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Implementation of fault tree analysis to a prototype of employee leave information system

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ABSTRACT

The problem faced by companies in general is the delay in agreeing to apply for leave, this is caused by two things, namely too many stages to be skipped and the difficulty of meeting with the boss whenever he wants to apply for leave. The purpose of this research is to design a proposed design for a leave application information system. The development method used is the prorotype method, while the method used to find the root of the problem is one of the techniques in Root Cause Analysis, namely Fault Tree Analysis. The results of this study are a prototype proposal that can be taken into consideration for companies to start implementing a digital-based system for submitting employee leave. The results of this study are expected to provide information as a basis for consideration, support, and contributions to ideas for companies to be able to use technology in the process of applying for employee leave.

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1. INTRODUCTION

One of the impacts of Covid-19 on life is the use of information technology which has begun to spread evenly in almost all sectors of life without exception in the industrial and service sectors (Amalia, Ferdinand). Since the Covid-19 pandemic, not a few companies have started using information systems and applications in several processes running in their respective companies. Even so, there are still some procedures that are still carried out manually, such as applying for employee leave. The leave itself consists of maternity leave, sick leave, big leave, annual leave and leave for important reasons, according to Law No. 13 of 2003 Article 79 paragraph 2 (Adikara, 2016).

In general, the stages that an employee needs to go through when wanting to apply the leave application are : First the employee will face HRD to inquire about the remaining leave they have, if it is still possible for the employee to apply for leave, the employee will fill out a leave application form. The completed form is then submitted to the manager for the manager's signature as a form of approval to apply for leave. The manager then submits the leave form to the supervisor. It takes at least three working

days to get confirmation of approval or rejection of the proposed leave. An information system is a system that is used to store and analyze data that has been input and produces a report format that represents the data that has been input (Dwi Adjie, 2015). In the current system, there are two things that can be minimized by utilizing information technology, the first is to reduce the steps that must be passed by employees, the second is to reduce the time needed from the time the leave is submitted to the leave approval decision. In other words, the purpose of this research is to reduce the stages carried out by employees to be more efficient and to reduce the time needed for one cycle of applying for leave.

There are several similar studies that have been conducted by previous researchers. Research conducted by Eriek Orlando with the title Application for Submitting Leave in Human Resource Cases at PT. Intiloka) Software used for making this application is PHP, MYSQL and XAMPP. According to Nugroho, XAMPP is a program package complete website that can be used for learning web programming, especially PHP and MySQL (Anggraini et al., 2020). MYSQL is a software contained in an SQL database management system (database management system) or commonly called a DBMS which is multithreaded, multi-user, with around 6 million installations worldwide (Dhika et al., 2019).The goal is to create a computerized leave recording system. The method used is literature, observation, interviews and analysis (Orlando, 2017).

Research with the title Implementation of the Employee Leave Submission System Website at the Ciawi Bogor District Office was conducted by Susilowati and Widiana. The aim of the research is to produce a web-based leave application program so as to make it easier for users to apply for and process leave. The software system development method uses the waterfall model (Susilowati & Widiana, 2019).

The research conducted by Aslamiyah and Agustina was used as a reference for the use of the Root Cause Analysis method. The title of the research is measuring the knowledge gap (k-gap) using importance and performance analysis and root cause analysis. The purpose of this study was to measure the value of the knowledge gap (K-Gap) in student units and find the causes of this gap. The method used in this research is the Importance and Performance Analysis (IPA) and the Root Cause Analysis (RCA) method (Aslamiyah & Agustina, 2021).

research conducted by Hery Suliantoro et al with the title application of overall equipment effectiveness (oee) and fault tree analysis (FTA) methods to measure the effectiveness of battery machinery. This study aims to measure and determine the level of effectiveness of battens machines using the Overall Equipment Effectiveness (OEE) method, identify the causes of six big losses using Fault Tree Analysis (FTA), and provide suggestions for improvements to increase the level of machine effectiveness (Suliantoro et al., 2017).

research conducted by Puruntoro and Bhaskara. This study aims to determine the accuracy of the implementation of the Occupational Safety Management System in the Service Building Development Project (Physical) of the Tidar Hospital in Magelang City and to identify, analyze risks using the Fault Tree Analysis (FTA) method and plan mitigation to reduce the scope of construction in progress work. The research method used is quantitative, data collection techniques through structured interviews (Purbiantoro & Bhaskara, 2019).

based on the background of the problems above, we decided to raise the title of making a prototype for an employee leave application system. The method used is the prototype method because the prototype has several advantages, namely: There is good communication between developers and customers, developers can work better in determining needs. The customer plays an active role in system development, saves more time in system development, and implementation becomes easier because the user knows what to expect makes the client get an initial picture of prototype (Punkastyo, 2018).

2. RESEARCH METHOD

The discussion in the research methods section is divided into three parts, namely: problem formulation method, data collection method and system development method.

2.1 Problem formulation method

The method used to find the root of the problem is root cause analysis. The root cause analysis method is divided into several types namely : Fishbone Diagrams, Pareto Analysis, 5Whys, Brainstorming, Failure Mode Effect Analysis (FMEA) Fault Tree Analysis (FTA) and Six Sigma (Susendi et al., 2021).

According to Rooney and Heuvel (2004) in widyastuti (Nyoman Widyastuti, 2014), RCA is a four-step process which includes: (a) Data collection, (b) Making a causal factor diagram. (c) Identify root causes. Step (d) Recommendation search and implementation

The RCA technique used in this study is Fault Tree Analysis. Fault Tree Analysis (FTA) is an analysis used to determine the potential root cause of a failure that occurs in the system so that efforts can be made to reduce the defective product. This method is top-down in nature, which means that it begins with an assumption of failure at the top event detailing it to the basic failure. In other words, this method is to look for problems that start from the assumption of the peak event in great detail to get to the root of the basic problem (Nugraha & Sari, 2019). FTA uses structured steps in conducting system analysis (A. Wicaksono & Yuamita, 2022). As for the FTA steps, namely (Duyo, 2020): (a) Identify the Most Important Events/Events in the system (Top Level Event), (b) Create a Fault Tree. (c) Analyze Fault Trees.

The advantage of the Fault Tree Analysis (FTA) method is that it is a qualitative method that has the ability to identify a series of events that cause risk (Fansuri & Diana, 2021). Apart from that the advantage of the FTA method is that the search for the causes of failure that occurs is more detailed than the 5 why method, which only searches for the causes of failure by asking 5 questions, while a problem may not necessarily be resolved by asking 5 questions (Nur & Sari, 2018).

2.2 Method of collecting data

a. Interviews

Interview method is the method used by the author to collect data by asking directly to the party concerned (Sari, 2020). Data collection using the interview method was carried out by interviewing the parties involved in the process of applying for leave.

b. Literature review

At this stage, researchers carry out scientific deepening related to the preparation of this research report (Ramdhani & Aslamiyah, 2023).
Literature review of documents related to research material is carried out through books and scientific journals.

c. Observation

Observation is a data collection technique in which the researcher makes observations, either directly or indirectly, about the things being observed (Ahsanulkhaq, 2019). Direct observation in collecting data also needs to be done to find out the running process and the infrastructure owned by the company that can support the system to be developed.

2.3. Development Method

The method used in the development of this system is the Prototype method. According to Yanuarti (2017) in Siswidiyanto (Siswidiyanto et al., 2020), "Prototype is an approach in software engineering that directly demonstrates how a software or software components will work in its environment before the actual construction stages are carried out. This method is suitable for systems that require a lot of changes to their

features (M. A. Wicaksono et al., 2021). The prototype model is used as an indicator of the picture that is will be made in the future and distinguish the two functions of exploration and demonstration"

The following are the steps or stages in the prototype method (Rohmadi & Yasin, 2020): (a) Communication or initial data collection, namely analysis of user needs. (b) Quick plan, namely the planning stage of needs. (c) Modeling Quick Design, the stages of making a design. (d) Formation of prototypes, namely the manufacture of prototype devices including testing and refinement. (f) Deployment Delivery & Feedback, namely evaluating prototypes and refining the analysis of user needs. Prototype improvement, namely making the actual type based on the results of the prototype evaluation and then the final production, namely producing the device correctly so that it can be used by users

According to Widiyanto (Widiyanto, 2018) prototype has the following advantages: (a) Customers actively participate in system development, so that product development results will be more easily adapted to the wishes and needs of customers. (b) Determining needs is easier to realize. (c) Shorten the development time of software products. (d) There is good communication between developers and customers. (f) Developers can do a better job of defining customer needs. (g) More time-saving in system development. (g) Deployment becomes easier because the customer knows what to expect

According to Kurnia and Riysda (Kurnia & Risyda, 2021) There are several weaknesses in the method prototypes include: (a) The customer does not see that the software does not reflect the quality of the software as a whole and has not thought about maintenance for a long time. (b) Developers usually want to quickly complete projects so they use simple algorithms and programming languages. (c) The customer's relationship with the computer may not reflect good design techniques

3. RESULTS AND DISCUSSIONS

The pre-research stage which is very important to do is identify the problems faced by the company in terms of applying for leave and then find the root causes or main causes of all these problems. This stage is carried out by applying the Fault Tree Analysis method.

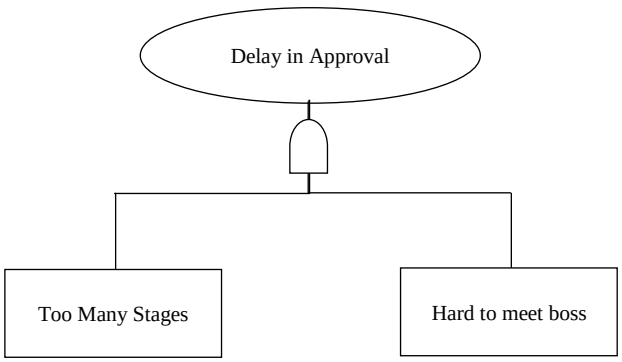

Figure 1. Fault Tree Analysis

The problem that is often experienced in the process of applying for leave is the delay in agreeing to apply for leave, this is caused by too many steps that must be passed and also the boss who cannot be found anytime and anywhere. Departing from this problem, the researchers thought it necessary to create an information system that makes the process of submitting leave concise and tends to be short and can be accessed by the boss anytime and anywhere if he wants to approve the submission of employees.

The next stage is to make a system modeling using the Unified Modeling Language. System modeling is made as a flow framework for the developed system as shown in Figure 2.

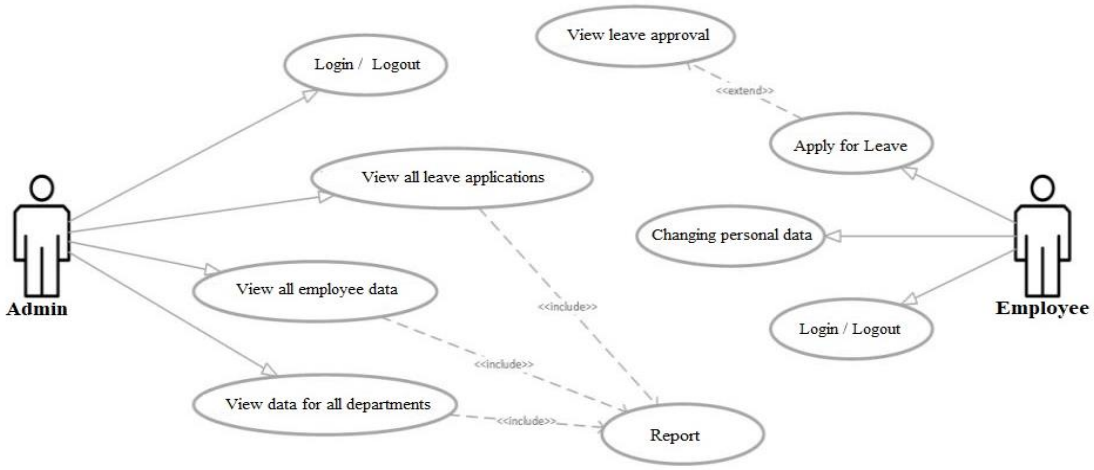

Figure 2. Use Case Diagram

There are two levels of user access rights in the leave application information system, namely admin and employees. The boss who will approve the application for employee leave can log in as admin. Admin is given access to as many as 4 menus, namely login / logout, View all leave applications, view all employee data, view all departments. Employees have access to 4 menus that apply for leave, view leave approval, change personal data and login/logout.
The final stage is to create a prototype for each proposed menu.
For the login menu display, between admin and employees the login page display is the same as shown in the figure 3.

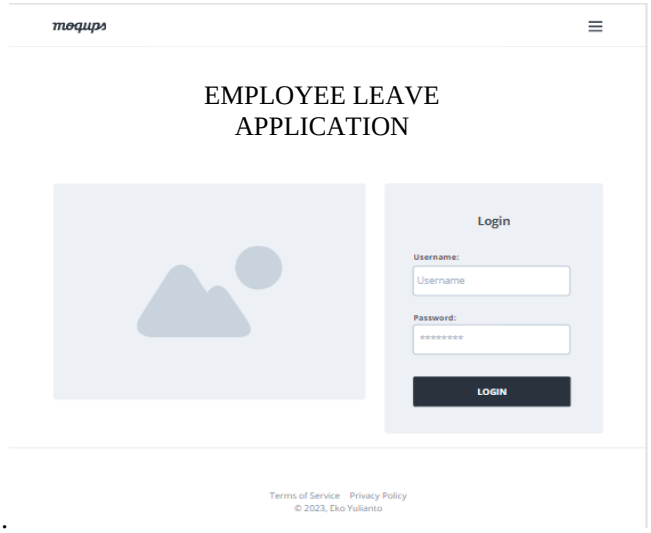

Figure 3. Login page prototype

There are three main menus that are most important in this information system, namely: Submitting Leave (Employees), Viewing leave approval (Employees) and viewing all leave application data (Admin).

Next is a prototype of the employee leave application page as shown in Figure 4.

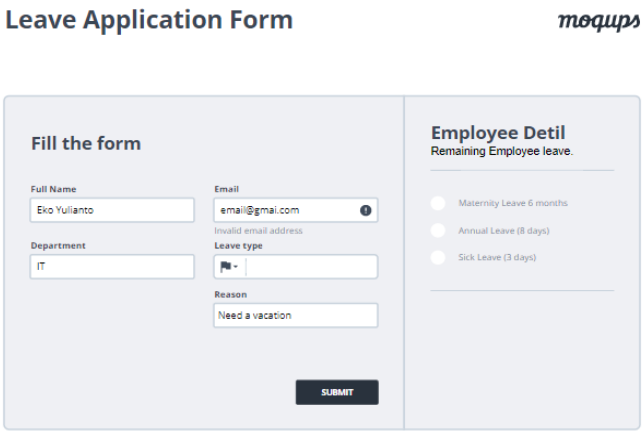

Figure 4. Leave application form prototype

The next prototype design is to look at the approval page for submitting leave as shown in figure 5, this page is useful for knowing the progress of submitting employee leave at which stage, whether it has been approved by the boss or not.

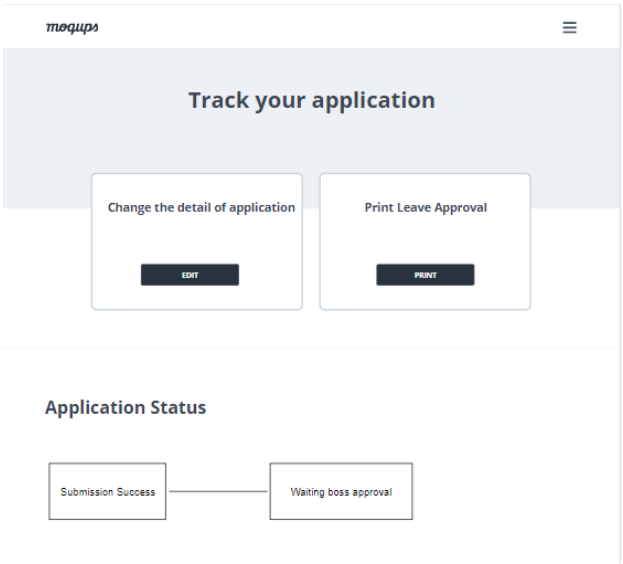

Figure 5. Track your application prototype

The prototype in Figure 6 is the view from the admin side. This prototype contains a list of submissions that will be reviewed by the boss, whether they will be accepted or not.

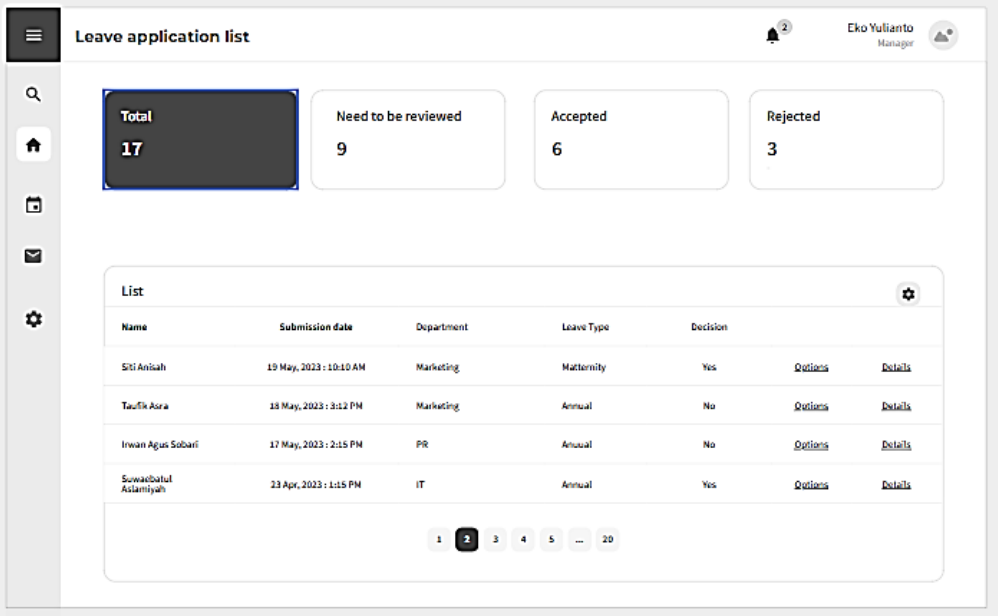

Figure 6. List of Leave application Prototype

4. CONCLUSION

Based on the explanations in the previous chapters, several conclusions can be drawn from the results of this research, namely: The problem faced by companies is generally delays in approval of requests for leave, this is caused by two things, namely too many stages to be skipped and the difficulty of meeting with the boss at any time want to apply for leave, with the design of this leave application application it is hoped that it can be a solution for companies to start using the system in their process to facilitate and speed up the process of agreeing to leave for employees. Suggestions for further research are to create a website or mobile-based system that allows employees to access anytime and anywhere.

REFERENCES

Adikara, F. (2016). Pengembangan Fungsi Pengajuan Cuti Karyawan pada Sistem Absensi Mobile. *Sisfo*, *06*(01), 77–88. https://doi.org/10.24089/j.sisfo.2016.09.006

Ahsanulkhaq, M. (2019). Membentuk Karakter Religius Peserta Didik Melalui Metode Pembiasaan. *Jurnal Prakarsa Paedagogia*, *2*(1). https://doi.org/10.24176/jpp.v2i1.4312

Anggraini, Y., Pasha, D., Damayanti, D., & Setiawan, A. (2020). Sistem Informasi Penjualan Sepeda Berbasis Web Menggunakan Framework Codeigniter. *Jurnal Teknologi Dan Sistem Informasi*, *1*(2), 64–70. https://doi.org/10.33365/jtsi.v1i2.236

Aslamiyah, S., & Agustina, A. (2021). Pengukuran Kesenjangan Pengetahuan (K-Gap) Menggunakan Importance and Performance Analysis dan Root Cause Analysis. *STRING (Satuan Tulisan Riset Dan Inovasi Teknologi)*, *6*(1), 82. https://doi.org/10.30998/string.v6i1.9933

Dhika, H., Isnain, N., & Tofan, M. (2019). Manajemen Villa Menggunakan Java Netbeans Dan Mysql. *IKRA-ITH INFORMATIKA : Jurnal Komputer Dan Informatika*, *3*(2), 104–110. https://journals.upi-yai.ac.id/index.php/ikraith-informatika/article/view/324

Dirgantara, U., & Suryadarma, M. (2014). Rancang Bangun Penerapan Model Prototype Dalam Perancangan Sistem Informasi Pencatatan Persediaan Barang Berbasis Web. *Jurnal Sistem Informasi Universitas Suryadarma*, *8*(2), 223–230. https://doi.org/10.35968/jsi.v8i2.737

Duyo, R. (2020). Analisis Penyebab Gangguan Jaringan pada Distribusi Listrik Menggunakan Metode Fault Tree Analysis. *Jurnal Teknik Elektro UNISMUH*, *12*(2), 1–12.

https://journal.unismuh.ac.id/index.php/vertex/article/view/4017

Dwi Adjie, M. (2015). Sistem Informasi Konsep Dasar. *The Effects of Brief Mindfulness Intervention on Acute Pain Experience: An Examination of Individual Difference*, *1*, 1689–1699.

Fansuri, S., & Diana, A. I. N. (2021). Fakultas teknik universitas wiraraja sumenep - madura. *Jurnal "MITSU" Media Informasi Teknik Sipil*, *9*(1), 1–8.

Nugraha, E., & Sari, R. M. (2019). Analisis Defect dengan Metode Fault Tree Analysis dan Failure Mode Effect Analysis. *Organum: Jurnal Saintifik Manajemen Dan Akuntansi*, *2*(2), 62–72. https://doi.org/10.35138/organum.v2i2.58

Nur, M., & Sari, Y. M. (2018). Usulan Strategi Pemasaran dengan Menggunakan Experiential Marketing dan Fault Tree Analysis (FTA). *Industrial Engineering Journal*, *7*(2), 44–50. https://www.journal.unimal.ac.id/miej/article/view/344%0Ahttps://www.journal.unimal.ac.id/miej/article/viewFile/344/252

Nyoman Widyastuti, L. (2014). Analisis Gangguan Sistem Transmisi Listrik Menggunakan Metode Root Cause Analysis (Rca). *Industrial Engineering Online Journal*, *3*(3), 1–8.

Orlando, E. (2017). Aplikasi Pengajuan Cuti Pada Human Resource Management Menggunakan PHP dan MYSQL (Studi Kasus Pada PT. INTILOKA). *Jurnal Ilmiah KOMPUTASI*, *16*(3), 275–284. http://ejournal.jak-stik.ac.id/index.php/komputasi/article/viewArticle/2336

Punkastyo, D. A. (2018). Perancangan Aplikasi Tutorial Jurus Dasar Beladiri Cimande Menggunakan Metode Prototype. *Jurnal Informatika Universitas Pamulang*, *3*(2), 87. https://doi.org/10.32493/informatika.v3i2.1433

Purbiantoro, A., & Bhaskara, A. (n.d.). FAULT TREE ANALYSIS AND ACCURACY AUDITS ON APPLICATION INTEGRATED CONSTRUCTION WORK SAFETY MANAGEMENT SYSTEM Case Study: Service Building Construction Project (Physical) Tidar Regional Hospital Magelang City, B1 Contractor. *Publication.Petra.Ac.Id*, 1–3. http://publication.petra.ac.id/index.php/teknik-sipil/article/view/9621

Ramdhani, R. A., & Aslamiyah, S. (2023). Jurnal Teknik Informatika Kaputama (JTIK), Vol 1 No 1, Januari 2017. *Jurnal Teknik Informatika Kaputama (JTIK)*, *7*(1), 92–100.

Rohmadi, A., & Yasin, V. (2020). *DESAIN DAN PENERAPAN WEBSITE TATA KELOLA PERCETAKAN PADA CV APICDESIGN KREASINDO JAKARTA DENGAN METODE PROTOTYPING p-ISSN : 2579-5201 (Print).* *4*(1), 70–85.

Sari, N. N. K. (2020). Rancang Bangun Media Pengenalan Huruf Hijaiyah Untuk Anak Usia Dini Berbasis Android. *Jurnal Teknologi Informasi: Jurnal Keilmuan Dan Aplikasi Bidang Teknik Informatika*, *14*(2), 161–170. https://doi.org/10.47111/jti.v14i2.1214

Siswidiyanto, S., Munif, A., Wijayanti, D., & Haryadi, E. (2020). Sistem Informasi Penyewaan Rumah Kontrakan Berbasis Web Dengan Menggunakan Metode Prototype. *Jurnal Interkom: Jurnal Publikasi Ilmiah Bidang Teknologi Informasi Dan Komunikasi*, *15*(1), 18–25. https://doi.org/10.35969/interkom.v15i1.64

Suliantoro, H., Susanto, N., Prastawa, H., Sihombing, I., & Mustikasari, A. (2017). Penerapan Metode Overall Equipment Effectiveness (Oee) Dan Fault Tree Analysis (Fta) Untuk Mengukur Efektifitas Mesin Reng. *J@ti Undip : Jurnal Teknik Industri*, *12*(2), 105. https://doi.org/10.14710/jati.12.2.105-118

Susendi, N., Suparman, A., & Sopyan, I. (2021). Kajian Metode Root Cause Analysis yang Digunakan dalam Manajemen Risiko di Industri Farmasi. *Majalah Farmasetika*, *6*(4), 310. https://doi.org/10.24198/mfarmasetika.v6i4.35053

Susilowati, S., & Widiana, R. (2019). Penerapan Website Sistem Pengajuan Cuti Pegawai Pada Kantor Kecamatan Ciawi Bogor. *J-SAKTI (Jurnal Sains Komputer Dan Informatika)*, *3*(2), 327. https://doi.org/10.30645/j-sakti.v3i2.151

Wicaksono, A., & Yuamita, F. (2022). Pengendalian Kualitas Produksi Sarden Mengunakan Metode Failure Mode And Effect Analysis (FMEA) Dan Fault Tree Analysis (FTA) Untuk Meminimalkan Cacat Kaleng Di PT XYZ. *Jurnal Teknologi Dan Manajemen Industri Terapan*, *1*(3), 145–154. https://doi.org/10.55826/tmit.v1iii.44

Wicaksono, M. A., Rudianto, C., & Tanaem, P. F. (2021). Rancang Bangun Sistem Informasi Arsip Surat Menggunakan Metode Prototype. *Jurnal Teknik Informatika Dan Sistem Informasi*, *7*(2), 390–403. https://doi.org/10.28932/jutisi.v7i2.3664

Widiyanto, W. W. (2018). Analisa Metodologi Pengembangan Sistem Dengan Perbandingan Model Perangkat Lunak Sistem Informasi Kepegawaian Menggunakan Waterfall Development Model, Model Prototype, Dan Model Rapid Application Development (Rad). *Jurnal Informa Politeknik Indonusa Surakarta ISSN*, *4*(1), 34–40. http://www.informa.poltekindonusa.ac.id/index.php/informa/article/view/34