challenges during the digital learning age because teachers, teachers, and lecturers, are challenged to produce exciting learning materials in digital media due to the hampered transfer of knowledge (Hendayana, 2020). In this case, it appears that VUCA can be the basis for media startup Kok Bisa to transform science communication. In addition to complex conditions, other strategies that support organizations are to have the capability and knowledge to create initiations, use social media platforms, and build networks with actors who move to conduct science communication.

The capabilities possessed by Kok Bisa in shaping the company's ecosystem so that it can adapt to rapid changes and develop innovative things by utilizing momentum in 2020. Next, there are capabilities and knowledge possessed by Kok Bisa in providing credible sources and can reach out to several agencies to create content or initiate. The data sources used by Kok Bisa in its content are taken from credible sources over the internet, such as scientific journal articles, leading science sites (The Conversation, Vox, Science Wired), and reliable news sources. The sources used for video content are always listed in the video description field. The source is listed in the form of a link so that the audience can quickly check and find out more about the content discussed by Kok Bisa. However, to do fast checking requires participation from the community because the community does fast checking by having literacy and critical thinking.

Then, this platform can be a bridge between parties engaged in science communication and other agencies, such as bringing together journalists and scientists' interests and policyholders (government). It was shown when Kok Bisa organized the Edukreator Academy. Several agencies supported this initiation, such as Youtube Learning, the Ministry of Education and Culture, the Indonesian Institute of Sciences, and other content creators. According to Founder Kok Bisa, the initiative to encourage educational creators is inspired by what educational creator content has done until it forms into a community abroad. The existence of these communities can be a bridge to encourage other creators to produce and disseminate educational content. It can be a solution to connect scientists with society, rather than blaming both parties. In the Academy of Educators, seen by the government, LIPI and Kemendikbud collaborated with the private sector, Youtube Learning which the initiation made by Kok Bisa bridged. According to Mila Kencana, Head of Legal, Cooperation, and Public

Relations Bureau, LIPI said cooperation in packaging more popular scientific research to understand science literacy. Similarly, the expression from Hasan Chabibie, Plt. Pusdatin Kemendikbud expressed support to the Edukreator Academy to support creators to produce high-quality educational content. One of the initiations conducted by Kok Bisa can bring together the interests of other parties in developing high-quality educational content on Youtube.

In addition to the initiation of the Educational Academy, Kok Bisa also collaborates with other parties of different backgrounds and sectors of the field through jointly run innovations, either in the form of video content or online classes. Kok Bisa creates classes/training online with NGOs, one of which is the Indika foundation. Kok Bisa with Indika Foundation created an infographic class for the general public about COVID 19. In addition to the Indika Foundation, Kok Bisa also collaborates with Refo Indonesia and the Ministry of Education and Culture, conducting online training for teachers in schools to create learning content that appeals to their students. The themes raised include starting educational channels on Youtube and creating science content that is easy to understand quickly and interestingly. Kok Bisa also provides training for teachers to create science transfer media that can be interesting in digital platforms. The method used by Kok Bisa is different from the teaching methods commonly used in conventional education systems. Nevertheless, because of the need to create digital learning media, finally, the way used by Kok Bisa can also be adopted by teachers in schools. In this case, the way of transferring science owned by Kok Bisa has become one of the alternatives and changed the structure of conventional teaching methods. In other words, Kok Bisa has the opportunity to develop its innovations through cooperation with various agencies that have strategic interests to build a science communication ecosystem in Indonesia.

Next, the capabilities possessed by Kok Bisa in experimenting with packaging content that contains science appeals to the audience because it slips humor, uses popular culture references, uses analogies, and discusses it with a helicopter view. In this case, it appears that Kok Bisa has dynamic organizational capabilities when developing innovations. However, there are still challenges in each strategy that needs to be a record for the organization. These challenges include volatility due to limited audience segmentation and not yet making the most of disseminating information on platforms other than Youtube and Instagram, uncertainty due to the accuracy process with the speed of dissemination of unbalanced information. The lack of experts who

can filter information according to their expertise. Due to the sustainability of actors' initiation in science communication and initiation is still sporadic and increased audience engagement to fast check or delve into a specific topic discussed by Kok Bisa as a measure of anticipation of reducing ambiguity.

From the four challenges, it appears that the condition of uncertainty becomes a condition that is quite difficult to adjust to the strategy because there is still no proper strategy to balance between the speed of information dissemination and accuracy. On the other hand, Kok Bisa can use its capabilities to cooperate with various parties to form a science communication ecosystem. The existence of a science communication ecosystem can suppress the condition of uncertainty because each can curate information. In addition, the platform also utilizes its capabilities in interacting with the audience to be able to do fast checking and explore its curiosity to explore a topic and overcome uncertainty due to the lack of experts who become information gatekeepers.

Kok Bisa also invites the audience to interact and discuss the comments field and community tab on Youtube. The comment field on the video is used by the audience as a way to be able to convey what is thought, the related part, or can discuss with other audiences. The call to action to the audience is evident from the inclusion of sources on each Kok Bisa video. The data source is placed in the description field. The goal is for the audience to fast-check. It is conveyed by an audience of Kok Bisa that the presence of sources listed in the content can facilitate data validation done independently, whether the source is trustworthy or not. However, to distinguish between valid information or not comes from the audience who have obtained information academically, such as on-campus or who have the curiosity to be able to criticize the information obtained by it. At the same time, there are still quite many other audiences who do not have such capabilities.

Therefore, disruptive conditions and challenges can be used as a basis for transformation so that the science communication model can be adaptive because the condition has its strategy to deal with it. Challenge conditions and strategies will make it easier for organizations to determine what kind of innovations they want to develop by leveraging their dynamic capabilities. In this case, media startup Kok Bisa can develop innovations that have been lived by improving the capabilities of dynamic organizations and adjusting disruptive challenges because disruptive conditions will continuously evolve, and each challenge has its transformative strategy. Because every disruptive condition has

challenges caused by various factors and will continue to develop a variety of unintended consequences due to innovations developed.

Nevertheless, from the capabilities that media startups have done, Kok Bisa has enough capabilities in the face of ambiguity and complexity conditions, seen from innovative experiments, and can build networks that can be useful to build a science communication ecosystem. Although, other actors have not yet established a collaborative initiation with Kok Bisa. On the other hand, Kok Bisa is quite challenging to face uncertainty conditions because curating and retrieving credible data sources is quite tricky amid the information overload and rapid dissemination of information in digital platforms. In addition, this uncertain condition also makes the Kok Bisa ecosystem experience vulnerabilities due to rapid changes due to the development of society and technological innovation by the platform.

This form of innovation and transformation can be the foundation to form an adaptive science communication model. They were referring to what has been done by Kok Bisa, innovations made in social media platforms using the delivery of motion graphic animation and storytelling. However, at first, the content carried by Kok Bisa has not been considered popular because it packs science in a fun way in the form of animation. Usually, science content is only found in other media. Educational content was also not in demand by the public because, at that time, Youtube functioned as a medium to find sources of entertainment. Youtube channel owned by Kok Bisa belongs to the science communication section with an informal form because the media used is a Youtube platform and has an online community. Kok Bisa continues to produce video content because it aims to make science popular in Indonesia. It is in line with Merton that the innovation brought by Kok Bisa has the purpose of educating the community, but the way it is used is less popular because the interest of the public tends to entertainment content and only get science information in school.

Nonetheless, it can achieve the goal of developing the ecosystem of science communication by becoming a party that bridges actors' interests in the same field and creates educational content that the public can access through digital platforms. Various innovation efforts made in the end can be conformity because some parties have legitimized the innovations made by Kok Bisa. In addition to innovation, adaptive science communication models are also supported by transformative strategies utilizing disruptive conditions through

actor capabilities in building organizational ecosystem resilience, generating valid information, restructuring by building hubs or bridges and conducting experiments to reduce ambiguity due to gaps in people's knowledge and beliefs.

CONCLUSION

The communication model of science in Indonesia has led to a more adaptive model by utilizing innovation and transformation strategies amid the VUCA era. In this case, there is adaptive models of science communication led by startup media Kok Bisa. The style of science communication that Kok Bisa uses with a presentation in motion graphics, storytelling through short videos, and working with creators or other agencies to creating online classes and training to reproduce educational contents in Indonesia. The innovations developed by Kok Bisa gained legitimacy from other parties, which is characterized by achievements in international events and ease of collaboration with significant agencies. Nevertheless, the innovations developed face challenges from volatility, uncertain, complex, and ambiguous dynamic conditions. These four challenges show the complexity of challenges in science communication in Indonesia because the challenges are interrelated. As a result, science communication that media startups have conducted has also become hampered by these dynamic challenges. Suggestions for the actors involved, innovations that Kok Bisa has done can be a reference for actors who play a role in developing science communication in Indonesia. However, in the development of such innovations, Kok Bisa can analyze disruptive conditions and dynamic changes to be structured into transformative strategies. For policymakers, it is necessary to have the capability to develop science communication in order to socialize policy to the community. For further studies, using the VUCA concept can be used to analyze a phenomenon in the present state and analyze transformative strategies. However, it is necessary to define each derivative of the VUCA element in it by being supported by other concepts.

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