Investigating the role of transformational leadership and TOE framework to adopt e-government in Indonesia: the case of village information system

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Abstract: This study aims to determine the factors that influence the adoption of village information system (VIS). We propose a conceptual model involving leadership theory and technology-organisation-environment (TOE) framework. The model was examined empirically using data collected from 184 village apparatus in Indonesia. The findings reveal that a village can adopt the VIS as a form of e-government if it has a transformational village leader. This study also demonstrates the role of the TOE framework that can mediate transformational leadership factors and the intention to adopt VIS. Practically, the result of this study indicates that the adoption of VIS can be implemented if the village government has transformational leaders who can motivate awareness of the benefits of VIS (technological context), mobilise village resources (organisational context), and synergise with supra-village (environmental context).

Keywords: e-government; village information system; transformational leadership; TOE framework.

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1   Introduction

Like other developing countries, the Indonesian government is currently paying attention to good governance. It can be seen from issuing regulations on the electronic-based government system (SPBE) or commonly known as e-government. Electronic government (e-government) refers to the use of information and communication technology (ICT) to improve the delivery of public services to citizens and businesses (Sabani, 2020). Currently, there are many electronic-based government service applications used at every level of government so that globally it can impact the achievement of sustainable development goals (SDGs).

The adoption of e-government at every level of government is also intensively carried out in Indonesia. For district, city, provincial, and country, e-government adoption is not as complicated as e-government adoption at the village government level. It is due to many obstacles such as infrastructure, limited ICT resources, low ICT literacy, and others that are not found at the level government above it. In fact, the adoption of e-government in the village is important because the village, as the smallest government organisation in Indonesia, has the role as the basic foundation of public services and becomes the gateway for administrative processing to the government level above it.

However, the adoption of VIS has not been fully implemented in the villages to date. Some villages have never adopted VIS, some have adopted VIS but stopped the process, and some have successfully adopted VIS. Data from the Indonesia internet domain registry (PANDI) stated that there were 12,994 users of the desa.id (village.id) domain as of April 2021, while there are 83,320 villages in Indonesia. So, it can be said that at most

15% of villages in Indonesia use e-government applications at the village government level. It is important to investigate what factors can influence the intention to adopt information technology in rural areas with this condition.

Leadership is generally considered one of the main influencing factors motivating employees to use information technology (Rezvani et al., 2017b). During the last decades, there was an increasing interest in transformational leadership research in the context of adoption technology. These researches combined leadership theory with other adoption theories such as self-determination theory (Rezvani et al., 2017b), unified theory of acceptance and use of technology-UTAUT (Torre and Sarti, 2020), information system success model (Aldholay et al., 2018), and technology acceptance model (Elkhani et al., 2014). The adoption theories are generally used at the individual level. Meanwhile, there is no research that combines leadership theory with adoption theory that is used at the organisational level, namely technology-organisation-environment (TOE) framework (Haneem et al., 2019).

The adoption of VIS in Indonesia is mandated by the law. However, there are still many villages that fail to adopt it. One of the factors that are thought to have played a significant role in the success of VIS adoption is the role of village leaders. In contrast to leadership at higher levels of government (such as districts, cities, provinces), a village leader is seen as a figure who not only leads in government but also in consuetude. It shows how influential a village leader is. Therefore, this study provides insight into the role of village leaders in giving awareness to village officials about the importance of VIS. In addition, village leaders also play a role in mobilising all village resources, both tangible (infrastructure and others) and intangible (human resources and others).

VIS is one manifestation of e-government at the village level. This study aims to investigate the factors that influence the adoption of VIS. By looking at the role of transformational leadership in information system (IS) adoption and seeing the village as an organisation, this study involves transformational leadership theory and the TOE framework. This study uses the framework as mediating factor between transformational leadership and the intention to adopt VIS by village apparatus. To the best of our knowledge, no research integrates leadership theory and the TOE framework to examine IS adoption by village governments. This study attempts to fill this gap.

2 Literature review

2.1 Transformational leadership

Transformational leaders are individuals who can direct the attitudes and behaviour of their subordinates (Bass, 1985). Thus, transformational leadership focuses on inspiring and motivating followers to work in better ways. As a result, followers feel trust, loyal, and respect the leader and often go beyond self-interest for the sake of the organisation (Cho et al., 2011).

Transformational leadership consists of four behavioural components (Bass, 1985): which include:

1   idealised influence, which is an admirable behaviour intended to arouse the emotions of followers

2   inspirational motivation, which focuses on behaviour about communicating an inspiring and interesting vision

3   individualised consideration, which is the extent to which a leader provides support in training

4   intellectual stimulation, the degree to which a leader increases the awareness of followers.

Therefore, transformational leadership has a positive relationship with organisational commitment, motivation for follower awareness, and organisational performance (Cho et al., 2011).

2.2 *Technology-organisation-environment*

At the organisational level, the innovation adoption process is complex and influenced by multidimensional factors. TOE is broadly applicable to exploring organisational level adoption of various ICT innovations (Liang et al., 2017). TOE explains that adopting innovation in an organisation can be influenced by three dimensions: technology, organisation, and environment. Unlike other theories or models in IS research, TOE only mentions the dimension that influences the adoption without specifying the factors of each dimension. It makes the TOE framework can be widely used in different disciplines and contexts. Researchers can choose their factors from each dimension according to the organisation's characteristics and technology to be adopted.

In Indonesia, the village is the smallest government organisation. By looking at the village as an organisation, this study involves the TOE framework in the proposed model (Figure 2).

1   Technological context is about how ICT innovation is felt to help in the work and the threat if not using the innovation. In this study, we use the awareness of VIS variable, which leads to the awareness of village apparatus to use VIS to provide administrative services to citizens and make village development plans.

2   Organisational context emphasises characteristics of the organisation. In this study, we use the village resource variable as a village characteristic. Village resources include all intangible and tangible assets of the village, such as the capacity of the village apparatus to use IS and the availability of technology equipment at the village office.

3   Organisational context includes everything outside the organisation but can affect adoption. One of the external factors that influence is government support. This study considers how much support the supra-village has, such as the sub-district government, district government, and central government level, in the VIS adoption process.

2.3 *Adoption of village information system*

The use of e-government has increased in recent years. Currently, both developing and developed countries use it to provide the best service to their citizens. E-government can be adopted at different levels of government: city, county, and state (Turban et al., 2018).

In contrast to the adoption of e-government at the state, provincial, city, and district, at the village government level look more complex. Compare with other level government, village government in Indonesia has a fairly wide digital divide. ICT use in rural Indonesia is limited due to geographical barriers and social inequality (Sujarwoto and Tampubolon, 2016). The digital gap that occurs is not only related to infrastructure issues but also related to issue of education, community, institutional structure and governance, and skill in using ICT, contributing to this gap. However, lack of awareness due to social inequality is the basis of the digital divide (Hadi, 2018).

By these characteristics, a village leader must motivate, raise awareness, or influence the village officials to adopt ICT innovations. Various ICT infrastructure that has been prepared by supra-village will be in vain if village officials do not have an awareness of the VIS benefits.

In Indonesia, the adoption of SID has been regulated in the Law of Village, where it includes hardware and software facilities, networks, and human resources. According to the law, data in the VIS includes village data and development, rural areas, and other information related to village and rural area development. The VIS is managed by the village officials and accessible to the village community.

Figure 1   VIS application (see online version for colours)

The implementation of VIS must be in line with the development of village government facilities and capacities. Furthermore, it can be used to plan, implement accountability, transparency, and provide public services (KOMPAK, 2017). During this pandemic, it was also used to record entry-exit of their citizens and determine the social assistance beneficiaries.

3   Research model and hypotheses development

This section explains the findings of related studies that are our foundation to develop a model and hypotheses. This section also describes the definition of each construct that we use as constructs in the research model (Figure 1).

3.1   Transformational leadership and TOE context

In the technological context, the role of a transformational leader is needed in order to influence employee behaviour related to the adoption of a technology (Shao et al., 2015). VIS is an information technology that is managed directly by village officials. Thus, a transformational village leader is expected to provide awareness to his village officials to take advantage of VIS in carrying out service tasks for villagers. In this study, we adopt the definition of transformational leadership expressed by Bass (1985), a leader who can motivate, inspire, and increase the awareness and knowledge of followers.

Various studies have proved the role of transformational leadership in various contexts of the adoption of IS. One of them is that transformational leadership will positively affect SI user satisfaction (Tang and Wei, 2021). Transformational leadership has also been a positive relationship with awareness of the convenience and usefulness of a technology (Elkhani et al., 2014). In the context of e-government, Mawela et al. (2017) revealed that one of the obstacles in implementing e-government is the weak leadership in government organisations. Reviewing the previous literature, we hypothesise:

Hypothesis 1   There is a positive relationship between transformational leadership and awareness of the VIS.

In the organisational context, transformational leadership is also important to mobilise organisational resources towards fulfilling their mission (Antonakis and House, 2014). A strong transformational leader position can also positively impact the readiness to utilise IS infrastructure (Fitrios et al., 2018). In addition, the presence of a transformational leader was also found to improve organisational performance (Aldholay et al., 2018), such as providing training to increase capabilities. The readiness of infrastructure in the organisation and the capability of village officials in using VIS, in this study, we include these two things as organisational or village resources. It leads to the following hypothesis:

Hypothesis 2   There is a positive relationship between transformational leadership and village resources.

This study takes supra-village support as a variable that represents the environmental context. A transformational village leader is considered to establish a harmonious relationship and synergise with the supra-village. He can also run the policies and regulations issued by the supra-village. To carry out the VIS, good cooperation is needed between the village government and the supra-village parties. Thus, our next hypothesis is:

Hypothesis 3   There is a positive relationship between transformational leadership and supra-village support.

We have explored the role of transformational leadership in the successful adoption of IS in various contexts. These are the literature in the context of enterprise resource planning (Rezvani et al., 2017b), enterprise systems (Rezvani et al., 2017a), AIS – accounting information systems (Fitrios, 2017), smart government (Al-Obthani and Ameen, 2019), cloud-based computing (Celaya, 2015) and online learning usage (Aldholay et al., 2018). It prompted us to explore the role of transformational leadership in the context of VIS.

3.2   TOE and adoption of e-government

As discussed earlier, this study involves the TOE framework. For the technological dimension, we refer to the diffusion of innovation theory (Rogers, 2003) which stated that the perception of innovation and its benefits are key factors that impact adoption strategy decisions. Research from Yamin and Alyoubi (2020) and Hung et al. (2014) also revealed that awareness of the advantages of using technology, such as higher productivity, has a drastic effect on decision making about adopting technological innovations. In this study, we adopted the definition of awareness of VIS from Hung et al. (2014) as the perception of village officials on the VIS environment, benefits, threats, and impacts. Summarising the views of these researchers, our following hypotheses:

Hypothesis 4   There is a positive relationship between awareness of VIS and intention to adopt VIS.

On organisational dimensions, we see many studies involving organisational readiness as a factor related to technology adoption (Yang et al., 2015; Wang and Lo, 2016). Organisational readiness refers to how the skills and knowledge of employees are prepared to adopt IS. Organisational readiness also includes IT infrastructure, a significant factor in the IT innovation adoption process (Yang et al., 2015). Iacovou et al. (1995) define organisational readiness as the availability of organisational resources for technology adoption. In this study, we call organisational readiness as organisational or village resources because both infrastructure and skills are assets of the organisation or village. Thus, our next hypothesis:

Hypothesis 5   There is a positive relationship between village resources and intention to adopt VIS.

The environmental dimension plays an important role in determining IS adoption at the local government level. Government readiness in the form of policies and regulations is a determining factor often used in previous studies (Rubin et al., 2014; Liang et al., 2017). Local governments will adopt an innovation if there are policies from higher-level of government to implement it (Haneem et al., 2019). Likewise, the village government will adopt an innovation if there are regulations from the supra-village. Next, we hypothesise that:

Hypothesis 6   There is a positive relationship between supra-village support and intention to adopt VIS.

Transformational village leaders are considered capable of synergising with the supra-village in implementing regulations that support the adoption and implementation of VIS. Based on the theory stating that a transformational leader can motivate followers

(Bass, 1985) and mobilise organisational resources (Antonakis and House, 2014) to achieve organisational objectives, our next hypothesis:

Hypothesis 7   Awareness of VIS will mediate the positive relationship of TL and intention to adopt VIS.

Hypothesis 8   Village resource will mediate the positive relationship of TL and intention to adopt VIS.

Hypothesis 9   Supra-village support will mediate the positive relationship of TL and intention to adopt VIS.

Figure 2   Conceptual model
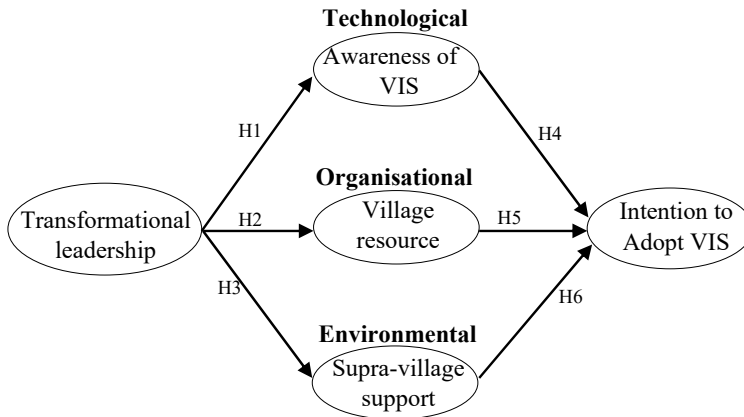
4   Methodology

4.1   Sample and procedure

We conducted a survey in several villages in Indonesia. The respondents were village apparatus including village secretaries, heads of affairs, section managers, staff, and hamlet leaders. We assumed that the respondents have capacities to evaluate their leaders. For instance, the selected respondents assess how the village leader encourages them to build intention to adopt VIS.

The questionnaires were distributed to several villages in the Special Region of Yogyakarta (DIY) and East Nusa Tenggara (NTT) Provinces. The two provinces are considered to represent the western and eastern regions of Indonesia that have a relatively large digital gap (Hadiyat, 2014). Factors that indicate this gap are ICT infrastructure and the ability to use ICT (Handayani and Afrizal, 2018). In total, 150 questionnaires were distributed directly to five villages in Sleman Regency, DIY Province. Meanwhile, 118 questionnaires were returned, including 20 incomplete questionnaires. Therefore, the number of valid questionnaires was 98 or 65.33%. In addition, the questionnaire was also distributed online to villages in NTT Province, including Kupang, Belu, TTS, East Flores, Sikka, and Lembata Regencies. There were 86 questionnaires collected online and

valid. So that the final total of data collected was 184 valid questionnaires. Table 1 presents the demographics of the respondents.

Table 1   Respondent demographics

Item	Data category	Percentage
Gender	Male	67.8%
	Female	32.2%
Level of IT mastery	Beginner	43.9%
	Medium	52.9%
	Expert	3.2%
Education level	High school	61.6%
	Diploma	4.7%
	S1	32.5%
	S2	1.2%
	S3	0%
Age	18-23	5.9%
	24-29	20.8%
	30-35	17.7%
	36-40	12.5%
	> 40	43.1%

The survey items were adapted from validated and published scale measures. All items were translated to Indonesian and subjected to language validation by evaluating the accordance of the items with the study context. The survey was conducted during June–August 2020. A detailed description of the items is shown in Table 2.

4.2   Measurements

In total, five variables were included in this study. The variables are transformational leadership, awareness of VIS, village resources, supra-village support, and intention to adopt VIS. The measurement items were adapted from prior studies (Table 2). All measurements use a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). Each variable is labelled and abbreviated as follows: transformational leadership (TL), awareness of VIS (AVIS), village resource (VR), supra-village support (SVS), and intention to adopt (IA). For the sake of the research context, the questionnaire was designed specifically for the village apparatus. Prior to the distribution, the draft questionnaire was reviewed by four local government officers as a legibility test.

4.3   Data analysis

The developed conceptual model was analysed using the PLS-SEM method with SmartPLS version 3 statistical tools that were considered suitable for exploration and prediction and analysing complex relationships (Ringle et al., 2012). In PLS-SEM, two steps were carried out in analysing and interpreting the model: first, the validity and reliability of the measurement model; and second, the assessment of the structural model.

5 Result

5.1 Measurement model

The measurement items used in this study were adapted from previous research. Therefore, both validity and reliability have been tested. The acceptable threshold for composite reliability (CR) is above 0.7 and for average variance extracted (AVE) is above 0.5. While the minimum threshold for Cronbach's is 0.6 or 0.7, and the factor loading value > 0.70 is generally acceptable (Hair et al., 2014). Based on these criteria, all indexes in this study are adequate (Table 2).

Table 2 Validity and reliability test results

Construct	α	CR	AVE	Factor loading
TL: transformational leadership Source: Bass and Aviolo (1997)	0.873	0.922	0.798	
1 The village leader shows confidence that the village program (vision and mission) would be achieved with the use of VIS.				0.907
2 The village leader suggests new ways to use VIS, such as planning and decision making.				0.907
3 The village leader is very optimistic about the future usage of VIS.				0.866
AVIS: awareness of village information system Source: Hung et al. (2014)	0.881	0.918	0.737	
1 Our village is aware of the importance of VIS				0.868
2 Our village knows what kind of data and information need to be available in VIS content.				0.855
3 We understand the benefits of using VIS.				0.861
4 We know the disadvantages of not using VIS.				0.849
VR: village resources Source: Hung et al. (2014)	0.785	0.875	0.701	
1 Village apparatus were given the training to improve knowledge and skills in using computers.				0.765
2 We have the technology (i.e., computers) which is sufficient to operate VIS.				0.860
3 Our village office is competent in encountering the dynamic of technological advances to increase community service quality.				0.882
SVS: Supra-village support Source: Hung et al. (2014)	0.874	0.923	0.800	
1 We know that local and central governments have effective regulations to encourage VIS implementation.				0.890
2 We believe that our law environment supports the adoption and implementation of VIS.				0.929
3 Local and central governments have stated their determination to support the development of VIS.				0.863

Table 2   Validity and reliability test results (continued)

Construct	α	CR	AVE	Factor loading
IA: intention to adopt SID Source: Venkatesh et al. (2003)	0.948	0.967	0.907	
1 Our village intends to use VIS.				0.956
2 I think our village will use VIS.				0.954
3 Our village plans to use VIS.				0.945

Table 3 shows the discriminant validity of constructs. Since the diagonal values are more significant than the related other values, these constructs demonstrate accepted discriminant validity.

Table 3   Discriminant validity of the constructs

	AVIS	IA	TL	SVS	VR
AVIS	0.858				
IA	0.645	0.952			
TL	0.740	0.605	0.893		
SVS	0.629	0.717	0.636	0.894	
VR	0.601	0.634	0.659	0.614	0.837

5.2   Structural model and hypotheses testing

After testing the model's validity and reliability, the study was continued by testing the proposed hypotheses. By performing bootstrapping using 5,000 sub-samples with the SmartPLS application, the path coefficient (β) and p-value for each hypothetical path were obtained. These hypotheses testing were conducted by measuring the significance level of the relationship between variables in the structural model. This study used three levels of significance (Hair et al., 2014), namely 10% ($p < 0.1$), 5% ($p < 0.05$), and 1% ($p < 0.01$). The findings from the analysis are depicted in Figure 3.

The results reveal that between TL and awareness of VIS, TL and village resources, as well as TL and supra-village support, all have significant relationships: β = 0.740, p = 0.000; β = 0.659, p = 0.000; β = 0.636, p = 0.000, respectively. For the technological dimension, the results reveal that awareness of VIS has a significant relationship with the intention to adopt VIS: β = 0.240, p = 0.002. Furthermore, for the organisational dimension, the results reveal that village resources have a significant relationship with the intention to adopt VIS: β = 0.228, p = 0.001. Meanwhile, for the environmental dimension, the results reveal that supra-village support also has a significant relationship with the intention to adopt VIS: β = 0.426, p = 0.000.

Because this study uses mediating factors, we also observe the results of indirect effects. Table 4 shows the results of specific indirect effects which reveal that there is a significant relationship between TL and the intention to adopt VIS through the awareness of VIS factor (H7); a significant relationship between TL and intention to adopt VIS through the village resource factor (H8); and also a significant relationship between TL and intention to adopt VIS through supra-village support factor (H9).
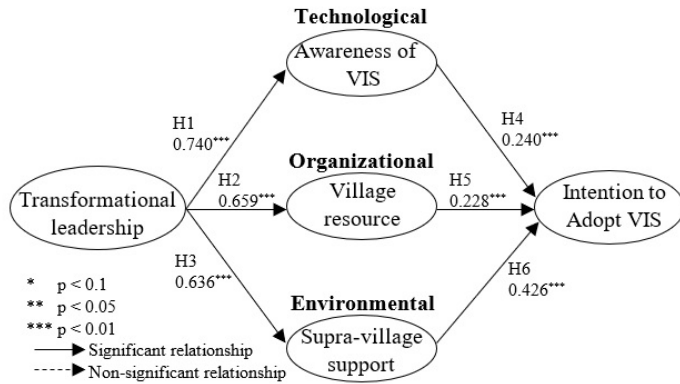
Figure 3 Analysis results

Table 4 Indirect effects

	Path coefficient (β)	p-value
TL → Awareness of VIS → Intention to adopt VIS	0.177	0.002
TL → Village resource → Intention to adopt VIS	0.150	0.001
TL → Supra-village support → Intention to adopt VIS	0.271	0.000

6 Discussion

This study extends the previous literature on the intention to adopt an information system by proposing and testing a model in which transformational leadership influences the intention to adopt an information system through technological and organisational dimensions. In response to research related to the role of transformational leadership, this study integrates transformational leadership theory, the TOE framework, and the intention to adopt IS model in a village information system context.

Our finding reveals the relationship between transformational leadership and awareness of VIS (H1). These findings also confirm previous studies in multi-national banks (Cho et al., 2011) and enterprise resource planning (Elkhani et al., 2014). Regarding awareness, we also found that this factor positively affects the intention to adopt the technology (H4). In line with a prior study, this finding suggested that organisations tend to adopt a technology if it generates faster response times to stakeholders and yields more efficient information dissemination (Hung et al., 2014). Furthermore, we found a positive relationship between transformational leadership, awareness, and intention to adopt VIS (H7).

A transformational village leader can prepare and mobilise all village resources in carrying out organisational missions (Antonakis and House, 2014; Hassan, 2019). In the context of this study, village resources refer to the availability of ICT infrastructure and the competence of village apparatus in the use of ICT. Our findings confirmed that there is a positive relationship between transformational leadership and village resources (H2). Furthermore, we also found a significant positive relationship between village resources and intention to adopt VIS (H5). So, the better the readiness of a village's resources, the higher the intention to adopt a technology (Hung et al., 2014; Wang and Lo, 2016; Yang

et al., 2015). Also, we found a positive relationship between transformational leadership, village resources, and intention to adopt VIS (H8).

Supra-village supports are existent. Various policies and regulations to encourage villages to adopt VIS have been issued, such as the Law on Villages and SPBE, which have been elaborated in regional regulations, have influenced the intention of the village government to adopt VIS. Our findings revealed a significant positive relationship between supra-village support and intention to adopt (H6). These findings are also consistent with other findings that disclose the role of governments in the success of e-government implementation (Hapsara et al., 2017). However, all the regulations made by the supra-village to implement the VIS will be in vain if the village leaders cannot synergise with the supra-village parties. Our findings reveal that there is a significant positive relationship between transformational leadership and supra-village (H3). In addition, we also prove the role of the supra-village as a mediator between village leaders and the intention to adopt VIS (H9).

7   Conclusions

This study has achieved its objective by constructing and validating a theoretical model that examines the role of transformational village leaders in adopting a village information system (VIS) in Indonesia. This study found a significant positive relationship between transformational leadership and awareness of VIS (technology dimension), village resource (organisational dimension), and supra-village support (environment dimension). This study also confirms that the technological dimension (awareness of VIS), the organisational dimension (village resource), and the environment dimension (supra-village support) have a significant positive relationship to the adoption of VIS by village governments in Indonesia.

Another finding from this study reveals that the dimensions of technology, organisation, and environment can be factors that mediate transformational leadership and intention to adopt VIS. In other words, a transformational village leader can:

1   provide awareness of VIS to village officials

2   empowering the resources owned by the village

3   synergise with supra-village parties to adopt VIS.

Practically, this study can be beneficial for policy-making of VIS adoption. The results have highlighted the key constructs that affect VIS adoption in villages, leading to broader acceptance of the technology by village apparatus and supra-village governments. The indirect effect (Table 4) indicates that VIS adoption can be well carried out if the village government is led by a transformational leader who can motivate awareness of the VIS benefits and mobilise village resources. Several local governments have collaborated with the central government providing technical guidance to improve village leadership and other training programs.

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