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Challenges of adopting digital marketing technologies by grape growers and role of government support: A study across Karnataka state

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Abstract
The purpose of the study is to explore the difficulties grape growers face when choosing digital marketing technologies and to observe what role the government has in helping them to use these technologies. The study aims to discover what challenges hinder grape growers when they use digital marketing such as problems with technology, investing in it or learning about it. It also aims to assess whether the government's initiatives, policies or programs help grape producers to make good use of digital marketing methods. The study uses a quantitative approach concentrating on grape growers in Karnataka, gathers information from 100 Grape growers using convenience sampling and ensures a 10% margin of error. The process involved giving a standard set of questions about participants' backgrounds, challenges, government support and how they use digital marketing. SPSS is used for descriptive statistics to get a clear picture of the classification and the trends in the data. Moreover, structural equation modeling (SEM) in AMOS will be used to study the influence of obstacles and government aide on grape growers' decision to use digital marketing. The findings show that there is a negative impact of Challenges in adoption of digital marketing technologies of grape growers in Karnataka. The study also finds that there is a positive impact of Government support in adoption of digital marketing technologies. The study suggest that policymakers should try to help and support grape growers in making beneficial use of digital technologies. Such a mixed plan handles the challenges of the moment and makes sure the sector remains healthy and grows over time. Increasing digital marketing abilities allows growers of grapes to handle market changes, work more efficiently and support the region's progress.

Keywords: Challenges, adopting digital marketing technologies, grape growers, government support

Introduction
Karnataka's grape industry is a major part of the countryside, supporting both local agriculture and farmers' livelihoods. Even so, even though digital marketing technologies are becoming more significant for improving visibility, awareness and profits, granules in India still encounter many obstacles when trying to adopt them. Some difficulties are caused by a shortage of digital resources or because farmers do not have the skills needed to use technology. Also, government assistance is very important in making this change easier, so we need to look at it to find out how to best encourage digital adoption.

One major problem with digital marketing adoption for Farmers is the scarcity of digital infrastructure. Because internet coverage is weak in most rural areas, farmers have difficulties making full use of online marketing (Pradhan *et al*., 2024) [18]. Because of poor internet connections, victims have difficulties finding details about the market, preferred consumer products and competing with others (Nyagango *et al*., 2023) [15]. Many farmers avoid fully using digital technology because they do not receive enough training on how to use it (Reddy, 2021) [21].

Farmers sometimes do not understand the benefits of digital marketing, making it a big problem. A lot of grape growers are still using old marketing tactics which reduces their reach and the profits they can make (Sharma *et al*., 2024) [25]. It was noted by Sarjerao (2021) [22] that having technology is not enough; we also need the right knowledge to get the most out of it. Many farmers tend to doubt digital platforms because they are unsure of how they can positively affect their farm's finances (Vasavi *et al*., 2025) [28].

Tight budgets significantly impact the obstacles that winning teams have to handle.

Some small operators may have difficulty with digital marketing since it involves purchasing smartphones, getting data packages and possibly undergoing training (Yarazari *et al*., 2022) [29]. Resource-poor farmers are more likely to put money into essential farming activities rather than digital marketing efforts which helps them achieve growth and greater profits (Babybowna, 2018) [2].

Also, because the grape market is so competitive, using digital marketing can be a hurdle. If a sales proposal or special product differentiation is left out, many businesses may face difficulties being noticed online (Phadke *et al*., 2022) [17]. As many products are advertised on digital channels, it becomes difficult for essential farmers to compete, so they might not be able to do the required marketing due to their problems.

Digital marketing adoption by grape producers is facilitated by the government's support. By teaching farmers digital literacy, it is easier for them to use online platforms for marketing their agriculture products (Chaudhari and Anute, 2022) [6]. Using mobile applications to help with marketing and sharing information has been promising for changing how graphic marketing is done (Nikam *et al*., 2020) [14].

Besides, subsidies from the government aimed at using digital technology can ease the budget constraints of grape grapes and help them try out new marketing methods (Ray, 2024) [20]. Sharma *et al*. (2020) [24] studied that better awareness of digital marketing among farmers through government-run programs can help the farmers accept it. Programs like these encourage the sharing of wins, encouraging others to imitate their achievements.

As well as teaching small farmers digital skills, the government can support platforms that unite farmers and let them access training and benefits from working together (Reddy, 2021) [21]. If political support promotes using technology in farming, it could boost how efficient the grape market supply chain is and raise the market's competitiveness (Khan *et al*., 2020) [11].

Since digital marketing tools are not easy for farmers in Karntaka to get used to, the government plays a very important role in helping them adopt them. Better digital literacy, better infrastructure and financial rewards play a big role in making this transition happen. Working on these obstacles matters to the development of the company as well as to the well-being of the farmers who help keep it running. For this reason, close cooperation between the government and the agriculture industry is required to use digital marketing fully within the Indian grape sector.

With this background the current study is entitled "Challenges of adopting digital marketing technologies by Grape growers and role of government support - A study across Karnataka state"

The study first explains why digital marketing matters for agriculture and then looks at the situation of grape growers in Karnataka and how government support helps them adopt new technologies. Then, information from relevant studies about agricultural digital technology adoption, the main problems of farmers and government efforts is analyzed. In this section, the researchers talk about the quantitative methods they used to gather and analyze information from grape growers all over Karnataka. In the findings and discussion part, the research identifies the main problems as low digital literacy, high costs and infrastructure issues and discusses how the government overcomes these by providing training, financial assistance and new policies. Overall, the study highlights that successful use of digital marketing technologies depends on agreement between grape growers, technology companies and the government which can make Karnataka's grape growers more competitive.

Review of literature

The use of digital technology by farmers in India is limited by many challenges which stand in the way of them being more effective and sustainable. Lack of digital equipment is a big problem in this situation. A lack of proper internet connections in rural places makes it hard for farmers to use digital advertising platforms. According to Chaudhari and Anute (2022) [6], it is difficult for agricultural service companies to use digital marketing in regions that lack basic infrastructure. According to Reddy (2021) [21], because of the lack of technology, farmers are unable to fully use digital marketing, therefore making these strategies less popular among them.

Not having proper education on digital marketing is also a major factor that stands in the way for farmers. Because many farmers in India do not know much about technology, using new digital marketing methods is not easy for them. Tiwari *et al*. (2021) [27] underlined the need for education so that farmers are able to make use of online resources and tools. In this study by DAS and PRADIP (2021), they noted that present farming programs do not sufficiently discuss digital marketing and this lack of knowledge is an obstacle for farmers. Farmers were not able to understand digital marketing fully since they didn't get the right education which weakened the impact on their businesses.

Discussions about digital marketing always have to consider how economics influence the process. A shortage of funds can prevent farmers from using digital resources and also from wanting to join training courses. Research from Kumar *et al*. (2025) [13] shows that farmers mostly invest their budgets on urgent needs rather than on digital marketing. As a result, reaching this quick objective might overlook chances to benefit from digital marketing in the future which could lessen the sustainability of farming. Bose and Kiran (2021) [5] also mentioned that worrying economic conditions among farmers, for instance unstable markets and various crop price shifts, make them less committed to digital marketing.

Lack of infrastructure, especially technology, creates huge problems for rural India's productivity. In their study (RAO, 2022) [19], the authors pointed out that strong infrastructure plays a key role in making digital marketing successful in agriculture. Because of poor transport systems and supply chains in rural areas, selling farm products digitally is made more difficult, according to Arief *et al*. (2021) [1]. Digital marketing does not work well for farmers in this region unless there is improved support infrastructure and technology which requires involvement from politics.

Also, recent research points out that overcoming these challenges requires strong support from the government and institutions. In their study, Dhillon and Moncur (2023) [9] underlined that training sessions and workshops can greatly increase farmers' readiness to adopt modern farming techniques. Bisen and Kumar (2018) [3] bring up the E-National Agricultural Market (E-NAM) to make sure farmers have more access and to improve efficiency, stressing the need for organized reforms in agricultural marketing.

The use of advanced technologies like the Internet of Things (IoT) offers farmers both advantages and disadvantages. According to Jarial (2022) [10], if IoT helps organizations increase their productivity and reach a wider market, it leads to challenges related to expenses and the expertise needed. However, Shaheen *et al*. (2020) [23] added that using precision agriculture techniques could enhance farm productivity; But many farmers lack the necessary resources and know-how to achieve this.

Different government efforts have been put in place to ease this shift, knowing how both positive and negative factors come with the digital innovation in agriculture. Using digital marketing in agriculture has greatly improved the ability of farmers to get their goods to customers. Digital technology brings farmers closer to their customers and sellers, letting them get rid of middlemen and raise their earnings (Deshmukh & Patil, 2021) [8]. Moreover such platforms give farmers instant updates on prices and demand in the market, so they can make more informed choices. According to Reddy (2021) [21], digital tools have strongly influenced how agricultural businesses work in India and farmers who use them to market online have enjoyed stronger sales and higher productivity.

Nevertheless, there are a number of obstacles to getting these technologies into use. Many farmers cannot use digital tools effectively because their digital literacy is not high (Kollinal, Moolakkattu, & Paul, 2019) [12]. Poor infrastructure infrastructure, mainly in rural regions, stops businesses from using advanced digital marketing. Though the government is working on it, not all students are able to use the internet due to slow connections and not having suitable devices which limits the success of the government's plans (Sindakis & Showkat, 2024) [26].

Such government efforts, including the Digital India Initiative, supply farmers with assistance and training. In workshops and by participating in educational programs, farmers will find advice on the benefits and uses of digital marketing. According to Chaudhari and Anute (2022) [6], companies in India's agriculture sector embraced digital marketing because of government incentives, showing how useful such initiatives are.

Government work on land tenure and small-scale farming can have a huge effect on both productivity and opportunities for selling produce. The government helps farmers use digital marketing tools which benefits not only them, but also boosts the whole agricultural economy. Deshmukh and Patil (2021) [8] discovered that the use of digital tools in agriculture can greatly enhance both success and earnings. Hence, progress in Digital Marketing for Indian farmers largely relies on what the government supports and does.

Research Gap

Although digital marketing helps increase the market reach and earnings of agricultural products, little research has been done on the key hurdles that grape growers in Karnataka encounter when adopting digital marketing technology Although there is plenty of information about digital marketing in agriculture and how government encourages its use, much of this misses the specific problems faced by grape growers, like theirs Malay, lowed operations, less technology knowledge and reluctance to change due to traditional marketing. Also, not many in-depth studies have looked at how the government helps bridge the gap in Karnataka's digital transition which is shaped by its unique socio-economic and agricultural factors. To close these gaps is necessary to develop well-targeted strategies that allow grape growers to use digital marketing tools and increase both their presence and resilience in the market.

Research Objectives

- To identify the challenges faced by grape growers in adoption of digital marketing technologies
- To assess the impact of government support on enhancing adoption of digital marketing technologies

Research Methods

Table 1: Research Methods

Research Method	Description
Research strategy	Quantitative analysis
Sample area	Karnataka
Sample size	At 10% margin of error 100 Grape growers
Sampling technique	Convenience sampling
Data collection tool	Questionnaire - Demographic profile, challenges, government support and Adoption of digital marketing
Plan of analysis	Descriptive statistics- SPSS
	Structural equation model - AMOS

Results and Discussion

Demographic profile of the respondents

The data covers the detailed profile of persons engaged in farming, what land they own and the practices they use, mainly those growing grapes. Most farmers are relatively young to middle-aged and the largest group consists of those between 18-25 years old (32%). The next group is made up of 28% of the population between 25 and 40 years old and another 28% are between 40 and 55 years old. A smaller group, 12%, is older than 55 years. The fact that most people are young implies they are flexible, lively and willing to try out new agriculture practices and technologies.

Men form a very large majority (88%) of farmers in this dataset, while women make up only 12% of the total group. It points out that there are fewer women than men in agriculture which could be because of limitations on the part of women or wider problems in society. Ensuring equality between men and women in agriculture may help achieve inclusive development and improve people's lives in rural areas.

Among farm families, about 44% do not have any formal education. The next largest group are people who have education up to the 7th standard, followed by SSLC (16%), PUC (12%) and mostly graduation degrees (8%). It is evident from the educational profile that a range of farmers might find it hard to learn about the latest techniques which requires targeted educational and training courses to help them.

Most farmers (88%), according to marital status data, are married which may reflect stability in their farming businesses, since married couples might have better resources and more help. Just 12% of farmers are unmarried which could indicate that young adults or people starting their farming lives make up most of the demographic.

About 88% of farmers own the land they work on, whereas 12% rent it. Because so much land is owned by farmers, a strong base for farming is created, as ownership reassures

farmers to put more effort and resources into upgrading their land. The fact that all this land is dry may indicate that water shortage is an important problem for the farmers.

Most farmers, roughly 40% of the total, hold 7 to 9 acres which is the most typical sized landholding. A smaller group of 12% have farms under 1 acre, another 12% have farms between 1 and 3 acres and 16% have properties of 4-6 acres. About 20% of all farmers work on 10 acres or more, indicating these farmers may manage larger operations and have many more resources than others.

More than a third of farmers have 15-20 years of experience, so they are likely to have strong expertise in farming. Out of all respondents, almost a quarter (24%) have over 20 years in finance and only 8% have worked for less than 5 years in the field. Because everyone brings different experience, new farming techniques usually get discussed, along with older traditions.

Grapes from Bangalore Blue (20%), Thompson, along with other popular types (12%) make up the majority of grape farming here. Vineyards grow different grapes because of what the market wants which grapes like or personal choices. The extent of each grape color within the data is balanced and color-seeded grapes are the most commonly spotted variety. Because grapes are grown for eating, drying for raisins and making wine, the wide range of types matches these purposes and table grapes (which are the most typical grape type) are grown most frequently at 64%.

All in all, the dataset portrays most farmers as male, between young and middle-aged and possessing different levels of educational background. Growing various grape types for various purposes draws interest to an agricultural sector that may need assistance and development. Providing help for educational gaps, gender equality and access to water management and key agricultural techniques could make farming more profitable and safer for future generations.

Item analysis - Challenges in adoption of digital marketing technologies

From the dataset, it is visible that not all participants agree on digital marketing technologies and have a range of concerns. Average scores for the statements suggest what companies believe about different digital marketing issues and government assistance. The mean score of 4.06 for CHLNG_3 (“There isn’t enough internet connectivity to use digital marketing tools”) shows that most respondents regard insufficient internet connectivity as an important barrier. Also, more concern is recorded in CHLNG_5 ("It is hard to send and store perishable agricultural items using digital marketing channels") and CHLNG_6 ("People may work out unexpectedly low prices or use online markets to cheat farmers") as these mean scores are also high. Meanwhile, the relatively low scores for CHLNG_4 ("There is unreliability of traders and commission agent to trade electronically") indicate that it is a less significant matter.

On the contrary, the mean scores for government support statements (GS) suggest that optimism about interventions is average. Suggesting that participants find it important, GS_6 ("The government can assign districts officers and respective board for digital marketing to aid in overcoming its challenges") scores highest, with a mean 4.04. Support measures such as upgrading the internet (GS_5) and offering training in how to use digital technology (GS_8) have mean scores over 3.5, meaning they are recognized as important. At the same time, people think that working with industry partners (GS_4) and direct government support for online sites (GS_1) are both less effective or significant. All in all, while some roles of the government are seen positively, challenges related to infrastructure and knowledge are also noticed.

H1-There is a negative impact of Challenges in adoption of digital marketing technologies

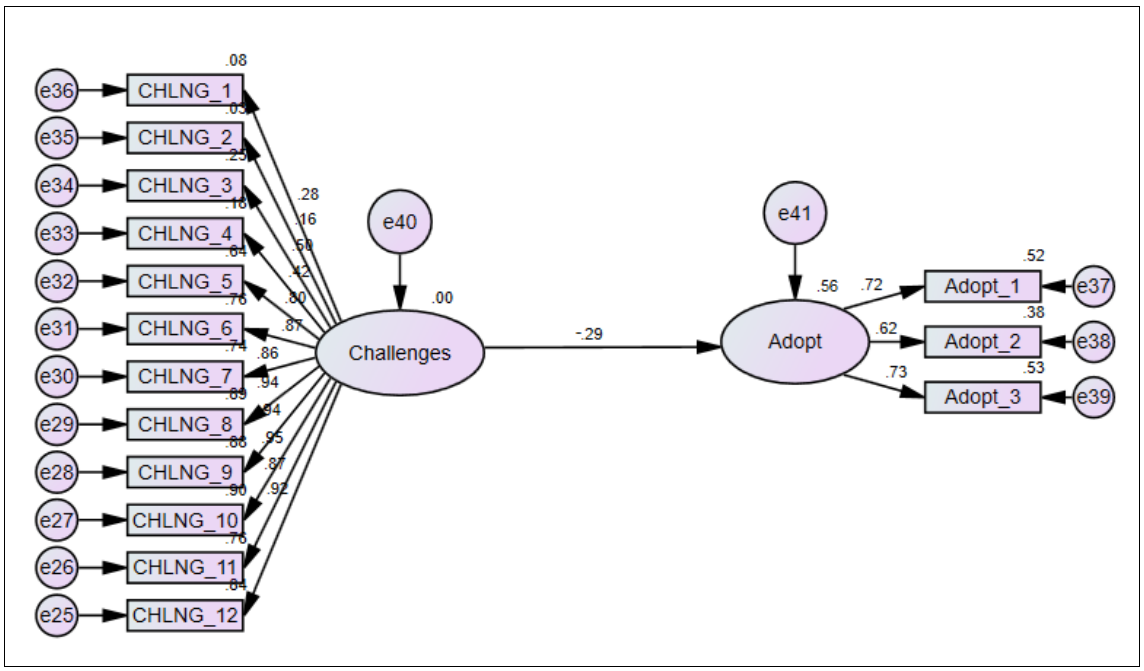

Fig 1: Structural equation model - Impact of Challenges on adoption of Digital marketing technologies

The results show a fairly strong correlation between the obstacles and how digital marketing technologies are used, with the R-squared value being 0.583. As a result, about 58.3% of the way in which companies adopt digital marketing technology is explained by these detected challenges. Results show that things like having fewer

resources, not enough talent and resistance from some workers play a big role in how much businesses use digital marketing. Although these challenges create obstacles, they make it clear that suitable strategies can contribute to a rise in adoption rates. With clear training, careful use of resources and the right change management methods, organizations can more successfully include digital marketing tools in their activities and be more competitive.

Table 2: Structural relationship between variables - Impact of Challenges on adoption of Digital marketing technologies

			Estimate
Adopt	<---	Challenges	0.294

The figure indicates that, when challenges rise, companies tend to use digital marketing technologies less. The negative estimate implies that the greater the problems with using digital marketing, the less likely or to a smaller extent businesses are to use them. Having access to technologies is often affected by technical challenges, a lack of resources and lack of knowledge which hampers companies wanting to incorporate these tools in their marketing efforts. So, if organizations encounter major difficulties, they may hesitate to introduce digital tools which could reduce their power to benefit from online marketing, more targeted campaigns and fact-based decision-making. One way to address this problem is for businesses to work on removing the barriers by providing training, better infrastructure or getting advice from experts which helps make digital marketing technologies more successful in that setting.

H2 - There is a positive impact of Government support in adoption of digital marketing technologies

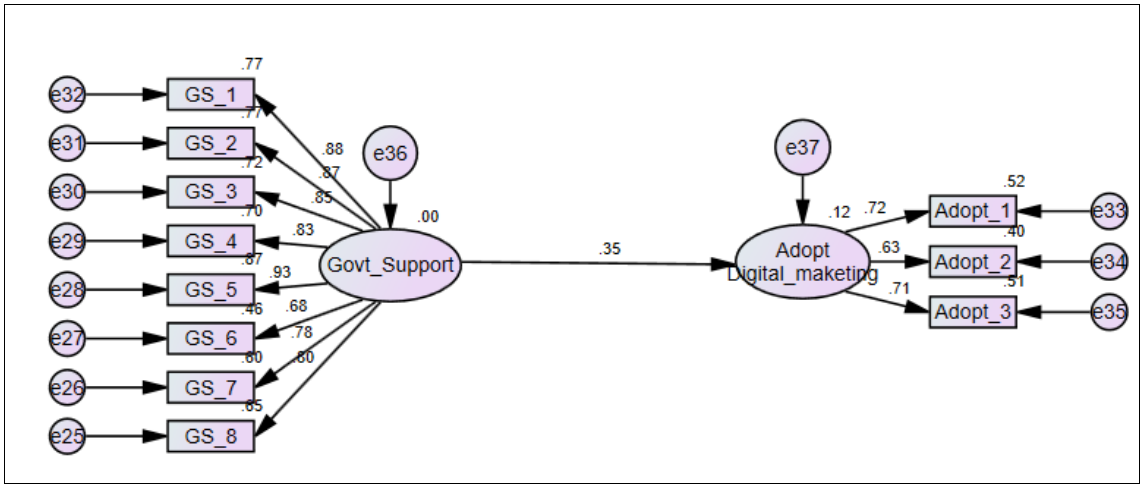

Fig 2: Structural equation model - Impact of government support on adoption of Digital marketing technologies

There is some positive effect of government support, as revealed by an R^2 value of 0.121. It follows that the policies set by the government explain approximately 12.1% of the variance in the adoption rates seen for these technologies. The positive correlation from the statistical analysis points out that gaining government support does matter, but adoption also depends on a variety of other aspects such as a firm's size, its industry and what the marketplace looks like. The findings prove that a complete approach, with government facilitating rather than directing, prompts businesses to adopt new digital marketing methods using resources, offers and favorable regulations as support. In other words, this discovery means that government assistance must blend well with the efforts of private businesses and improvements in infrastructure to reach the best results with digital marketing technologies.

Table 3: Structural relationship between variables - Impact of government support on adoption of Digital marketing technologies

			Estimate
Adopt_Digital_maketing	<---	Govt_Support	0.35

The connection between government assistance and the use of digital marketing technologies is measured by a positive number of 0.35 which shows a strong and positive influence. In other words, when the government supplies more help, more businesses begin using digital marketing technologies. Support could be given using subsidies, training, policy changes or by developing infrastructure, all helping to reduce the barriers for technology use and boosting business abilities to implement them. It can be inferred that increased government support leads to a rise in the use of digital marketing technology, proving that governments are important for advancing and modernizing business techniques. It underlines how important it is for the government to encourage businesses to go digital which in turn makes companies more competitive and helps them reach a broader market.

Conclusion

Tackling the adoption of digital marketing in Karnataka by grape growers depends on a combination of actions. The first thing is to offer workshops to grape growers on how to use different marketing platforms and why they benefit from learning. Planning workshops and training sessions led by digital marketing and agritech professionals can fill any missing knowledge. Also, creating easy-to-use technology for farmers in agriculture can help them move toward digital farming more smoothly. Languages and interfaces need to be localized and easy to use so anyone can use them. Sharing platforms between grape growers provides the opportunity for learning and innovation from each other. If growers receive financial support through subsidies or tax reductions, it can persuade them to buy and set up modern technologies. At the end, a solid way to check digital

marketing effectiveness and modify strategies should be established.

New digital marketing tools used by grape growers in Karnataka open the door to better marketing, bigger yields and higher profits. Still, issues related to digital literacy, finances and the status of infrastructure should be solved to make use of this potential. The government helps by setting up policies, offering financial aid and setting up educational programs for the transition. By supporting digital adoption, the government allows grape growers to use everything digital marketing tools have to offer. This will bring sustainable results for the grape farmers in Karnataka and inspire other agricultural sectors across the state and nation. To boost innovation and ensure technology is shared among grape farmers, coordination among the government, private businesses and farming associations is very important.

Scope for further research

Study into the problems that grape growers meet when adopting digital marketing and how government support helps can be diverse and beneficial. Considering how particular digital tools and platforms help grape growers is a promising field to explore. The study could analyze how blockchain, mobile apps and data analysis can best meet the needs of those growing grapes in Karnataka. Based on what is found in case studies and through empirical data, researchers realize some grape growers are unable to adopt these technologies due to not being digitally literate, inadequate infrastructure and financial difficulties. In addition, by considering how using new technology supports getting into different markets, digital marketing strategies can strengthen grape growers' competitiveness and help them earn more profit.

In addition, studying the influence of government aid on digital adoption in the grape business in Karnataka is important. It is possible to evaluate government policies and programs to see how they help digital literacy and infrastructure in the farming sector. Finding weaknesses in present initiatives can lead to advice for programs that better meet the tech needs of those who work in the grape industry. Also, this research could suggest fresh partnership models, using government backing, to boost digital training for growers. Looking at the effects of government projects such as subsidies for tech adoption, training programs and the creation of online marketplaces, researchers may suggest ways to help Karnataka's agricultural community grow into a more digitally skilled community.

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