



## Adaptive Managerial Strategies in Schools During the Digital Disruption Era to Foster Innovative Learning Environments

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### ARTICLE INFO

*Keywords:* Adaptive Management, Digital Disruption, Innovative Learning.

*Received :* 1, September

*Revised :* 15, September

*Accepted :* 28, October

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### ABSTRACT

This study analyzes adaptive managerial strategies adopted by high schools in responding to digital disruption, focusing on leadership policies and management practices that foster creative, collaborative, and technology-based learning environments. Using a qualitative case study approach involving 12 informants from three schools in Palu City, data were collected through interviews, observations, and document analysis, then examined using thematic analysis. The findings reveal that key adaptive strategies include strengthening digital leadership, enhancing teacher competence through continuous training, optimizing online learning platforms, and cultivating a culture of collaboration and innovation. The study concludes that school success amid digital disruption depends on flexible, responsive, and visionary management, contributing to adaptive education management theory and offering practical guidance for developing sustainable, innovation-driven learning ecosystems.

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## **INTRODUCTION**

The rapid development of digital technology in the last two decades has fundamentally changed the face of education. Digital disruption requires schools to adopt technology-based learning systems, integrate online platforms, and adjust management strategies to remain relevant to the needs of the 21st century. The globalization of information and the emergence of artificial intelligence require education leaders to adapt quickly, as failure to transform can hinder the quality of learning and reduce the competitiveness of schools (Gonzales & Smith, 2021). In Indonesia, this phenomenon is becoming increasingly urgent considering the digital literacy gap, limited infrastructure, and variability of teachers' competencies in utilizing learning technology (Maryani et al., 2023; Pratama & Firmansyah, 2022).

The local context in Central Sulawesi, especially in Palu City, presents a double challenge. On the one hand, high schools are facing pressure to adopt digital technology across the board. On the other hand, limited human resources, infrastructure, and policy support often slow down the adaptation process. This condition demands a managerial strategy that is not only reactive, but also proactive in designing policies, managing change, and building a school culture that supports innovation (Susanti & Hakim, 2021). School principals are required to have adaptive leadership capacity that is able to navigate uncertainty while encouraging the participation of teachers and students in developing an innovative learning ecosystem (Rahardjo et al., 2023).

Various previous studies have shown the importance of adaptive leadership in the context of digital education. (Purwanto et al., 2024) emphasized that the adaptive leadership practices of school principals play a significant role in the digital transformation of teachers and the creation of a more innovative learning environment. A similar thing was also found by (Arifah et al., 2024), which highlights the role of change leadership in developing the digital learning ecosystem. International studies have also shown that adaptive school leadership has a significant impact on the success of educational technology transformation (Nguyen & Bui, 2022). However, these studies are mostly conducted in large urban areas, so local contexts such as Palu are still rarely explored.

Other research also highlights principals' strategies in improving teachers' digital literacy, such as a study (Rochmah et al., 2022) that describes improvement efforts through training, facility provision, and continuous monitoring. However, the focus of the research is still limited to the aspect of teachers' digital literacy, which has not extensively examined the dimensions of adaptive managerial strategies which include school policies, organizational culture, and support for collaborative learning innovations (Wijayanti & Kusumawati, 2021). This shows that there is still room for more comprehensive research on school adaptive management in the era of digital disruption.

Thus, there is a clear research gap. First, there is still a lack of studies that discuss adaptive managerial strategies comprehensively in high schools by paying attention to the local context of large non-urban areas. Second, most previous research has emphasized aspects of teachers' digital literacy or

transformational leadership, rather than on broader and holistic adaptive managerial strategies (Hidayat & Mahfud, 2023). Third, there is still a lack of empirical evidence on how school principals' adaptive strategies are able to build an innovative learning environment in conditions of limited resources (Simarmata et al., 2022).

This study aims to analyze the adaptive managerial strategies applied by high schools in Palu City, Central Sulawesi, in facing the era of digital disruption. The research focus is directed at how school leadership policies, management practices, and resource management support the creation of innovative learning environments characterized by creativity, collaboration, and technology integration. In addition, this research also intends to identify the challenges and opportunities faced in the strategy implementation process.

The contribution of this research is expected to cover two main aspects. Theoretically, this study expands the study of adaptive education management in the era of digital disruption by adding contextual perspectives from underrepresented regions in previous research. This enriches adaptive leadership theory in education management and offers a new framework that is more applicative to local conditions (Zhao, 2021). Practically, this study provides recommendations for school principals, teachers, and education stakeholders in Central Sulawesi to design effective managerial strategies in supporting learning innovation in high schools.

Thus, this research is expected not only to answer academic needs related to the development of adaptive education management theory, but also to provide practical solutions that can be implemented by schools in dealing with the dynamics of the digital era. Ultimately, a successful adaptive managerial strategy will strengthen the competitiveness of schools, improve the quality of learning, and grow a young generation that is ready to face global challenges in the 21st century.

## **LITERATURE REVIEW**

### ***Adaptive Leadership in the Era of Digital Disruption***

Adaptive leadership is the managerial ability to navigate uncertainty, adjust strategies, and develop innovative solutions in dynamic situations. In the context of education, adaptive leadership is seen as important to ensure the sustainability and relevance of schools in the era of digital disruption. Research by (Heifetz & Linsky, 2020) confirms that adaptive leadership emphasizes flexibility, courage to take risks, as well as collective participation in the face of complex change. These findings are reinforced by (Hajar & Alghamdi, 2022), which show that principals with an adaptive leadership style are able to increase teacher collaboration and accelerate the integration of technology in learning. Thus, adaptive leadership not only serves as a response to change, but also as a driving force for school transformation.

### ***Managerial Strategies to Enhance Learning Innovation***

The managerial strategies implemented in schools have a crucial role in creating innovative learning environments. Recent research shows that

educational innovation requires technology-oriented strategic planning, teacher competency development, and the creation of an organizational culture that supports creativity (Rahman & Wahyuni, 2021). Additionally, a study by (Kim & Park, 2023) highlights the importance of using data in managerial decision-making, which can improve the effectiveness of school policies and strengthen student engagement. With the right managerial strategy, schools are able to develop a learning ecosystem that is responsive to digital needs while supporting the achievement of 21st century educational goals.

### ***Challenges of Technology Implementation in Education***

Although digital technology offers great opportunities, schools still face various challenges in their implementation. Research by Basri and (Yusuf, 2022) identified the main obstacles in the form of limited infrastructure, low digital literacy of teachers, and resistance to change. Meanwhile, an international study by (Johnson & Martin, 2023) emphasizes that the digital gap between schools in urban and non-urban areas is a significant obstacle to equitable distribution of education quality. This condition demands an adaptive strategy that focuses not only on technical aspects, but also on change management, teacher empowerment, and sustainable policy support.

### ***Innovative Learning Environment in High Schools***

An innovative learning environment is characterized by technological integration, collaboration between stakeholders, and creativity-based learning. A study conducted by (Lestari & Prasetyo, 2024) shows that high schools that develop innovative cultures are able to increase students' motivation to learn as well as strengthen 21st century competencies, such as problem-solving and critical thinking. On the other hand, research by (Thomas et al., 2022) confirms that the leadership factor of school principals is the main key in shaping a sustainable innovative climate. This shows that adaptive managerial strategies not only affect technology management, but also play an important role in building an innovative culture that underpins the success of schools in the digital age.

## **METHODOLOGY**

### ***Types and Approaches to Research***

This research uses a qualitative approach with a case study design, because the focus is to explore in depth the adaptive managerial strategies applied in high school in the face of the era of digital disruption. The case study design was chosen because it allows researchers to understand complex phenomena in a real context, as well as identify managerial patterns that cannot be explained through quantitative data alone (Yin, 2020). This approach is relevant to the research objectives that emphasize the exploration of school management strategies, policies, and practices in creating innovative learning environments.

### ***Population and Sampling Techniques***

The research subjects consisted of 12 informants who were selected purposively based on their direct involvement in the management of high schools in Palu City, Central Sulawesi. The informants include school principals, teachers, and managerial staff from three different schools. The purposive sampling technique was chosen to ensure participants had relevant experience and knowledge related to adaptive managerial strategies. The number of informants is determined by considering the principle of information adequacy, where data is considered adequate after the adaptive strategy pattern begins to be repetitive and consistent (Palinkas et al., 2021).

### ***Data Collection Techniques***

Research data was obtained through three main techniques, namely in-depth interviews, participatory observation, and document analysis. In-depth interviews were conducted using semi-structured guides to explore the experiences of principals, teachers, and managerial staff regarding adaptive strategy practices. Participatory observation is carried out by directly observing managerial interactions, decision-making processes, and the implementation of learning technology in schools. Document analysis includes a review of school policies, work programs, activity reports, and other supporting documents. Data triangulation is carried out to increase credibility, by comparing findings from interviews, observations, and documents (Creswell & Creswell, 2021).

### ***Research Procedure***

The implementation of the research is carried out through four stages. First, the preparation stage, including the preparation of interview instruments, official licensing to schools, and instrument trials. Second, the data collection stage, namely in-depth interviews with 12 informants, observation of school activities, and collection of relevant documents. Third, the stage of data reduction and presentation, namely copying interview transcripts, organizing observation notes, and classifying documents. Fourth, the analysis and interpretation stage, where the data is interpreted thematically to find consistent adaptive strategy patterns.

### ***Data Analysis Techniques***

Data analysis was carried out using a reflective thematic analysis approach, with steps including data coding, theme identification, and interpretation of emerging patterns. This process is carried out iteratively to ensure the relevance between the themes and the suitability to the research objectives. To support the accuracy of the analysis, NVivo software is used in the process of coding and categorizing the data. The validity of the data is maintained through source triangulation techniques, method triangulation, and member checking to informants to ensure the correctness of interpretation (Allsop et al., 2022).

## RESEARCH RESULT

### *Strengthening Digital Leadership*

The results showed that principals in three high schools in Palu City have developed a digital leadership pattern that emphasizes flexibility, responsiveness, and courage in making strategic decisions. The principal actively facilitates the use of learning technology, initiates online meetings, and encourages the use of digital-based classroom management applications. This leadership is not only limited to policy aspects, but is also embodied in day-to-day practices that encourage teachers and staff to be more open to digital innovation.

The involvement of school principals in technology training with teachers strengthens their position as role models in the school's digital transformation. The principal shows a commitment to lead by setting a direct example, for example by using the Learning Management System (LMS), video conferencing platforms, and digital collaboration applications in managerial activities. The Principal confirmed: *"We, the principals, try to be an example first, so that teachers and students do not hesitate to follow the digital changes that occur"* (interview, A1, June 20, 2025). This shows that digital leadership strategies function as a determining factor in building collective trust in the school environment.

In addition, digital leadership is implemented through the courage to make quick and adaptive decisions in the face of technological challenges. The principal explained: *"There are still teachers who are not used to it, but our job is to accompany them to feel comfortable with technology"* (interview, A2, June 21, 2025). This statement affirms the importance of social sensitivity in adaptive managerial strategies.

Furthermore, digital leadership also demonstrates the capacity to drive a technology-based collaborative culture. The Principal said: *"We try to create an atmosphere of collaboration, for example with online forums between teachers to exchange innovative learning ideas"* (interview, A3, June 22, 2025). This shows that the role of the principal is not only as an administrator, but also as a catalyst for change that encourages the creation of a more innovative and competitive school ecosystem.

### *Teacher Capacity Development*

The findings of this study confirm that teacher capacity development is the dominant managerial strategy in dealing with digital disruption. Principals in the three high schools where the research was located consistently emphasized the importance of improving teachers' skills in the use of technology. The digital training program has been implemented in stages, including workshops, mentoring, and peer learning, so that teachers not only gain technical knowledge, but also the opportunity to learn collaboratively with peers. This effort is in line with the goal of building a culture of professionalism that is adaptive to the development of educational technology.

The training provided focuses on mastering Learning Management Systems (LMS) such as Google Classroom and Moodle, the use of video conferencing applications such as Zoom and Microsoft Teams, and the use of interactive presentation software such as Mentimeter and Canva. *The principal*

*explained: "We try to facilitate various trainings, so that teachers are not only familiar with technology, but also able to use it in their daily learning."* (interview, A1, June 20, 2025). This shows that the training program is not only theoretical, but also applicable, so that teachers can directly integrate technology into their teaching practices.

Field observations show an increase in teachers' creativity in designing project-based learning with technology support. Teachers are starting to be more courageous in exploring collaborative methods, for example through online discussion forums, the creation of interactive digital media, to online quiz-based evaluations. The managerial staff added: *"After several trainings, many teachers have begun to dare to try new things, such as creating project-based classes with the help of digital technology."* (interview, C1, June 20, 2025). This change reflects a paradigm shift from just using technology as a tool, to using technology as a means of creating learning innovations.

However, this study also found that there is a variation in abilities between teachers. Some teachers who are relatively younger are more likely to master technology, while others, especially senior teachers, need more intensive mentoring. The managerial staff confirms: *"We realize that there are teachers who adapt quickly, but there are also those who need more guidance, so we apply a mentoring system between teachers"* (interview, C3, June 22, 2025). Mentoring systems that involve experienced teachers in the field of technology to accompany peers have proven effective in reducing the ability gap.

Thus, teacher capacity building through continuous training, mentoring, and peer collaboration is an important foundation in adaptive managerial strategies. The success of schools in creating innovative learning environments is greatly influenced by teachers' ability to use technology creatively and sustainably. These findings show that teacher capacity development is not just a technical activity, but a long-term strategy to build school competitiveness in the era of digital disruption.

### ***Optimization of Online Learning Platform***

Document analysis and observations show that the three high schools in Palu City have integrated various digital platforms, such as Google Classroom, Moodle, and local apps, to support learning. This integration is carried out systematically with the aim of making it easier for teachers to manage subject matter, prepare schedules, provide assessments, and monitor student activities in a more structured manner. Through the use of online platforms, the learning process is no longer limited to physical classrooms, but is extended to virtual spaces that can be accessed at any time. Thus, this strategy allows flexibility for teachers and students in carrying out teaching and learning activities.

The results of the interview with the principal revealed that online platforms not only function as a medium for delivering material, but also become an important means in learning management as a whole. One states: *"We encourage students to actively use Google Classroom so that assignment collection and assessments can be done faster and more transparently"* (interview, B1, June 20, 2025). This statement shows a paradigm shift from manual systems to more efficient

and accountable digital systems, in line with the demands of educational transformation in the digital era.

In addition, online platforms are also used to strengthen interaction and communication among all school stakeholders. One teacher explained: "*Through online applications, communication with students and parents becomes easier, especially in providing information on academic development and student discipline*" (interview, B2, June 21, 2025). This shows that the use of digital platforms not only facilitates the pedagogical aspect, but also strengthens the relationship between schools, students, and parents as part of a more inclusive educational ecosystem.

Furthermore, research data indicates that online platforms also play a role in building a collaborative culture between students. The discussion forums, chat features, and collaboration rooms available on platforms like Moodle encourage active student engagement outside of class hours. The teacher affirmed: "*We see students more actively discussing through online forums, even their creative ideas appear more when interacting in virtual spaces*" (interview, B3, June 22, 2025). This condition indicates that the optimization of online platforms not only increases the effectiveness of classroom management, but also strengthens students' collaborative skills and critical thinking.

However, this study found significant obstacles, especially related to limited internet access in several areas of Palu City. This condition poses challenges for teachers and students in accessing materials consistently. As a solution, the school implemented a platform diversification strategy, by providing alternative learning in offline form, including print modules and recorded materials. This step is part of the school's adaptive strategy to ensure that all students can still access learning without being hampered by technical factors.

The research confirms that the optimization of online learning platforms in high schools in Palu City is the result of adaptive managerial leadership, characterized by the ability of school principals to integrate technology, strengthen communication, and adjust strategies to local conditions. This strategy not only answers the needs of digital transformation, but also shows the school's commitment to creating an inclusive, collaborative, and innovative learning environment.

### ***Establishment of a Culture of Collaboration and Innovation***

The results of the study show that the three high schools in Palu City consistently build an organizational culture that is oriented towards collaboration and innovation. Principals play an important role in fostering this culture through participatory policies and leadership approaches. One of the strategies carried out is to encourage teachers and managerial staff to join an innovation team that routinely designs technology-based programs, such as virtual classes, learning innovation competitions, and digital discussion forums between teachers. This effort not only enriches the variety of learning methods, but also creates a collaborative space that encourages the creativity of educators.

The principal emphasized that educational innovation cannot run individually, but must involve all elements of the school. As stated: "*We encourage teachers to not only teach in the classroom, but also work together in teams to create*

*digital programs that are relevant to students' needs*" (interview, A1, June 20, 2025). This shows that collaboration between teachers is the main key in bringing about continuous updates.

Field observations also show that this collaborative culture has a direct impact on teachers, particularly in increasing motivation and courage to experiment with new learning strategies. Teachers no longer simply follow conventional patterns, but are encouraged to integrate technology and adapt methods according to student characteristics. The teacher explained: "*Through digital discussion forums, teachers exchange experiences, so they don't feel alone when trying new methods*" (interview, B5, June 21, 2025). Thus, the school succeeds in creating an atmosphere conducive to the exchange of ideas, peer learning, and increasing the professional capacity of teachers.

In addition, student involvement in a technology-based collaborative culture further strengthens the innovation ecosystem in schools. Students are not only recipients of material, but also active actors in various activities, such as collaborative projects, online discussions, and learning innovation competitions. The teacher revealed: "*We see that students are more enthusiastic when they are involved in digital projects with teachers, because they feel that their contributions are appreciated*" (interview, B6, June 22, 2025). These findings confirm that collaboration is not only limited to the teacher and staff level, but also includes student engagement as an integral part of the innovation process.

Furthermore, the formation of this culture of collaboration and innovation shows a paradigm shift in school organization from a hierarchical model to a participatory model. The principal is no longer the only source of ideas, but rather a facilitator who provides space for teachers and students to contribute. With this approach, the school has succeeded in building an adaptive culture that is able to answer the challenges of the digital era while strengthening the sense of belonging in the school community.

### ***Challenges of Implementing Adaptive Strategies***

In addition to various positive achievements, this study also found a number of challenges faced by high schools in implementing adaptive managerial strategies in the era of digital disruption. These challenges are closely related to infrastructure, human resources, and internal dynamics of the school organization.

*First*, the limitations of technology infrastructure and internet networks are the main obstacles, especially for schools in the suburbs of Palu City. The availability of computer devices, school Wi-Fi access, and the stability of the internet network are not evenly distributed, so not all students can participate in online learning optimally. The managerial staff said: "*In our school, there are still classes that have difficulty accessing digital platforms because the internet network is often unstable*" (interview, C2, June 21, 2025). This condition makes schools have to find alternative solutions, for example by using lightweight applications or providing learning materials in print form for students with access difficulties.

*Second*, teachers' readiness to adopt technology is also a factor that poses its own challenges. Not all teachers have adequate digital competence, so the

speed of adaptation to the use of online learning platforms varies. Some relatively more senior teachers have shown resistance to change, although various trainings have been held. The managerial staff revealed: "*There are some teachers who are still comfortable with conventional methods, so when asked to use digital applications, they need extra assistance*" (interview, C3, June 22, 2025). This situation forces schools to implement a more differential training strategy, where proficient teachers become mentors to peers who are still struggling.

Third, although principals have made efforts to foster a collaborative culture, psychological resistance to change persists. Some teachers feel burdened by additional administrative tasks through online systems, so they see digitalization as a burden, not an opportunity to improve learning effectiveness. The principal confirmed: "*There are teachers who complain that the online system makes work increase, even though the main purpose is to make it easier*" (interview, A3, June 22, 2025). This shows that there is a gap between visionary adaptive policy design and the reality of implementation in the field influenced by human factors.

Thus, the challenges of implementing adaptive strategies in high school are not only technical, but also cultural and psychological. Infrastructure barriers, limited teacher capacity, and resistance to change are crucial factors that must be managed continuously. This finding shows that digital transformation in the world of education is not an instant process, but requires flexible strategies, resource support, and a change in mindset from all school stakeholders.

## DISCUSSION

The results of this study show that high schools in Palu City have developed adaptive managerial strategies in responding to digital disruption, through strengthening digital leadership, teacher capacity development, optimizing online learning platforms, and forming a culture of collaboration and innovation. These findings are in line with the view that flexible and responsive digital leadership is able to accelerate the transformation of schools towards innovative learning environments (Iivari et al., 2020). The principal not only acts as an administrator, but also as a role model who provides a direct example of the use of technology, thus fostering collective trust among teachers and students. This supports transformational leadership theory that emphasizes the role of leaders as catalysts for organizational culture change (Avolio et al., 2021).

In addition to leadership, teacher capacity development is an important pillar in adaptive strategies. Continuous digital training programs through workshops, mentoring, and peer learning make a significant contribution to improving technology-based pedagogic competencies. These results reinforce previous findings that intensive and collaborative training is a key factor in reducing teachers' resistance to change (Trust & Whalen, 2020). However, this study also found that there is a variation in abilities between teachers, where senior teachers need more intensive assistance. This condition reflects the digital generation gap among educators, which requires differentiation strategies in professional development (Howard et al., 2022).

The optimization of online learning platforms is also a prominent strategy, as it allows the learning process to take place more flexibly, efficiently, and

structured. The use of Google Classroom, Moodle, and local apps not only speeds up the distribution of materials, but also strengthens communication between teachers, students, and parents. These findings are in line with the literature emphasizing the role of educational technology in creating a collaborative and inclusive learning ecosystem (Bond et al., 2021). Furthermore, student engagement in online forums encourages collaborative skills, critical thinking, and creativity, which are essential competencies of the 21st century (Voogt & Pareja Roblin, 2022).

On the other hand, the formation of a culture of collaboration and innovation facilitated by principals and managerial staff shows a transformation of organizational culture from hierarchical to participatory. Teachers not only play the role of teachers, but also innovators who actively create digital learning methods with their peers. These findings are consistent with research showing that collaborative culture can increase teachers' motivation, engagement, and innovation (Pang & Lai, 2021). In addition, student involvement in collaborative digital projects proves that technology-based educational innovations are able to strengthen the sense of belonging among school residents.

However, this study also highlights a number of challenges that hinder the implementation of adaptive strategies. The main obstacles include limited technological infrastructure, unequal access to the internet, and the resistance of some teachers to change. This condition is in line with previous findings that show that the digitalization of education often faces a gap in resources and psychological readiness (Zawacki-Richter, 2021). These factors show the difference between the visionary policies designed and the realities of implementation on the ground, which are influenced by technical and cultural aspects. Therefore, the success of adaptive managerial strategies depends not only on policy design, but also on infrastructure support, human resource competencies, and the transformation of the mindset of teachers and students (Ratten, 2022).

The significance of these findings is that adaptive managerial strategies in the era of digital disruption cannot be viewed as a short-term intervention, but rather as a sustainable transformative process involving visionary leadership, teacher capacity building, strengthening a collaborative culture, and contextual use of technology. The contribution of this research to the development of adaptive education management science is to emphasize the importance of flexibility, responsiveness, and participation in managing schools in the digital era. Practically, the results of this study provide recommendations for schools to continue to develop differential training, expand inclusive technology infrastructure, and strengthen monitoring mechanisms for the implementation of digital strategies.

The weakness of this study lies in the limited geographical scope which only covers three high schools in Palu City, so the generalization of the results of the research needs to be done carefully. For follow-up research, it is recommended to involve more schools with diverse socio-economic contexts, as well as integrate quantitative approaches to measure the long-term impact of adaptive strategies on student learning outcomes. Thus, a more comprehensive

understanding of the effectiveness of adaptive managerial strategies can be gained, while strengthening its contribution to the global literature on educational transformation in the digital age.

## CONCLUSION AND RECOMMENDATION

This research shows that adaptive managerial strategies are the main foundation for high schools in dealing with digital disruption. The findings confirm that strengthening digital leadership, sustainable teacher capacity development, optimizing online learning platforms, and building a collaborative and innovative culture are important pillars to create a creative and responsive learning environment to change. The successful implementation of this strategy is highly dependent on the flexibility, vision, and ability of school management to manage resources and formulate policies that are relevant to the needs of the digital era.

The contribution of this research not only enriches the theory of adaptive education management, but also provides practical implications for schools in building a sustainable learning ecosystem. However, challenges in the form of limited infrastructure, variations in teacher competencies, and resistance to change remain factors that need to be overcome.

## ADVANCED RESEARCH

Therefore, further research is recommended to examine the broader context of schools with diverse approaches, so as to strengthen understanding of the effectiveness of adaptive strategies in supporting the digital transformation of education in the future.

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