Assemble of Information Technology (AIT) as School Infrastructure Optimization

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Abstract. Disruption to the learning process occurs during a pandemic. All educational arrangements are changing. Along with these changes, the independent learning curriculum is trying to be implemented. The purpose of this study was to analyze the state and availability of school infrastructure related to IT in Vocational High Schools in Central Java, to develop an assemble of information technology (A-IT) manual as an effort to optimize school infrastructure in online learning. Evaluating the assemble of information technology (A-IT) manual as an effort to optimize school infrastructure in online learning. This research is development research with a mixed-method approach, namely qualitative and quantitative. A qualitative approach is used. The subject of this research is the Principal of Vocational Schools in Central Java, while the object of this research is the optimization of information infrastructure in schools. Data collection techniques used questionnaires and interviews with principals of SMK schools in Central Java. Qualitative data analysis was carried out by collecting data, reducing data (data reduction), presenting data (data display), and drawing conclusions or verification (conclusions). The results showed that the condition and availability of IT infrastructure in Vocational High Schools in Central Java were quite good but still required the development of IT infrastructure in a better and more structured manner. Development of guidebooks the development of assembling of information technology (A-IT) manuals can be well structured through the results of FGDs with SMK principals so that the final model of the manual can be compiled and used as guidelines in the development of IT infrastructure in schools. The assembly of information technology (A-IT) manual is very useful in compiling and preparing school infrastructure properly and making it easier for schools to develop IT infrastructure so that learning becomes more optimal.

Keywords: Guidelines · A-IT · Infrastructure · Information technology

1 Introduction

Disruption to the learning process occurs during a pandemic. All educational arrangements are changing. Along with these changes, the independent learning curriculum is trying to be implemented. Disruption of the learning process raises the urgency of supporting school infrastructure in the field of information technology. Infrastructure support that meets the eligibility standards for the learning process is needed so that

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the learning process runs smoothly. Globally, teachers and schools are trying to adapt to changes, teachers are trying to improve the way they teach, students are changing the way they learn, and the assessment process is changing too. The procurement of IT infrastructure in education systems at all levels is very important [1]. IT infrastructure helps transform teaching, learning, and assessment practice in the long term [2]. The integration of information and communication technology can help revitalize teachers and students in secondary schools. This can help improve and develop the quality of education. Teachers need to be involved in project development and collaboration to change teaching strategies using ICT tools. Teachers must understand and accept that IT has become a demand that must be mastered and prepared in the learning process. IT facilitates the learning process [3]. Many teachers do not master the use of IT during the learning process [4].

IT infrastructure is not well organized and available, many schools have not been able to meet the quality standards of IT infrastructure that can support online learning. Therefore, it is necessary to have guidelines in the development of IT infrastructure in schools so that it has good quality and is feasible and evenly owned by all schools, especially vocational schools in Central Java. This study aims to develop guidelines for the assembly of information technology (A-IT) to optimize school infrastructure in IT. This is an effort to build IT infrastructure in schools that are good and adequate and the same for all Vocational Schools in Central Java which at this time is still not evenly distributed and well organized and well developed. Thus, the learning process is still not structured and well implemented. Students need more independent learning experiences that develop students' higher-order thinking, creativity, independence, collaboration, and learning ownership. When IT infrastructure is used effectively, it can provide opportunities for all teachers, students, and parents/guardians to develop these key skills. Lack of digital competence and knowledge of the use of IT by education professionals. This question becomes a crucial issue in the context of today's school closures and the required adaptation of online teaching.

Information Technology (IT) infrastructure is an investment in hardware, software, and services such as consulting, education, and training that are shared across the company or all business units in the company [5]. In the IT sector, which includes hardware such as mainframe computers, servers, laptops, and PDAs, software such as operating systems and applications have many functions, and there is also a database to store important data [6]. The important factors that IT Infrastructure has are system network implementation, Multiplatform Interface, Database Management System, Virtual Server, and so on [7].

IT infrastructure refers to hardware such as computers, scanners, copiers, mobile phones, printers, projectors, and broadcasting technologies that include radio and TV as well as essential software that enhances teaching and learning. The IT infrastructure must be connected through computer networks and internet connectivity to allow for the sharing and distribution of data and information between teachers and students. Researchers agree that IT infrastructure should be easily accessible and used by all [8]. Schools should increasingly use multimedia applications to stimulate teaching and provide interesting activity opportunities for students [9]. Networked schools are not

only schools with physical networks, but if they are useful, the use of resources from outside the school network itself can be applied [10].

In recent years, technology and the internet have influenced the way we study, work, and socialize by modifying the concepts of distance and time in accessing information. This reality demands the development of new personal, social, and professional skills. In this sense, converting information into knowledge requires reasoning skills to organize information, relate it, analyse it, synthesize it, and make inferences and deductions of varying degrees of complexity [11]. Technology and the internet are becoming an educational necessity to transfer and integrate, operationally and functionally, advances and generalizations of Information and Communication Technology in teacher training curricula [12]. In the era of information technology, through satellites and computers, people not only enter the world's information, but are also able to process it and express it orally, in writing, and even visually [13]. The existence of information and communication systems is one component that cannot be separated from educational activities.

An educational institution must have the necessary components to run educational operations, such as students, facilities and infrastructure, organizational structure, processes, human resources (teaching staff), and operating costs. Meanwhile, the communication and information system consist of components that support educational institutions to provide the information needed by decision-makers when carrying out educational activities. For this reason, the role of information and communication technology in education includes: 1) information technology as skills and competencies, 2) information technology as educational infrastructure, 3) information technology as a source of teaching materials, 4) information technology as a tool and educational facilities, 5) information technology as education management, 6) information technology as a decision support system.

The use of mobile technology has a major contribution in the world of education, including the achievement of distance learning goals. Various media can also be used to support the implementation of online learning. For example, virtual classes use Google Classroom, Edmodo, and Schoology services [14, 15], and instant messaging applications such as WhatsApp [16]. This research is a solution to the rapid development of technology. The need for IT governance must be adequate so that IT infrastructure can be identified, organized, and available properly. Excellent infrastructure arrangement is the capital of smoothness and comfort in the implementation of learning. Structuring good infrastructure in a school requires a manual to be used as a reference in its arrangement. This is because with the A-IT manual, the identification of IT needs and arrangements can be carried out properly. The A-IT Handbook is prepared based on the results of the identification of needs in the field. The A-IT handbook contains what the need for A-IT is then the steps for the preparation of A-IT, evaluation of the preparation of A-IT which is used as the basis for follow-up for improvement. The purpose of this development research is to analyze the state and availability of school infrastructure related to IT in Vocational High Schools in Central Java, develop an assemble of information technology (A-IT) manual as an effort to optimize school infrastructure in online learning, evaluate the assemble of information manual technology (A-IT) as an effort to optimize school infrastructure in online learning.

2 Research Methods

This research is development research with a mixed-method approach, namely qualitative and quantitative. A qualitative approach is used to analyse qualitative data, while a quantitative approach is used to analyse quantitative data. Both approaches are deliberately used to obtain data and research meanings that are complete, easy to read, and easy to understand. The population of this research is the principal of SMK in Central Java. The sample of this research is Public and Private Vocational High School in Central Java. The research will be conducted for eight months starting from January to August 2021. The sampling technique used is the sampling technique. The subject of this development research is the principle of SMK in Central Java, while the object of this development research is the optimization of information and technology infrastructure in schools. Primary data were obtained through interviews, observations, and questionnaires with research subjects, after that data was also obtained from model validation through FGD, and field trials. Secondary data sources in the form of information and research results from various literature and research journals.

The research method used in this study refers to the R&D Model with the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation because this research and development model is more rational and more complete than other models according to product development steps. Techniques for collecting data in the study used open interviews and questionnaires. Interviews were conducted with respondents to obtain information about the infrastructure owned by each school and what IT needs are needed for the learning process. Document studies are used to obtain information about existing IT availability. Questionnaires are used to collect quantitative data which will later be used to evaluate the use of the A-IT manual.

Qualitative data analysis was carried out by collecting data, reducing data (data reduction), presenting data (data display), and drawing conclusions or verification (conclusions). The data is used to present data related to the implementation of existing IT infrastructure in schools. The ADDIE development stage (Analysis, Design, Development, Implementation, Evaluation) is used to develop the A-IT handbook to optimize IT infrastructure in schools. The analysis stage carried out was conducting a needs analysis, the design stage was carried out by developing an A-IT manual, then the model was validated by experts and practitioners. The implementation phase is carried out by testing the A-IT manual. At the evaluation stage, a questionnaire was used to determine the feasibility of the model.

3 Results and Discussion

Institutions that operate online teaching must consider the support that can be easily used, effective, and overcome various factors of online learning such as interaction with students and their parents or guardians, required infrastructure, the ability of personnel to operate online learning, meeting the need for learning, difficulties encountered experienced by students, school personnel, and outcomes, performance, and feedback from students and staff. The indicators in the needs analysis are as follows: (1) Availability of networks in schools, (2) Network support devices, (3) IT capabilities of teachers and

education personnel, (4) Online media support devices, (5) Ownership of Information and Communication Technology tools (ICT), (6) Utilization of the Internet, (7) Mastery of Information and Communication Technology, (8) The role of the internet in supporting the learning process, (9) Internet access in schools.

Based on the results that have been obtained, it shows that starting from network procurement to internet management in Vocational Schools, it is quite good, but still needs to be further refined so that IT infrastructure development becomes more optimal as a support for learning both during the pandemic and as a supporter in independent campus learning activities. The development phase of the manual is carried out using the ADDIE research procedure (Analysis, Design, Development, Implementation, Evaluation) which is used to develop the A-IT handbook to optimize IT infrastructure in schools. The analysis stage is carried out by conducting a needs analysis. The design stage is carried out by designing the A-IT manual. The development stage is the stage of developing the A-IT manual then the manual is validated by experts and practitioners. The implementation phase is carried out by testing the A-IT manual. At the evaluation stage, a questionnaire was used to determine the feasibility of the model.

a. Analysis stage
   The analysis phase is carried out by conducting interviews related to IT infrastructure in Vocational Schools through-out Central Java. The analysis carried out is not only limited to the provision of internet networks or infrastructure facilities but also to optimize the capacity of supporting human resources, their operations as well as maintenance and good governance.
b. Design
   This design stage is carried out to design the right guide model related to school infrastructure. This manual has been prepared by taking into account three components. Completely adaptive information technology infrastructure is something that is structured using a certain pattern to support the application of information and is easy to adapt to circumstances. The need for adaptive information technology infrastructure, namely how the infrastructure can keep up with any changes in the business environment. An adaptive information technology infrastructure involves a balance in the following three areas.

1) Human resources
   Human resources include roles, skills, and organizational structures that involve the infrastructure life cycle process. Utilization of information technology demands changes in the competency profile of the organization's human resources, competence in using and adapting to process changes that occur due to the use of the technology. The application of technology is expected to provide improvements to the quality of individuals and the quality of the work environment for human resources in the form of ease of work and increased work productivity.
2) Technology
   The technology consists of hardware, software, and services that are part of the infrastructure. The technology used should meet the established standards, be reliable, safe, have the flexibility to develop, and be cost-effective.

3) Process
   Processes consist of standards and information that define the life cycle of the infrastructure. The utilization of information technology will make various paradigms, assumptions, and limitations of a process change so that the business must review the process and change it when necessary. The application of technology is expected to provide benefits in the form of optimization and effectiveness of the learning process.
4) Maintenance
   Maintenance is an important part of the IT infrastructure for supporting devices on the IT infrastructure. Good maintenance management will make the sustainability of hard IT devices remain good and optimize work on hard IT devices. To achieve a balance in these three areas, human resources who manage technology need to have the skills and knowledge to choose the right technology to use.

c. Development
   The development stage is the stage of developing the A-IT manual following the feasibility standard, then the manual is validated by experts and practitioners. The process of validation activities is carried out using FGDs with experts and practitioners. After receiving input, the manual is revised according to the direction and input from experts and practical. After the revision process was completed, the manual was then re-validated to experts and practitioners through FGDs.

Based on the results of the FGD, it shows that there are still some things that still need attention. The manual still needs to be improved in terms of substance and layout. After the manual has been revised, it will be returned to the FGD to achieve optimal results. The substance written in the manual is related to.

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In the human resource component, it is necessary to increase the mastery of IT skills for both teachers and staff so that the IT infrastructure can run optimally. The technology components used should meet the established standards, be reliable, safe. Technology has good standards according to the needs of the school; the distribution of bandwidth and the arrangement of the network must be right so that trouble does not occur so that the network becomes slow. In the process component, it is necessary to write down good and appropriate IT infrastructure governance so that all matters related to IT infrastructure can be managed properly and smoothly. The maintenance component is also an important component so that all IT infrastructure can always be monitored and repaired and serviced regularly. This is intended so that the learning process or all needs that use IT infrastructure can be used properly.

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4 Conclusion

Based on the results of research and discussion, it can be concluded that:

a. The condition and availability of IT infrastructure in Vocational High Schools through-out Central Java are quite good but still require the development of IT infrastructure in a better and more structured manner.
b. Development of guidebooks. The development of assembling of information technology (A-IT) manuals can be well structured through the results of FGDs with

SMK principals so that the final model of the manual can be compiled and used as guidelines in the development of IT infrastructure in schools.

c. The assembly of information technology (A-IT) manual is very useful in compiling and preparing school infrastructure properly and making it easier for schools to develop IT infrastructure so that learning becomes more optimal.

References

1. S.K. Lowder and A. Regmi, Assessment of outcomes based on the use of PIM-supported foresight modeling work, 2012–2018: Intl Food Policy Res Inst, 2020. DOI: https://doi.org/10.2499/p15738coll2.133608
2. T.J. Kopcha, Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development, in: Computers & Education, 59(4), 2012, pp. 1109–1121. DOI: https://doi.org/10.1016/j.compedu.2012.05.014
3. A.C. Cheung and R.E. Slavin, How features of educational technology applications affect student reading outcomes: A meta-analysis, in: *Educational Research Review, 7*(3), 2012, pp. 198–215. DOI: https://doi.org/10.1016/j.edurev.2012.05.002
4. D. Butler, M. Hallissy and J. Hurley, The digital learning framework: What digital learning can look like in practice, an Irish perspective, Paper presented at the Society for Information Technology & Teacher Education International Conference, 2018.
5. K.C. Laudon, Sistem Informasi Manajemen, Jakarta Selatan, Salemba Empat, 2010.
6. G.W. Reynolds, Principles of Information System: A Managerial Approach, Yogyakarta, Course Technology, 2010.
7. D. Antoni and F. Fatoni, Faktor-Faktor Infrastruktur Teknologi Informasi Corporate di Kota Palembang, in: Jurnal Sisfokom, 5(2), 2016, pp. 38–45. DOI: https://doi.org/10.32736/sisfokom.v5i2.37
8. G. Özer and E. Yilmaz, Comparison of the theory of reasoned action and the theory of planned behavior: An application on accountants' information technology usage, in: African Journal of Business Management, 5(1), 2011, pp. 50–58.
9. E. Neyland, Integrating online learning in NSW secondary schools: Three schools' perspectives on ICT adoption, in Australasian Journal of Educational Technology, *27*(1), 2011. DOI: https://doi.org/10.14742/ajet.989
10. T. Bielefeldt, Guidance for technology decisions from classroom observation in: Journal of research on Technology in Education, 44(3), 2012, pp. 205–223. DOI: https://doi.org/10.1080/15391523.2012.10782587
11. D. Ortega-Sánchez, and I.M. Gómez-Trigueros, Massive Open Online Courses in the Initial Training of Social Science Teachers: Experiences, Methodological Conceptions, and Technological Use for Sustainable Development, in: Sustainability, 11(3), 2019, p. 578.
12. I.M. Gómez-Trigueros and D. Sánchez-Ortega, Los MOOC En La Didáctica de La Geografía: Aplicaciones En La Formación Inicial Del Profesorado de Primaria. In Nuevas Perspectivas Conceptuales y Metodol*ó*gicas Para La Educaci*ó*n Geogr*á*fica, in: Martínez-Medina, R., Ed., University of Cordoba, Córdoba, Spain, 2014, pp. 229–244.
13. A. Nata, Manajemen Pendidikan: Mengatasi Kelemahan Pendidikan Islam di Indonesia, Jakarta, Kencana, 2010.
14. M.A.S. Enriquez, Students' Perceptions on the Effectiveness of the Use of Edmodo as a Supplementary Tool for Learning, in: DLSU Research Congress, 2014. DOI: https://doi.org/10.1017/CBO9781107415324.004

15. S. Iftakhar, Google classroom: what works and how?, in: Journal of Education and Social Sciences, 3, 2016, pp. 12–18.
16. S. So, Mobile instant messaging support for teaching and learning in higher education, in: The Internet and Higher Education, 31, 2016, pp. 32–42. DOI: https://doi.org/10.1016/j.iheduc.2016.06.001