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Enhancing Teacher Quality: The Role of Digitalization in Transforming Educational Supervision

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ABSTRACT

This research aims to develop a system-based academic supervision model to address specific inefficiencies in the supervision process, such as logistical challenges and resource limitations. The purpose of this research is to develop a system-based academic supervision model to overcome the ineffectiveness of the academic supervision process. This research method uses the Borg and Gall model, which consists of 10 steps of product development from preliminary research to product dissemination. The research subjects were teachers and school supervisors in Salatiga City, especially in elementary schools, which are public and private schools. The selection of subjects is based on subjects with criteria, namely subjects who play an active role in the academic supervision process and have experience in academic supervision at school. The instruments in this study were observation guidelines, interview guidelines, user perception questionnaires, and product trial questionnaire. The research instruments have been validated by expert validators and meet the criteria of validity and reliability. The results showed that the development of the Management Information System for academic supervision of the Borg and Gall model resulted in a product that met the criteria of valid, effective, and practical for academic supervision. The research findings show that using the academic supervision system makes it easier for supervisors and teachers to carry out the academic supervision process. In addition, the efficiency of supervision becomes better, because it can overcome the distance and the limited number of supervisors to the number of schools whose ratio is not balanced. In addition, the use of an academic supervision system speeds up the supervision process, simplifies the use of assessment instruments, and is practically used flexibly.

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1. INTRODUCTION

The era of the fourth industrial revolution and the transition to Society 5.0 have brought about rapid changes, often referred to as exponential development. Exponential development is characterized by technological advancements that occur at a faster rate than the time comparison. The rapid development

of information technology has impacted all sectors of human life. One such sector that is directly affected by technological advancements is education. Education and technological development are integrated and inseparable, thus, technological advancements are followed by more adaptive learning processes (Irawan et al., 2018).

Trends in education in the 21st century have undergone many changes from previous eras, where education in this era cannot be separated from the use of technology in its learning process (Shonfeld et al., 2021). Moreover, the 21st century has been faced with the phenomenon of the COVID-19 pandemic, which has spread to all countries in the world. This event has caused a comprehensive change in the education process. One noticeable aspect is the change in the learning process that was previously conducted face-to-face in the classroom, which had to be converted to online learning, requiring distance learning (Temelli et al., 2021). The changes that occurred resulted in a paradigm shift in education, where the central role of the teacher in the education process had to be changed to optimize student self-learning because the evolving education process prioritizes independent learning (Wei & Chou, 2020).

The Ministry of Education of the Republic of Indonesia has programmed a transformation of education in Indonesia by adopting the concept of independent learning. Independent learning is an approach that allows students to choose the subjects in which they are interested. This concept is a step to optimize students' abilities and talents based on their interests, making it more meaningful (Tohir, 2020). The independent learning program aims to change the perception of subjects that students fear to learn, but what is learned is a subject of their choice. The transformation of education in the 21st century is a comprehensive transformation, namely, from the learning process, student learning media, student assessments, and monitoring of the learning process.

One aspect of monitoring that has not undergone many changes and is still based on manual processes is the academic supervision process. Academic supervision is a series of activities that help teachers develop the ability to manage the learning process to achieve learning objectives (Sanoto & Sugito, 2020). Academic supervision aims to monitor and evaluate the learning process. Follow-up actions are given by the supervisor to improve the learning process that has been carried out.

The academic supervision process is carried out periodically, with implementation every semester or twice a year. Thus, the learning process implemented by teachers in schools can be monitored. In addition, academic supervision serves as a place for teachers to consult with supervisors about learning obstacles experienced in school. Thus, academic supervision plays a very important role in the education process. The problem in the academic supervision process is that the implementation of academic supervision cannot be carried out according to the schedule set due to several implementation constraints, such as distance, time, and complex reporting processes (Yanuarti & Rusman, 2019).

The problems in implementing the academic supervision process result in ineffective supervision. The ineffectiveness arises because the supervision process cannot be fully implemented, is only based on implementation reports, and has minimal follow-up from the academic supervision process. In addition, the lengthy reporting process for academic supervision causes the focus of implementation to be on administration, with the goal of monitoring and evaluating the learning process carried out by teachers being insufficiently in-depth. The academic supervision process lacks effectiveness because supervision is done manually by conducting visits and evaluating documents that can only be done directly. The implementation of supervision has not been facilitated by a system that allows it to be carried out digitally. In addition, the limited number of school supervisors compared to many schools means that not all schools can be supervised optimally. So, a system is needed to optimize the limited number of supervisors with a relatively larger number of schools. Based on the constraints in the supervision process, it is necessary to develop a digital-based academic supervision system that can provide real-time monitoring, simplify the reporting process, and provide a more in-depth evaluation of the learning process.

2. METHODS

This study aims to design an academic supervision management model assisted by a Design SIM. The research design used in this study is Research and Development (R&D) using the Borg & Gall Development Model. According to Borg & Gall (Gall et al., 1983), the R&D model is an industry-based development model where research findings are used to design new products and procedures, which are then systematically field tested, evaluated, and refined so that the findings meet the criteria of Effectiveness, quality, or specific standards. R&D research, according to Sugiyono (2010), is a research method used to produce specific products and test the effectiveness of those products.

This study used the Borg & Gall development model, which consists of 10 stages: 1) research and information collecting (preliminary research and data collection), 2) planning, 3) developing the primary form of the product (developing the basic product design), 4) preliminary field testing (testing the basic product design), 5) main product revision (revising/improving the product design), 6) main field testing (limited product testing), 7) operation product revision (revising/improving the product), 8) operation field testing (field testing the product), 9) final product revision (improving the final product), and 10) dissemination and implementation (spreading and implementing the final product widely).

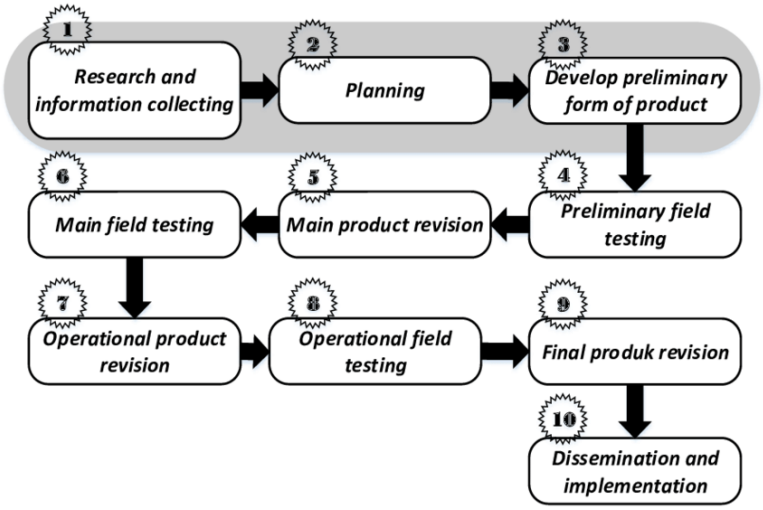

Figure 1. Borg And Gall Research Flow

3. FINDINGS AND DISCUSSION

3.1. Result

The data analysis in this study followed the Borg and Gall research and development model. The analysis began with a preliminary study of the academic supervision process, followed by a review of relevant literature. The findings from the preliminary study were used to guide the planning and design of the product. The next stage involved product testing, which started with a limited trial followed by a wider trial.

3.1.1 Research and Information Collecting

The research and information collecting stage was the initial step of the study, which involved gathering information and needs related to academic supervision. The initial observation indicated that the academic supervision process in Salatiga City was still manually based or conducted through classroom visits by school supervisors. Academic supervision was carried out twice a year or twice per semester, but it was sometimes not implemented according to the planned schedule. The main obstacle was the limited time of school supervisors to conduct visits.

Interviews with school supervisors revealed that the supervision process was hindered by an imbalance between the number of supervisors and the number of teachers being supervised, resulting in some teachers not receiving academic supervision. Additionally, the evaluation process used printed documentation. Most data were digital-based, and it would be easier to document them digitally rather than in print. However, there was no system available to accommodate this need.

Interviews with teachers showed that the academic supervision process was not always carried out according to the schedule. It was sometimes delayed or even not implemented due to differing schedules between the supervisors and schools, causing problems with the implementation of academic supervision. Additionally, the academic supervision process tended to focus on collecting learning documents such as lesson plans, syllabuses, and learning materials, but the evaluation and follow-up by school supervisors were insufficient. As a result, teachers experienced confusion in improving their performance based on the supervisor's evaluation.

3.1.2 Planning

The planning stage involved the development of an action plan based on the research findings. The initial analysis showed that the academic supervision process was constrained by time, both for school supervisors and teachers. Other constraints included the manual implementation of academic supervision and the lack of a digital-based system for academic supervision. The evaluation and follow-up provided by school supervisors to teachers were also insufficient, and the supervision process tended to focus on collecting learning data with insufficient evaluation. Therefore, a model for academic supervision was designed based on the research findings.

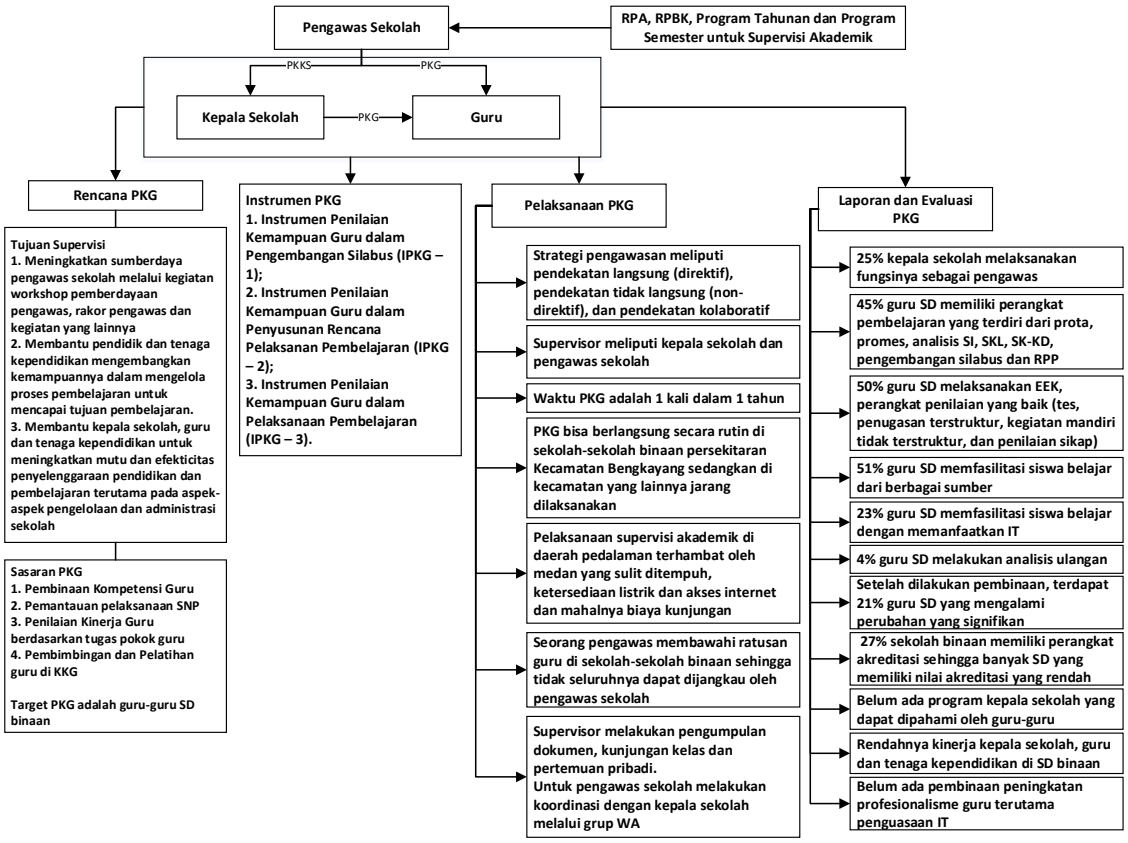

Figure 2. Academic Supervision Process Diagram

3.1.3 Developing the primary form of product

The advancement of technology in the 4.0 technological revolution demands work that is not limited by space and time. The same goes for academic supervision. The use of technology is expected to improve the effectiveness of educational quality supervision. The use of ICT is expected to overcome the limitations of direct communication time between supervisors and schools, ensure the sustainability of supervision, and can be used to speed up monitoring and evaluation carried out by school supervisors.

The design model was developed from the results of empirical model exploration in the field and literature review. The design model of academic supervision assisted by SIM (Management Information System) is an application that assists academic supervision by utilizing technology to improve the effectiveness of academic supervision processes. The Management Information System was developed to assist academic supervision processes in the city of Salatiga. The Management Information System uses a website or online platform. According to Yuhefizar (2013:2), a website is a collection of web pages contained within a domain that contains information.

The Management Information System is divided into four integrated user structures, namely: 1) Super users (admins) are users who centrally manage the application and are managed by the Salatiga Education Office; 2) School Supervisors are users held by school supervisors based on account activation by the super admin; 3) School Principals are users held by principals based on account activation by the super admin; 4) Senior Teachers are users held by senior teachers based on account activation by the super admin; and 5) Teachers are users held by teachers based on account activation by the super admin.

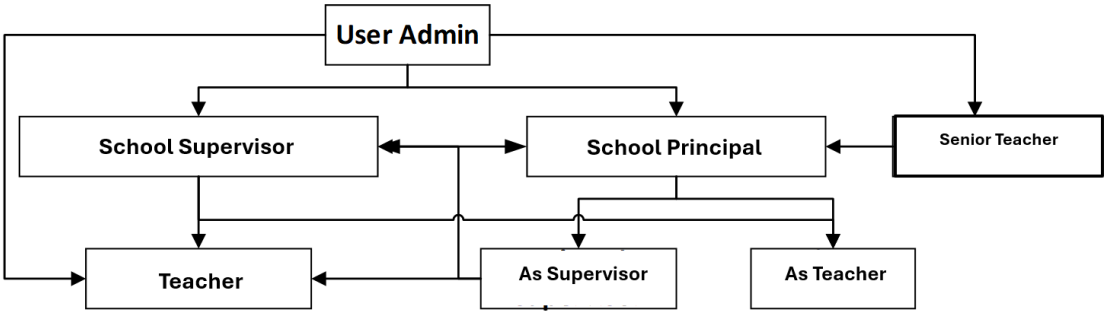

Figure 3. User Integration in Management Information System

The integration of these users can be illustrated in the following algorithm. Based on the designed algorithm, the Management Information System is constructed with the system display as follow.

Figure 4. Main Menu Display of Management Information System

Figure 4 shows the display of the academic supervision system. The initial display consists of a home menu, information, and log in to enter the system. So that new users can find out the functions and flow of implementing academic supervision through the information menu.

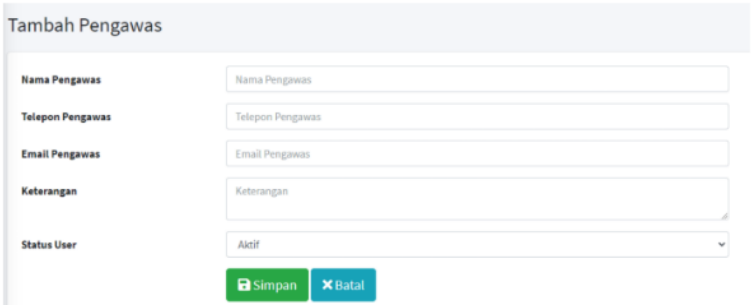

Figure 5. Supervisor User Management

Figure 5 shows the process of adding a school supervisor user that the main administrator of the system can do. Additions can be made based on the number of supervisors in each school being supervised.

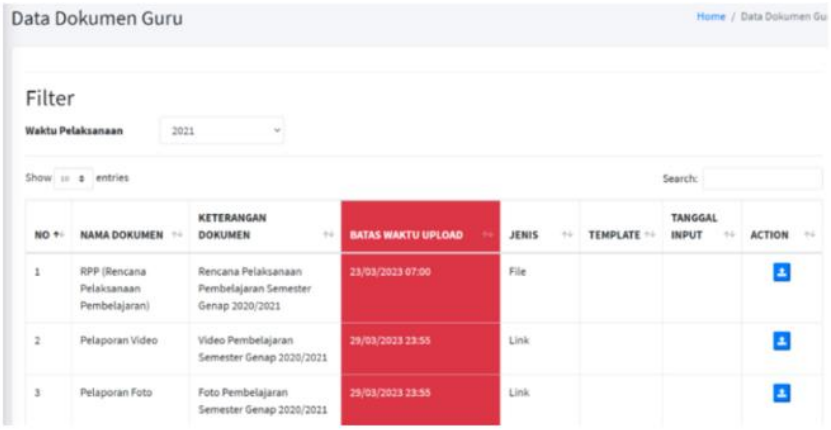

Figure 6. Display of options for uploading teacher user data.

Figure 6 shows the assessment process in the academic supervision process. The assessment form has been adjusted to the national academic supervision implementation standards. The system will facilitate the process of checking data and validating the data collected by teachers who are carrying out academic supervision.

3.1.4 Preliminary Field Testing

The Preliminary Field-Testing stage is a model testing process that has been developed through a Focus Group Discussion involving teachers, school supervisors, and education practitioners. The validation process is carried out in the Preliminary Field-Testing stage, which is conducted by expert validators. The assessment results from expert validators consisting of education management experts, technology experts, and education practitioners obtained an average score of 92% or met the criteria for use in research. The initial assessment results regarding the operation of the Management Information System conducted by teachers and supervisors obtained smooth criteria for using the system.

The conclusion from the limited trial assessment sheet results are as follows: 1) The Academic Supervision Management Information System can assist academic supervision activities in Salatiga City; 2) The Academic Supervision Management Information System can assist academic supervision

activities and is considered good; 3) School supervisors, principals, and teachers in Salatiga welcomed and were enthusiastic about the Academic Supervision Management Information System; 4) School supervisors, principals, and teachers need time to adapt to operating the Academic Supervision Management Information System. The steps that will be taken to respond to this feedback are 1) to conduct longer training sessions; 2) to complete the guidebook for supervisors and teachers.

3.1.5 Main Product Revision

This stage is the process of revising the product from the results of limited trials. The limited trial results found several revision points, including improving menus and features that were not yet available in the Academic Supervision Management Information System. Then, to improve understanding related to the use of the system, a system guidebook was developed consisting of user administrators, supervisors, principals, and teachers.

3.1.6 Main Field Testing

The Main Field-Testing stage is a testing phase with a larger number of subjects than the number of subjects during the limited trial. The testing results during field trials resulted in an improvement in the assessment results from research subjects, as follows: In detail, the results of the field test are shown in table 1 as follows.

Table 1. Limited Trial and Field-Testing Data Using SPSS Version 26

	Descriptive Statistics				
	N	**Minimum**	**Maximum**	**Sum**	**Mean**
Limited Trial Assessment	28	49	71	1674	59.79
Field Test Assessment	42	47	72	2549	60.69
Valid N (listwise)	28				

Table 1 shows that there was an increase in achievement from the limited trial compared to the field test. Apart from the aspect of increasing the achievement results, the number of research subjects used in the field test increased significantly. This shows the consistency of the effectiveness in using the academic supervision system.

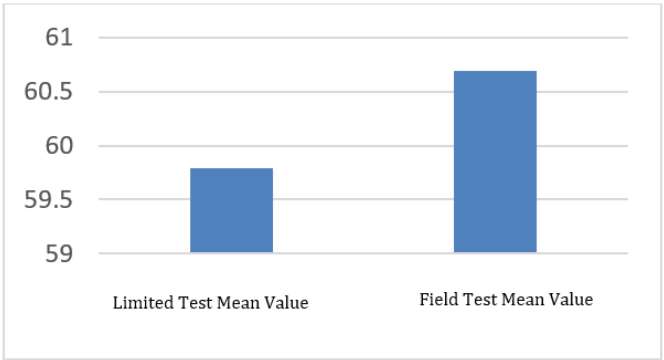

Figure 7. Comparison of Average Scores between Limited Trial and Field Testing

The test result in Figure 7 showed an improvement in the assessment of research subjects with the addition of more evaluation subjects in the field test. In addition to the improved evaluation results, there were several points that needed to be completed in the Management Information System, as several errors/bugs were found in some menus, requiring improvements.

Operation Product Revision is a revision process after field testing to improve parts that are still lacking and require improvement. The improvement in this stage is the correction of bugs/errors in the system found during field testing. The correction is carried out on the coding part of the system, so that it can fix the system parts that are in error. In addition to the system parts, the manual of the system also needs to be perfected to match the improvements made in the system.

3.1.7 Operation Product Revision

The Operation Product Revision stage is a process of revision after field testing to improve the parts that are still lacking and require improvement. The improvement in this stage is the fixing of bugs/errors found during field testing. Improvements have been made to the coding system so that it can fix the parts of the system that have errors. In addition to the system parts, there is also a refinement of the system manual book that undergoes improvements in accordance with the improvements made in the system.

3.1.8 Final Product Revision

The final product of the academic supervision model with the assistance of Academic Supervision Management Information System is a web-based management system that can be used for academic supervision activities online. The Academic Supervision Management Information System is the result of integrating technology (IT) with academic supervision that can be used to assess teacher performance. The results of the teacher performance assessment can be used as the basis for improving teacher professionalism.

Table 8 shows the final results of the system, specifically in designing the time of implementation of academic supervision, here is the display.

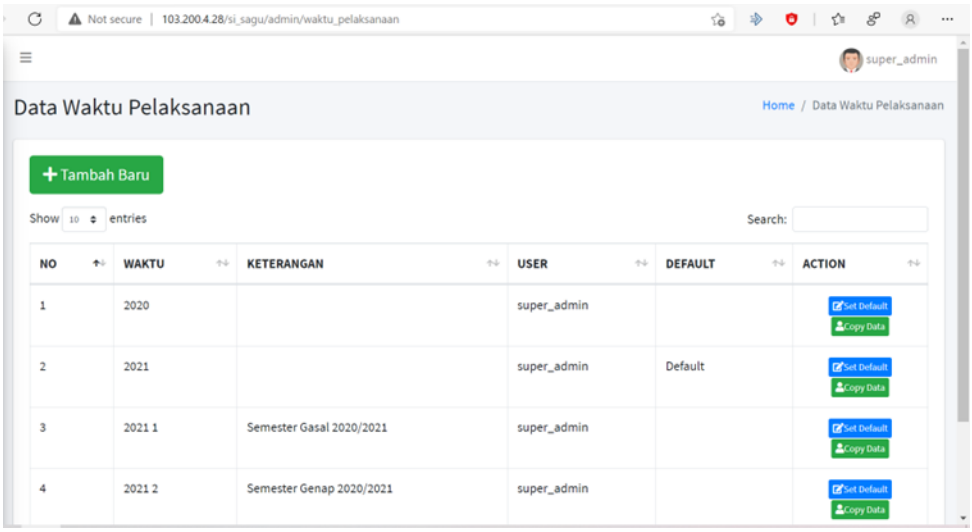

Figure 8. Settings of Academic Supervision Management System.

The output results of the Academic Supervision Management Information System can be printed and saved as a pdf file. Supervisors can print all documents uploaded by teachers, the results of teacher performance assessments, reports on academic supervision implementation, assessment result summaries, analyses, and follow-up actions of academic supervision activities. Teachers can also print their assessment results, uploaded documents, and progress reports from their supervisors. Furthermore, the Academic Supervision Management Information System allows for online consultation between teachers, principals, and school supervisors.

The following is an example of the display of the academic supervision report output using the application showed in Figure 9 below.

Form in system

Pembahasan Hasil Supervisi

- **Persiapan Pelaksanaan Pembelajaran**

Berdasarkan hasil pelaksanaan supervisi persiapan di atas maka hasil tersebut dapat ditabulasikan dan diuraikan sebagai berikut:

Tabel Hasil Supervisi Persiapan Pelaksanaan Pembelajaran

No	Perolehan Nilai	Guru Kelompok Mata Pelajaran						Jumlah	Prosentase keseluruhan (%)
		Adaptif		Normatif		Produktif			
		Banyaknya	%	Banyaknya	%	Banyaknya	%		
1	Baik sekali	5	45	3	50	2	14	10	32
2	Baik	5	45	2	33	6	43	13	42

Translate in English

Discussion of supervision results.

Based on the results of the implementation of supervision, the results are described as follows.

Learning implementation preparation supervision result table

No	Score	Classroom teacher Group						Sum	Overall percentage
		Adaptive		Normative		Productive			
		Sum	%	Sum	%	Sum	%		
1	Verry good	5	45	3	50	2	14	10	32
2	Good	5	45	2	33	6	43	13	42

Figure 9. Display results on the supervision system

3.1.9 Results of Perception Test on Academic Supervision Management Information System

A perception questionnaire was administered during field testing to determine users' perceptions regarding the use and benefits of the Academic Supervision Management Information System. User perception data met the prerequisite test criteria, which were normal distribution and homogeneity, enabling a mean difference test to be conducted. The results of the mean difference test yielded the following scores in table 2 below.

Table 2. Perception Test Results

	Code	N	Mean	Std. Deviation	Std. Error Mean
FGD2	Initial Perception.	42	133.8333	5.88059	0.90739
	Final Perception.	42	154.3095	7.32016	1.12953

Based on Table 2, the average value of initial perception data in FGD 2 was 133.8333, while the average value of final perception data in FGD 2 was 154.3095. It is apparent that the average value of final perception data in FGD 2 is higher than the average value of initial perception data in FGD 2. This means that in the field test, the perceptions of supervisors and teachers after using the Academic Supervision Management Information System model in academic supervision activities were higher than before using the model.

3.2. Discussion

Academic supervision is an effort to help teachers develop and improve their professionalism, as well as monitor the quality of teachers. Academic supervision consists of carrying out the tasks of guidance, monitoring, assessment, guidance, and professional training. Therefore, academic supervision can have an impact on improving the performance of teachers (Akhmad, 2014; Amini & Gholami, 2018; Dangara & Usman, 2015; Ngwenya, 2020; Özcan, 2020; Qureshi & Neelofar, 2016; Tri Irfa Indrayani & Metriza, 2017; Turan, 2019). If teacher professionalism increases, then performance in teaching will also improve. This will have an impact on increasing teacher work motivation, teacher competence in the learning process, achievement motivation, and student learning outcomes (Ajasan, Nasir Usman, 2016; Astuti, 2017; Daud et al., 2018; Hardono, Haryono, 2017; Kodariah et al., 2018; Murniasih & Tri Joko Rahardjo, 2016; Ndapaloka et al., 2016; Ngwenya, 2020; Özcan, 2020; Sitaasih, 2020). Academic supervision activities are carried out using various approaches and methods such as 1) classroom visits/observations; 2) cross-classroom visits/observations; 3) private meetings; 4) teacher council meetings; 5) school visits; 6) cross-school visits; 7) meetings in work groups; 8) professional bulletins publication; 9) training; 10) lesson study (Akhmad, 2014; Davidovitch & Eckhaus, 2020; Gordon, 2019; Ibara, 2013; McGhee & Stark, 2018; Mushlih & Suryadi, 2018; Nordentoft et al., 2013;

Turan, 2019). One of the methods commonly used by school supervisors and principals in conducting academic supervision is visiting classrooms to assess teacher performance.

The implementation of academic supervision with traditional approaches in various regions in Indonesia has its own obstacles and problems (Rahabav, 2016; Sanoto et al., 2021). The implementation of academic supervision in the city of Salatiga has experienced various problems, and if using a traditional approach, academic supervision activities are considered less effective. This is due to the imbalance between the ratio of supervisors and teachers, as well as scheduling that is not suitable either from the supervisor to the teacher or vice versa, so that the academic supervision process does not run well and according to schedule.

Management Information System (MIS) is the implementation of information systems within an organization to support the information needed by all levels of management (Sutabri, 2005). According to Utami (2011), MIS is an information system that, in addition to performing all the necessary transaction processing for an organization, also provides information support and processing for management functions and decision-making. Management Information System (MIS) is a computer-based system that makes information available to users who have similar needs (McLeod and Schell in (Zakiyudin, 2011). Therefore, management information system is an information system that manages information from various parties for decision-making. In this study, the management information system is in the form of an online or website-based management information system. According to Yuhefizar (2013:2), a website is a collection of web pages contained in a domain that contains information.

In this study, the development of the Teacher Management Information System Model using the 10 stages of Borg & Gall is carried out. The research and information collecting stage aims to obtain an overview of the implementation of supervision that has been taking place in Salatiga, which includes the mechanism of implementation, benefits perceived by teachers, constraints and challenges in conducting supervision, as well as the availability of supporting resources in implementing supervision.

The research and information collecting stage includes an initial analysis process related to the supervision process that has been carried out in Salatiga City, and the results obtained show that the implementation of the academic supervision process is less effective due to time constraints and the absence of system integration. This is supported by research (Sitaasih, 2020) which states that the process of implementing academic supervision depends on the periodic implementation of supervision. The planning stage in the research resulted in the design of the Academic Supervision Management Information System Model. The develop primary form of product stage is the stage of developing the model and producing the product. This stage resulted in the development of an online-based academic supervision model or called the Academic Supervision Management Information System. The preliminary field stage is the product validation process, which concludes that the Academic Supervision Management Information System is valid for use in research and meets the research criteria. The main product revision stage is the process of improving the results of validation and designing a guidebook to facilitate user use. The main field-testing stage is a small-scale test stage. The results of the main field-testing stage produced user assessments and perception tests of the developed SIM product. The operation product revision stage is the revision process of the limited test with some aspects improved, including the system and the system guidebook. The operation field testing stage is the extensive testing process with a wide range of subjects, resulting in evaluations from users consisting of user perception tests. Final revision is the final revision of the entire development stages and fixes bugs/errors found in the system, resulting in a good Academic Supervision Management Information System product.

The research findings indicate that a model of academic supervision based on Management Information System is needed in the digital era to accommodate user needs, provide more flexibility, and facilitate access, without requiring face-to-face interaction. Previous studies (California, 2015; Sanoto, 2021) have shown that some challenges in the academic supervision process can be addressed

using a system that can accommodate these needs. This description shows that in the academic supervision process, which consists of several assessment processes and complex instrument needs, a system is needed that facilitates supervision activities to be more effective and practical, namely by using an academic supervision system.

4. CONCLUSION

The academic supervision management system meets valid criteria based on expert assessments. These three aspects show that the academic supervision system is designed in accordance with the objectives and uses of the implementation of academic supervision. Meanwhile, the achievement of implementing academic supervision using the system has increased the number of schools that can be supervised compared to before using the system, thus meeting the effective criteria. The practicality of the system developed is shown in the ease of use by teacher users, school principals, and supervisors. The findings in the study show that using an academic supervision system makes it easier for supervisors and teachers to carry out the academic supervision process. In addition, the efficiency of supervision is improving because it can overcome the distance and the limited number of supervisors to the number of schools whose ratio is not balanced. Suggestions for future research include developing an academic supervision management system that can be collaborated with the school administration system to become a mutually integrated system. The use of the system in the academic supervision process contributes to an effective and practical assessment process. So that follow-up and improvement of school services are faster.

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Conflicts of Interest: The research conducted had no conflict of interest from all parties involved, starting from the research subjects and researchers. The results of the research are purely from the findings that arise in the research and there is no intervention from any party.

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