

***RISK MANAGEMENT ASSESSMENT USING FAILURE MODE  
EFFECT ANALYSIS (FMEA) AND INFORMATION SECURITY  
MEASUREMENT WITH ISO/IEC 27004:2016***

**TUGAS AKHIR**

Diajukan Sebagai Salah Satu Syarat  
untuk Memperoleh Gelar Sarjana Komputer pada  
Program Studi Sistem Informasi

Oleh:

**MUTIARA RAHMADANI**

**11950321570**



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## LEMBAR PERSETUJUAN

### *RISK MANAGEMENT ASSESSMENT USING FAILURE MODE EFFECT ANALYSIS (FMEA) AND INFORMATION SECURITY MEASUREMENT WITH ISO/IEC 27004:2016*

### TUGAS AKHIR

Oleh:

**MUTIARA RAHMADANI**

**11950321570**

Telah diperiksa dan disetujui sebagai Laporan Tugas Akhir  
di Pekanbaru, pada tanggal 05 Juni 2023

**Ketua Program Studi**

**Eki Saputra, S.Kom., M.Kom.**  
**NIP. 198307162011011008**

**Pembimbing**

**Eki Saputra, S.Kom., M.Kom.**  
**NIP. 198307162011011008**

## LEMBAR PENGESAHAN

### *RISK MANAGEMENT ASSESSMENT USING FAILURE MODE EFFECT ANALYSIS (FMEA) AND INFORMATION SECURITY MEASUREMENT WITH ISO/IEC 27004:2016*

### TUGAS AKHIR

Oleh:

**MUTIARA RAHMADANI**

**11950321570**

Telah dipertahankan di depan sidang dewan penguji  
sebagai salah satu syarat untuk memperoleh gelar Sarjana Komputer  
Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau  
di Pekanbaru, pada tanggal 16 Mei 2023

Pekanbaru, 16 Mei 2023

Mengesahkan,

**Ketua Program Studi**



**Eki Saputra, S.Kom., M.Kom.**

**NIP. 198307162011011008**



**Dr. Hartono, M.Pd.**

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#### DEWAN PENGUJI:

**Ketua : Siti Monalisa, ST., M.Kom.**

**Sekretaris : Eki Saputra, S.Kom., M.Kom.**

**Anggota 1 : Muhammad Jazman, S.Kom., M.Infosys.**

**Anggota 2 : Syaifullah, SE., M.Sc.**



## LEMBAR HAK ATAS KEKAYAAN INTELEKTUAL

Tugas Akhir yang tidak diterbitkan ini terdaftar dan tersedia di Perpustakaan Universitas Islam Negeri Sultan Syarif Kasim Riau adalah terbuka untuk umum, dengan ketentuan bahwa hak cipta ada pada penulis. Referensi kepustakaan diperkenankan dicatat, tetapi pengutipan atau ringkasan hanya dapat dilakukan atas izin penulis dan harus dilakukan mengikuti kaedah dan kebiasaan ilmiah serta menyebutkan sumbernya.

Penggandaan atau penerbitan sebagian atau seluruh Tugas Akhir ini harus memperoleh izin tertulis dari Dekan Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau. Perpustakaan dapat meminjamkan Tugas Akhir ini untuk anggotanya dengan mengisi nama, tanda peminjaman dan tanggal pinjam pada *form* peminjaman.

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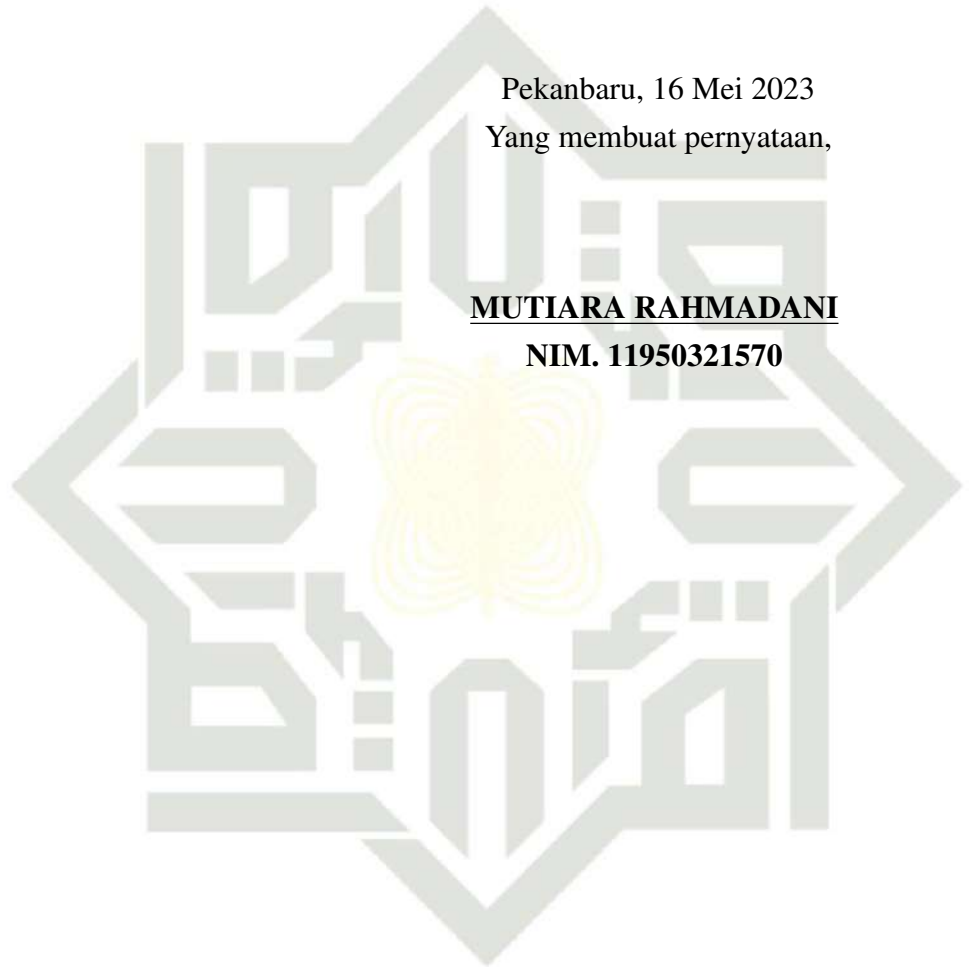
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Dengan ini saya menyatakan bahwa dalam Tugas Akhir ini tidak terdapat karya yang pernah diajukan untuk memperoleh gelar kesarjanaan di suatu Perguruan Tinggi, dan sepanjang pengetahuan saya juga tidak terdapat karya atau pendapat yang pernah ditulis atau diterbitkan oleh orang lain kecuali yang secara tertulis diacu dalam naskah ini dan disebutkan di dalam daftar pustaka.

Pekanbaru, 16 Mei 2023  
Yang membuat pernyataan,

**MUTIARA RAHMADANI**  
**NIM. 11950321570**



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## LEMBAR PERSEMBAHAN

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

*Dengan menyebut nama Allah yang maha pengasih lagi maha penyayang*

*Assalamu'alaikum Warahmatullahi Wabarakaatuh*

*Alhamdulillah Rabbil 'Alamin, segala puji bagi Allah Subhanahu Wa Ta'ala sebagai bentuk rasa syukur atas segala nikmat yang telah diberikan tanpa ada kekurangan sedikitpun. Shalawat beserta salam tak lupa pula kita ucapkan kepada Nabi Muhammad Shallallahu 'Alaihi Wa Sallam dengan mengucapkan Allahumma Sholihala Sayyidina Muhammad Wa'ala Ali Sayyidina Muhammad. Semoga kita semua selalu senantiasa mendapat syafa'at-Nya di dunia maupun di akhirat, aamiin ya rabbal'alaamiin. Kupersembahkan karya kecil ini sebagai salah satu hadiah istimewa bentuk bakti, rasa terimakasih, dan hormatku kepada orang tuaku tercinta, Papa dan Mama.*

*Papa dan Mamaku tersayang, terimakasih atas setiap perjuangan, doa, bimbingan, serta dukungan yang kalian berikan kepada saya. Terimakasih atas segala kebaikan dan selalu ada saat keadaan tersulit sekalipun. Terimakasih untuk segala pengorbanan yang kalian lakukan. Sampai kapanpun tiada rasa dan cara yang dapat membalas semuanya. Saya akan selalu mendoakan yang terbaik untuk Papa dan Mama agar bahagia dunia dan akhirat, serta diberikan tempat istimewa di sisi-Nya kelak sehingga kita bisa berkumpul kembali bersama-sama di Jannah-Nya.*

*Terimakasih juga saya ucapkan kepada kakak yang sangat saya cintai. Terimakasih untuk segala waktu berharga yang telah dilalui bersama, doa, dan dukungan yang tiada hentinya. Terimakasih juga saya ucapkan untuk Hadiul Bagasta yang sudah selalu memberi *support*, bantuan penuh, dan secara tidak langsung sudah bersama saya sejak awal perkuliahan dan selalu berada ditiap-tiap proses saya dalam menyelesaikan perkuliahan ini, yaitu sejak proses Kerja Praktek, Seminar Proposal, hingga Sidang Tugas Akhir. Kemudian saya ucapkan terimakasih kepada Bapak dan Ibu Dosen Program Studi Sistem Informasi yang telah mewariskan ilmu yang bermanfaat dan arahan kepada saya untuk menyelesaikan studi di Program Studi Sistem Informasi ini. Semoga kita semua selalu diberikan kemudahan, rahmat, serta karunia-Nya. Aamiin.*

*Wassalamu'alaikum Warahmatullahi Wabarakaatuh*

## KATA PENGANTAR

*Alhamdulillah Rabbil 'Alamin*, bersyukur kehadiran Allah *Subhanahu Wa Ta'ala* atas segala rahmat dan karunia-Nya sehingga peneliti dapat menyelesaikan Tugas Akhir ini dengan baik dan tepat waktu. Shalawat serta salam tidak lupa pula kita ucapkan kepada Nabi Muhammad *Shallallahu 'Alaihi Wa Sallam* dengan mengucapkan *Allahumma Sholli'Ala Sayyidina Muhammad Wa'Ala Ali Sayyidina Muhammad*. Tugas Akhir ini dibuat sebagai salah satu syarat untuk memperoleh gelar Sarjana Komputer di Program Studi Sistem Informasi Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau.

Pada penulisan Tugas Akhir ini, terdapat beberapa pihak yang sudah berkontribusi dan mendukung peneliti baik berupa materi, moril, dan motivasi. Oleh karena itu, peneliti ingin mengucapkan banyak terimakasih kepada:

1. Bapak Prof. Dr. Hairunas, M.Ag sebagai Rektor Universitas Islam Negeri Sultan Syarif Kasim Riau.
2. Bapak Dr. Hartono, M.Pd sebagai Dekan Fakultas Sains dan Teknologi.
3. Bapak Eki Saputra, S.Kom., M.Kom sebagai Ketua Program Studi Sistem Informasi sekaligus Dosen Pembimbing sejak Kerja Praktek hingga Tugas Akhir ini.
4. Ibu Siti Monalisa, ST., M.Kom sebagai Sekretaris Program Studi Sistem Informasi sekaligus Ketua Sidang Tugas Akhir peneliti yang telah memberi arahan, saran, serta nasihatnya yang bermanfaat.
5. Bapak Tengku Khairil Ahsyar, S.Kom., M.Kom sebagai Kepala Laboratorium Program Studi Sistem Informasi.
6. Bapak Muhammad Jazman, S.Kom., M.Infosys sebagai Penguji I peneliti yang telah banyak memberikan arahan, masukan, nasihat, serta motivasinya baik dalam penyelesaian Tugas Akhir, maupun juga dalam perkuliahan dan kehidupan sehari-hari. Setiap motivasi yang diberikan akan selalu peneliti ingat dan dijadikan sebagai pelajaran hidup.
7. Bapak Syaifullah, SE., M.Sc sebagai Penguji II peneliti yang telah banyak memberikan arahan, nasihat, masukan, serta motivasinya baik dalam penyelesaian Tugas Akhir, maupun juga dalam perkuliahan dan kehidupan sehari-hari. Setiap motivasi yang diberikan akan selalu peneliti ingat dan dijadikan sebagai pelajaran hidup.
8. Bapak Nesdi Evrilyan Rozanda, S.Kom., M.Sc sebagai Dosen Pembimbing Akademik peneliti yang telah banyak memberikan arahan, masukan, dan motivasi selama perkuliahan mulai dari Semester 1 hingga Semester 8 ini.

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9. Seluruh Bapak dan Ibu Dosen Program Studi Sistem Informasi yang telah banyak memberikan ilmunya kepada peneliti. Semoga ilmu yang diberikan dapat peneliti amalkan dan menjadi amal jariyah.
10. Seluruh Pegawai dan Staff Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau yang telah membantu dan mempermudah proses administrasi selama perkuliahan ini.
11. Kedua orang tua peneliti, yaitu Mama Masridawati dan Papa Eky Eriawan tercinta yang tanpa lelah selalu memberikan semangat, motivasi, *support*, serta doa terbaiknya dan selalu menjadi motivasi peneliti dalam menyelesaikan Strata 1 (S1) ini. Terimakasih atas segala keringat, jerih payah pengorbanan, dan kerja keras yang telah kalian berikan dengan penuh keikhlasan demi menuju kesuksesan anakmu ini. Semoga Allah *Subhanahu Wa Ta'ala* selalu menjaga dan melindungi Mama dan Papa dimanapun kalian berada.
12. Kakak Rezky Eka Putri, Abang Ipar Abror Aulawy dan Keponakan Ghaniyyah Nadzira Aulawy peneliti. Terimakasih telah memberikan perhatian, kasih sayang, semangat, *support*, serta doa kepada peneliti.
13. Seluruh Keluarga Besar H. Ahmad Jasam dan (Alm.) H. Sulaiman Kahar yang telah mendoakan serta memberi dukungan kepada peneliti.
14. Teruntuk diri sendiri yang telah kuat bertahan dalam perjuangan menempuh gelar Sarjana Komputer (S.Kom) yang tidak mudah namun indah ini. Terimakasih untuk selalu berjuang dan tidak menyerah. Maaf karena sudah terlalu memaksakan serta selalu *nge-judge* diri.
15. Sahabat-sahabat terbaik peneliti, yaitu Filia Yohazia Karen, Pina Rezqina, Ela Mardhotillah, T. Faiza Maharlika, Sarmitasari, Rahmi Aulia Astri, Dinda Erinta, Muhamad Irvandra, Ariq Hendrian, Umairah Rizky Gurning, Agisti Mutiara Ayulya, Riskina Saputri, dan Mutiara Aulia Risti.
16. Teman-teman seperjuangan Sistem Informai Angkatan 2019 terutama teman-teman *Calm Class* 19. Terimakasih juga teman-teman KKN Desa Pematang 2022 yang telah memberi masukannya, serta teman seperjuangan *conference paper* hingga tahap validasi yaitu Dinda Sofianti dan Fanisha.
17. Semua pihak yang namanya tidak dapat disebutkan satu persatu yang telah banyak membantu dalam pelaksanaan serta penyelesaian Tugas Akhir ini. Semoga segala doa dan dorongan yang telah diberikan selama ini menjadi amal kebajikan dan mendapat balasan setimpal dari Allah *Subhanahu Wa Ta'ala*. Peneliti menyadari bahwa penulisan Tugas Akhir ini masih terdapat banyak keku-

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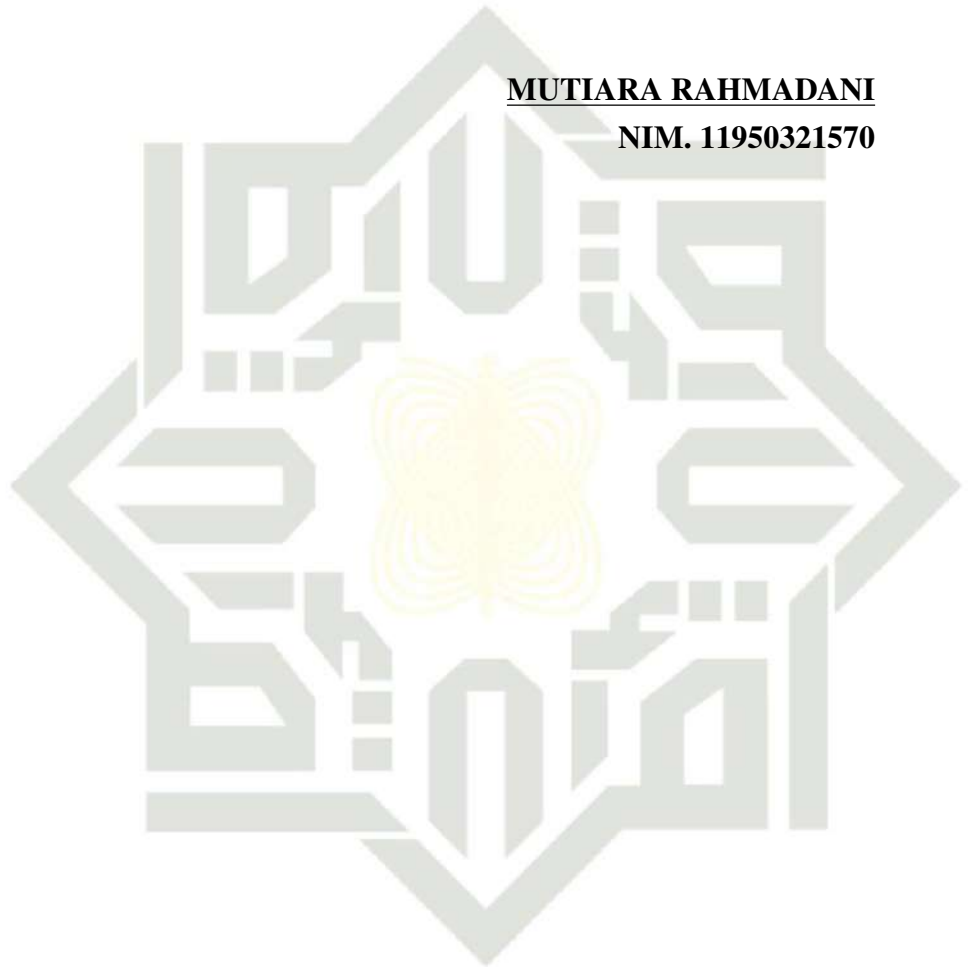
rangan dan jauh dari kata sempurna. Untuk itu kritik dan saran yang membangun sangat diharapkan demi kesempurnaan Tugas Akhir ini dan semoga laporan ini bermanfaat bagi kita semua. Akhir kata peneliti ucapkan terimakasih.

Pekanbaru, 05 Juni 2023

Peneliti,

**MUTIARA RAHMADANI**

**NIM. 11950321570**



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**IRTM**  
**International Conference**  
IIT, Delhi, India

# 2023 CONFERENCE PROCEEDINGS

**DATE: 20th - 22nd April, 2023**

**EDITORS:**

Prof. Satyajit Chakrabarti, Dr. Omkar Rai,  
Prof. Sanghamitra Poddar, Prof. Anupam Bhattacharya  
Prof. Malay Gangopadhyay, Prof. Srijita Chakraborty





## About the Conference

### IRTM 2023

We live in an inter-connected world. In the era of Industry 4.0, technology is getting embedded more and more in the way **'we learn, live, work and play'**.

This progression is accelerating at a pace never seen before. Inter disciplinary and collaborative research across disciplines within the Technology domain and Management domain, and across the Technology – Management interface is opening up exciting new possibilities for solving problems whose solutions are beyond the scope of a single discipline, domain or practice, and helping to create a brave, new world. We are living in an incredible time of change.

Our effort to hold such an interdisciplinary conference, in the virtual mode, apparently resonated across the academic community, as was evident from the huge response that the first ever conference on "Interdisciplinary Research in Technology and Management", (IRTM) held in February 2021 had received from participants across many countries. This has encouraged the organizers to hold the next edition of the conference physically in Kolkata on a larger scale in the online mode.

The pandemic unleashed by Covid 19 in the last two years has shaken the socio-economic foundations of countries and societies to a point where the world cannot be the same as before the pandemic. It has re-focused the world's attention on the priority of healthcare, and healthcare infrastructure and its innovative management.

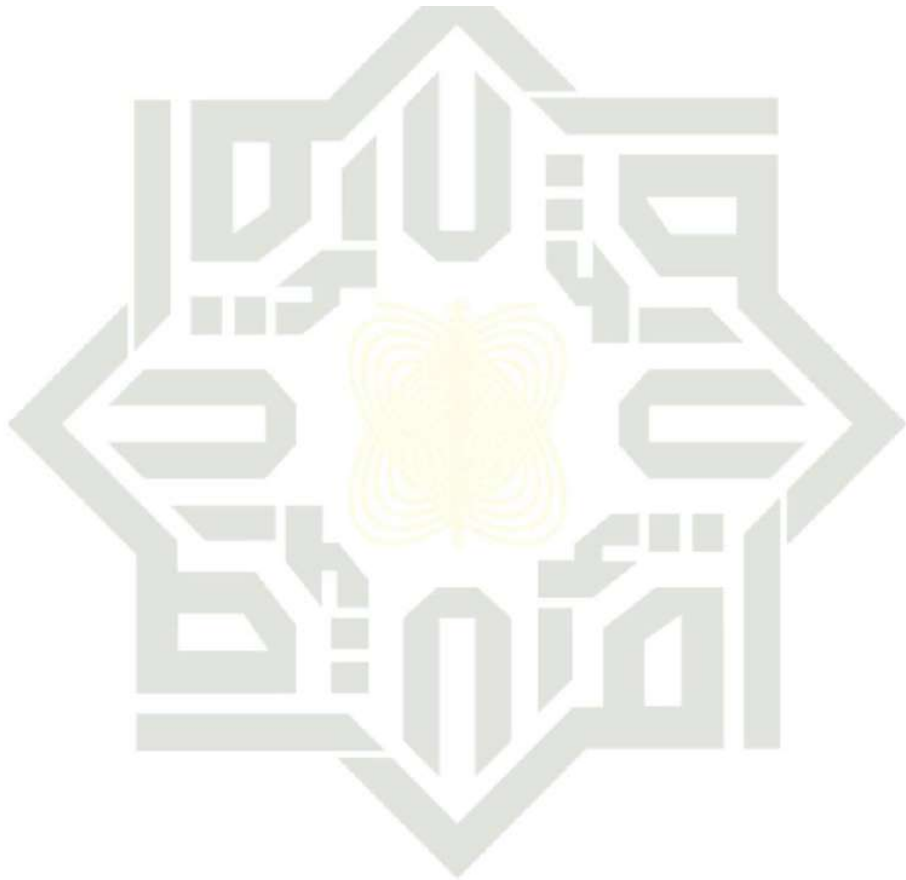
Inevitably, questions have again been raised more vehemently on what kind of a world we want to live in. Environmental concerns are being pursued with renewed vigour, The urgency of developing new, robust infrastructure relevant for the new world is gaining wider consensus.

By 2030, as reports suggest, cyber – physical systems – internet of things, wearable technology, et al – will be everywhere and in everything, renewable energy will power the world, and digital entertainment will take centre stage among other developments.



The third edition of the conference on “Interdisciplinary Research in Technology and Management” attempts to spotlight the above concerns. The number of tracks on which papers are invited from scholars, researchers, consultants and practitioners to share their interdisciplinary research and consultative work has been enlarged. As before, the papers will be peer reviewed and authors of the selected papers will be invited to present their papers in the IRTM conference.

The presentation of papers will be interspersed with **Keynote Talks** by eminent experts on the theme of the conference or individual domains.



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Mutiara Ara <mutiarahmadani2001@gmail.com>

# IRTM 2023] Your paper #1570895568 ('Risk Management Assessment Using Failure Mode Effect Analysis (FMEA) and Information Security Measurement with ISO/IEC 27004:2016')

IRTM 2023 <irtm2023-chairs@edas.info>

29 Maret 2023 pukul 13.43

Ke pada Mutiara Rahmadani <mutiarahmadani2001@gmail.com>, Eki Saputra <Eki.saputra@uin-suska.ac.id>, Muhammad Jazman <jazman@uin-suska.ac.id>, Syaifullah Syaifullah <syaifullah@uin-suska.ac.id>, Siti Monalisa <siti.monalisa@uin-suska.ac.id>

Dear Ms. Mutiara Rahmadani:

Congratulations - your paper #1570895568 ('Risk Management Assessment Using Failure Mode Effect Analysis (FMEA) and Information Security Measurement with ISO/IEC 27004:2016') for IRTM 2023 has been **accepted** and will be presented in the session titled \_\_\_.

The reviews are below or can be found at [1570895568](https://doi.org/10.1570895568).

## IRTM 2023 1

**Comments for reviewers: write at least 100 words regarding this review**

Well presented. You could have highlighted how the use of Blockchain can simplify logistics and supply chains of the future.

## IRTM 2023 2

**Comments for reviewers: write at least 100 words regarding this review**

Hardwork done by authors. Lots of information are present in this paper.

Regards,

State Islamic University of Sultan Syarif Kasim Riau

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**Content:**

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2.	Adaptive Authentication for Open Banking Customer Consents	Abir Ghosh (University of Engineering and Management, India); Indraneel Mukhopadhyay (Institute of Engineering and Management, India); Subhalaxmi Chakraborty (UEM, India)	6
3.	From Credentials to Contracts: Harnessing Blockchain Technology for Online Management Learning and Collaboration	Sohini Datta (Institute of Engineering & Management (IEM) & University of Engineering & Management, India); Anupam Bhattacharya. (Institute of Engineering & Management & University of Engineering & Management, India)	12
4.	Covid19 CT Lung Image Segmentation Using Connected U-Nets	Anwesh Reddy Paduri (Great Learning, India); Narayana Darapaneni (Northwestern University School of Professional Studies, India & Great Learning, India); Sithiha Parjana M (PES University, India); Sudha b G	18



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<p>5.</p>	<p>Optimal Approach for Data Pre-Processing of Time Series Data</p>	<p>Narayana Darapaneni (Northwestern University School of Professional Studies, India &amp; Great Learning, India); David Pratap (Great Learning, India); Ullas M S (PES University, India); Anwesh Reddy Paduri (Great Learning, India); Sudha b G (GREAT LEARNING, India)</p>	<p>23</p>
<p>6.</p>	<p>One Stop Solution for Air Quality Monitoring Through Predictive Analysis</p>	<p>Praveen Kumar R, Aravindan B and Adhithyan S (Easwari Engineering College, India)</p>	<p>29</p>
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<p>8.</p>	<p>An I-Voting System Using Dual-Blockchain Architecture</p>	<p>Debagnik Kar (Kalinga Institute of Industrial Technology, India); Sambit Prasad Kar (Kaling Institute of Industrial Technology, India)</p>	<p>42</p>
<p>9.</p>	<p>A Scientific Study to Evaluate Significance of Human Resource</p>	<p>Deepak Chandra Chandola (AMITY University Dubai,</p>	<p>49</p>

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	Management in Reduction of Aircraft Maintenance Turnaround Time Within Aviation Industry	United Arab Emirates & Banasthali Vidyapith University, India); Manoj Kumar Paidisetty (AMITY University, Uttar Pradesh, Noida & Directorate General of Civil Aviation, India); Rajendra Prasad Kholiya (Swiss Business School, United Arab Emirates); Preeti Chandola (Banasthali Vidyapith University & Kumaun University, India); Kamal Jaiswal (Higher Colleges of Technology, United Arab Emirates); Seema Verma (Banasthali Vidyapith, India)	
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# Risk Management Assessment using Failure Mode Effect Analysis (FMEA) and Information Security Measurement with ISO/IEC 27004:2016

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**Abstract**— Technology advancements particularly have had a tremendous impact on business operations. The risk impact of information technology (IT) is used in business that could impede a company from accomplishing its goals. Consequently, the risk ultimately needs to be avoided. Introducing these dangers poses a risk to a company's operational procedures. The lack of information security within a corporation is one of the factors contributing to this risk. This study intends to reduce risks in logistics firms by raising information security hazards to identify and manage those risks. By detecting and addressing these risks, our research aims to lower the risks logistics organizations face and enhance information security. Failure Mode and Effect Analysis (FMEA) determines the effects and consequences of these failures/risks based on severity, occurrence, and detection. Moreover, ISO/IEC 27004:2016 is a recommendation for information security risk mitigation based on objective standards.

**Keywords**— Information Security System, Risk Management, FMEA, ISO/IEC 27004.

## I. INTRODUCTION

The rapid advancement of technology, particularly the internet, has significantly changed how organizations conduct their operations[1]. When information technology (IT) is used in a business, there are hazards (referred to as "Information Technology Risks") that could prevent the company from achieving its objectives[2]. An issue that is expected is a risk. Organizational business processes could be disrupted as a result of the appearance of these hazards[3].

Information security requires effective risk management, particularly in large client-focused businesses. The execution of risk management is still often subpar, making information security open to assault or interference[4]. Information security is the attempt to uphold or safeguard information assets by considering confidentiality, integrity, and availability against cyber threats by creating business procedures, reducing risks, and improving an organization's or company's performance[5].

This research examines a logistics information system at a logistics company in Indonesia. Information security in this logistics company is still weak because the system has never been checked and repaired. Risks arise from weak company information security in the form of viruses, data loss or leakage, hacked systems, piracy, etc., where the risks that can occur will also impact a company's operational performance.

Then a solution is needed to overcome the problems described above, and one way to use the appropriate method to solve the problem. Namely, failure mode and effect analysis (FMEA).

FMEA is a risk management tool frequently employed in crucial risk assessments. The possibility for failure in the procedure, the good, or the service is found using FMEA[6]. The construction technique known as FMEA is used to characterize, identify, and eliminate known or potential faults, difficulties, and errors in systems, design development, or services[7]. The qualitative and descriptive method type was the most popular in risk management. The semiquantitative method includes FMEA[6]. Risk Priority Number, a risk rank methodology, was applied during FMEA implementation (RPN). The three-parameter risk assessment produced RPN (severity, occurrence, and detection)[8].

Scales for severity, occurrence, and detection will be chosen separately. These numerical scales go from 10 to 1. RPN's score decreases as numerical levels increase. These rankings all fluctuate based on the application. The standard scales should be used consistently throughout the FMEA after they have been chosen[9].

Cybersecurity is sometimes seen as an expensive expense with no apparent means to measure its advantages[10]. The international standards system comprises ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission)[11].

The ISMS standard ISO/IEC 27004:2016 is a member of the ISO/IEC 27000 series family[12]. Information security is measured using the standard ISO/IEC 27004. The





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Information security management criteria employ ISO/IEC 27004 as a benchmark for monitoring information security.

Therefore, the solutions provided are expected to be able to prevent information security risks in this logistics company.

LITERATURE REVIEW

A. Risk Management

Successful experts and professionals discovered that failures in information security risk, RM is crucial (IT)[13]. The goal of Risk Management, which strives to reduce losses and increase opportunities, is to discover, analyze, evaluate, regulate, monitor and communicate risk that is logically or reasonably present [14]. Five factors were examined when studying risk management: What the issue is, how it might originate, what threats might materialize, what to do in the event of a threat, and how to resolve it are the first two.

Operational risk is now understood to be a risk that can result in significant losses[15]. Risk management encompasses all facets of controlling the risk of an incident and its impact analysis that should alter decision-making and improve performance[4]. The steps in risk management are risk categorization, risk assessment, risk calculation, application of risk management actions, and occasionally risk monitoring[16].

B. Information Security System

Management of information security is a challenging and crucial task. Behavior monitoring for cybersecurity is the cornerstone of information security management activities[17]. The process of gathering different kinds of system events and network security log data from the defense mechanism and cybersecurity systems, moving on to data mining, adjusting for the political crisis, and providing services for upcoming data security and network trend research[18]. The main steps in the formal process of checking the security system for accuracy and completeness are: 1) defining the objects and objectives that need to be protected; 2) creating a security policy; 3) providing proof that, in light of the security policy, threats cannot be implemented; 4) support the security policy, a set of security functions (or services) must be defined, and 5) Additionally, there must be evidence that the group of security features (or services) genuinely implements the security policy[19]. Data and essential aspects of that data, such as confidentiality, integrity, availability, and the software and hardware used to store and convey that data, are all protected by information security[20].

C. Failure Mode and Effect Analysis (FMEA) Method

Failure Mode and Effects Analysis (FMEA), initially created as an official framework by the aerospace industry in the 1960s, has still been a helpful and effective method of identifying obvious risks and mitigating those from happening[21]. FMEA is a systematic method used to analyze a system or process to find probable failure modes and their potential effects on the operation of the system or process[22]. FMEA examines all plausible future issues and assigns each one a numerical score[23]. FMEA evaluation results often use risk priority numbers (RPN) for assessing risk, which determines the risk level of failure modes for a

product or a system using the failure severity (S), occurrence (O), and detection (D) variables[24][25]. This means failure modes with high RPN values are a high-risk priority and will receive much attention throughout the system's overall improvement[22].

D. ISO/IEC 27004:2016 Method

To assist businesses in adhering to ISO/IEC 27001:2013, 9.1: monitoring, measurement, analysis, and evaluation requirements, ISO/IEC 27004: 2016 offers instructions on evaluating the efficiency and performance of an information security management system[11]. SNI ISO/IEC 27004: 2016 is a standard that offers guidelines on the development and application of measurements and tests to evaluate the efficacy of measures and control groups in information security management systems, as indicated in the ISO/IEC 27001 standard[26]. Information security controls in ISO/IEC 27001:2013 include 114 controls and 14 clauses[27]. Information security management system measurement is its process of collecting data about the efficiency of the ISMS and controls utilizing measurement functions, analytical models, and decision criteria. Problems with information security are frequently the result of inadequate management. Therefore, management is the foundation, and we must develop an effective information security management system if the methodology is the solution to solve information security concerns (ISMS)[28].

III. METHODOLOGY



Fig. 1. Methodology Diagram

A. Literature Review

Searching for relevant references, such as papers, articles, and books that address risk management assessment using the FMEA method and information system security using the ISO/IEC 27004 method, is done during this stage.

B. Data Collection

Questionnaires, observations, and interviews were used to collect primary and supplementary data as research material.

C. Data Analysis and Processing

The FMEA risk assessment method, a continuous system flow, and the ISO 27004 information security measures are used to handle data.

IV. RESULT

A. Running System Analysis

This logistics company has never audited or evaluated the information system used. Information security at this logistics company has yet to be implemented. So, if there is damage or error in the logistics information system used, the admin reports to the head of the branch, then the head of the



**B. Risk Assessment Using the Failure Mode and Effect Analysis (FMEA) Method**

The following is the implementation of the staged risk analysis identification and valuation of technology assets information using FMEA in cases:

1. Identify Processes
  - a. To develop the business process flows for the company, the first step is to identify its business processes. As shown in the figure below.

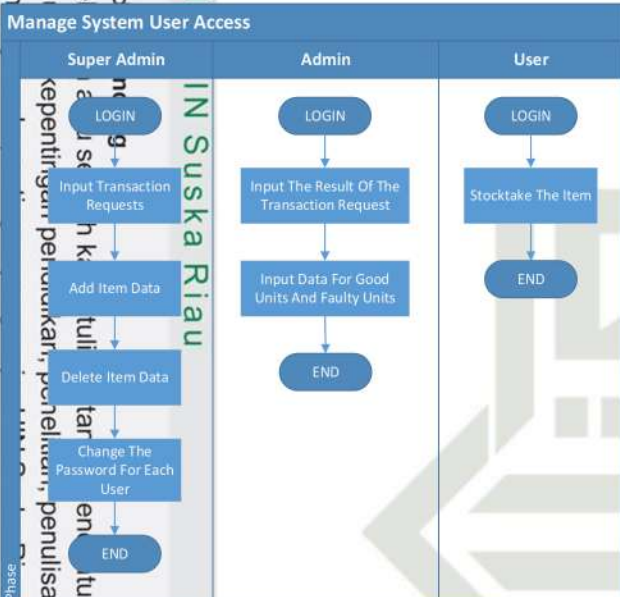


Fig. 2. Business Processes

**Risk Brainstorming**  
 This step is completed to identify any flaws in the system function that the organization uses to identify risky prospects. People, networks, hardware, software, and data all play a role in the emergence of risk-taking opportunities. In the table below, you can find the company's risk brainstorming.

TABLE 1. Risk Brainstorming

Business Process	
Policy	opportunities and delivery performance in inventory logistics.
Risk Opportunity	
<b>Hardware</b>	<ul style="list-style-type: none"> <li>- the occurrence of physical damage or theft of devices on computers/PC, servers, etc.</li> <li>- outsiders hacked the data center on the server.</li> <li>- the server is experiencing slow access.</li> <li>- need for storage space or media.</li> <li>- natural disasters like floods, fires, etc., happen frequently.</li> </ul>
<b>Software</b>	<ul style="list-style-type: none"> <li>- there is damage to the system.</li> <li>- there is a system breach or unauthorized application.</li> <li>- natural disasters like floods, fires, etc., happen frequently.</li> </ul>
<b>People</b>	<ul style="list-style-type: none"> <li>- the staff pays less attention to the importance of information security due to a lack of training and not fully mastering skills regarding information security.</li> <li>- there are no regulations on access to information.</li> <li>- lack of security regulations.</li> <li>- the occurrence of damage to the system resulting in work activities.</li> </ul>

- There is a possibility of using the information for fraud.
<b>Network</b>
<ul style="list-style-type: none"> <li>- Internet is experiencing less stable access.</li> <li>- Natural disasters like floods, fires, etc., happen frequently.</li> </ul>
<b>Data</b>
<ul style="list-style-type: none"> <li>- Losing important data due to virus attack.</li> <li>- Data loss due to data not being backed up.</li> <li>- Theft and modification of data</li> <li>- Natural disasters like floods, fires, etc., happen frequently.</li> </ul>

**3. Determine the RPN Results from Severity, Occurrence and Detection**

There are 23 dangers once the organization provides a risk assessment that is completed using the FMEA) worksheet assessment of severity, occurrence, and detection. In the column below, you can find the company's RPN results.

TABLE 2. RPN RESULTS

Code	Process Function (category)	Critical Asset	Potential Failure Modes (process defects)	Potential Effects of Failure	SEV	Potential Causes of Failure	OCC	Current Process Controls	DET	RPN	Lst
HW01	Hardware	Server	Servers fine.	Operational activity or performance has stopped	4	The server has overheated	3	Checking the server room every day	3	36	Low
HW02			Servers fine	Financial loss	10	Short circuit (power failure)	3	Checking for damaged IT infrastructure	2	60	Low
HW03			Server Overhead	Operational activities or performance is hampered	4	The AC is not functioning in the server room	4	Checking the server room every day	3	48	Low
HW04			Server Down	Operational activities or performance is hampered	4	Terlalu banyaknya user yang mengakses server pada waktu bersamaan atau serangan DDOS	4	Checking for damaged IT infrastructure	3	48	Low
HW05			Server crash	The server is unusable	10	There is no routine controlling and maintenance process	4	Checking for damaged IT infrastructure	3	120	High
HW06			Server crash	Financial loss	9	Natural disasters such as being hit by collapsed buildings (servers are located downstairs)	1	Checking for damaged IT infrastructure	5	45	Low
HW07		PC/Computer	Computer crash	Operational activities or performance is hampered	4	There is a virus attack	2	There is an antivirus on every PC	1	8	Very Low
HW08			Computer cannot be used	Operational activities or performance is hampered	1	Error in computer configuration	2	Checking for damaged IT infrastructure	5	10	Very Low
HW09			Computer device out of dead	Operational activities or performance is hampered	1	Outdated technology used	1	Device monitoring once a year	5	5	Very Low
HW10			Missing PC components	Financial loss	4	Theft	8	Limitation and monitoring of room access rights, locking the room and having CCTV	1	32	Low
HW11			Illegal access to PC information	Stealing information that damages the reputation of the agency	10	Security of access rights is weak and the computer is not given a password	2	Providing passwords for each employee's PC, and monitoring of damaged IT infrastructure	1	20	Low
HW12		Network Device	Network failure	Operational activities or performance is hampered	8	Network configuration manipulation	2	Checking for damaged IT infrastructure	5	80	Moderate
HW13			Network device failure	Operational activities or performance is hampered	10	Natural disasters (force of nature) and/or animals	1	Checking for damaged IT infrastructure	5	50	Low
HW14			Missing network device components	Operational activities or performance is hampered	10	Theft	10	Limitation and supervision of room access rights and the presence of CCTV	5	500	Very High
SW01	Software	Ms. Office Operating System Antivirus	Software Failure	Operational activities or performance is hampered	1	The software license used has expired	3	Checking for damaged IT infrastructure	5	15	Very Low
SW02			System Failure	Operational activity or performance has stopped	6	Buffer limitations in the database system	3	System maintenance is carried out by the center	5	90	Moderate
PP01	People	Admin and Operations	Human failure	Performance professionalism	10	Errors in inputting data and using system devices	3	Training once a year and SOP	2	60	Low

PP02			Counterfeiting or misuse of access rights	Agency reputation	10	There is cooperation with outside parties to forge signatures recorded on the system	3	No edit or delete permissions	5	150	High
DA01	Data	Data	It's full capacity	Unable to save data	10	Lack of control over server memory capacity	4	Checking the IT infrastructure	5	180	Very High
DA02			Data/information breach	Data confidentiality	10	Dissemination of confidential information by employees (sharing passwords)	4	There is a flow of data (malicious) in data access	5	180	Very High
DA03			Lost Data	Data integrity and availability	10	Software failure, network	4	Checking for damaged IT infrastructure	5	120	Very High
NT01	Network	Network	Lost Network Connection	System not accessible	10	Network failure	5	Checking for damaged IT infrastructure	5	150	Very High
NT02			Lost Network Connection	System not accessible	10	Damage to network devices and or blackouts	5	Checking for damaged IT infrastructure	5	150	Very High

- Planning
- Leadership
- Risk management
- Management of policy
- Resource management
- Communicate
- Management assessment
- Documenting
- Audits

The company's information security control or control group is the most reliable candidate for information security performance.

3. When to monitor, measure, analyze and evaluate?

Depending on personal information requirements, the necessary actions, and the data cycle supporting the required actions, businesses must create a timeline for monitoring, measuring, analyzing, and assessing their operations. Additionally, it is crucial to remember that before analysis and evaluation can begin, the right amount of data must be collected to serve as a foundation for judgment and comparison. Before the measurement data are relevant to the company, the monitoring, measuring, analyzing, and evaluating process also necessitates testing and modifications. The time that monitoring and data collecting would extend before analysis and evaluation can start must therefore be specified by corporations in any changes.

4. Who will monitor, measure, analyze and evaluate?

The company must decide which persons or positions will be responsible for the monitoring, measurement, analysis, and evaluation. Both manual and automated monitoring, measurement, analysis, and evaluation are possible. Companies can specify the following roles and duties concerning these measurements:

- Measurement clients: Information regarding the effectiveness of the ISMS from other interested parties that ask for it or need it.
- Measurement planner: the person who defines a measurement construct that relates measurable attributes to specific information needs.
- Measurement reviewer: the person who confirms that the measurement constructs created are appropriate for gauging the performance and efficiency of the ISMS in terms of information security.
- Information owner: the person who owns the information and provides input to the action. Responsible for providing data and also responsible for carrying out measurement activities.
- Information collector: the individual responsible for compiling, recording, and preserving information.
- Information analyst: the person responsible for analyzing data.
- Information communicator: the person in charge of conveying or publicizing the analysis's findings.

The following can be seen in ISO/IEC 27004 in mapping ISO/IEC 27001:2013, 9.1 requirements:

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The RPN results show that the risk level in the Very Low category has four risk threats. In the Low category, there are nine risk threats. Then the Moderate category has two risk threats. In the High category, there are two risk threats. And in the Very High category, this logistics company has six risk threats.

Measuring Information Management Security System Using Standard ISO/IEC 27004:2016

The first step in assessing the information security performance and efficiency of the ISMS is monitoring and measurement. The organization's information needs must be measured. To decide what has to be done to support each information need, follow these steps.

What to monitor?

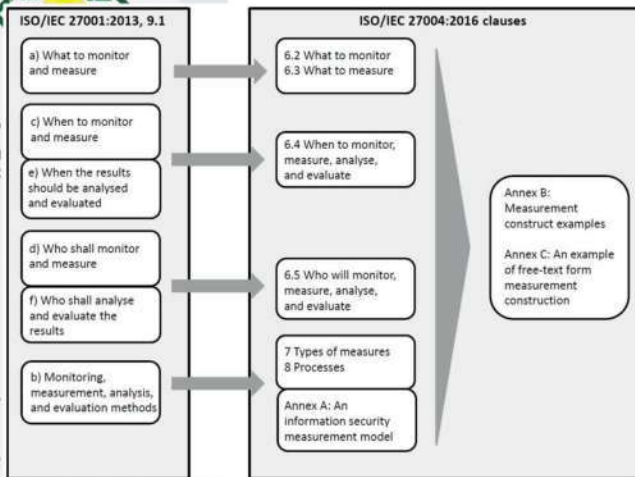
Monitoring establishes a system, process, or activity's state to fulfill specific information requirements. The following systems, processes, and activities can all be watched:

- ISMS process implementation
- Management of incidents
- Management of vulnerabilities
- Management of configuration
- Security awareness and training
- Event logging for access control, firewalls, and other systems
- Inspection
- Risk assessment process
- Risk handling process
- Third-party risk management
- Business continuity management
- Management of physical and environmental security
- System monitoring

Data produced by this monitoring activity can be used to support subsequent actions. Companies that monitor their operations can decide whether a danger has manifested and, if so, what countermeasures should be implemented.

What to measure?

Measurements are made to assess the efficacy and assist in identifying areas that may require improvement. Each ISMS process, activity, control, and control group can be measured. Here are a few instances of ISMS procedures and activities that are subject to measurement:



Mapping ISO/IEC 27001:2013, 9.1 Requirements

V. CONCLUSION

Information security assessed using the FMEA process stages had measured by ISO/IEC 27004:2016 aims to determine the risks identified in the information system. Also to measure the level of security of the information.

According to the findings of the Failure Mode and Effect Analysis (FMEA) method, which is used as a tool for risk assessment of information security assets, 23 risks have been identified based on the results of the evaluation through the stages of the FMEA process and the consequences of each questionnaire sheet based on the level of severity. These risks include business processes, risk monitoring, severity assessment, occurrence, detection, and acquisition of a Risk Priority Number (RPN). Likewise, information security measures are improved using the ISO/IEC 27004:2016 method.

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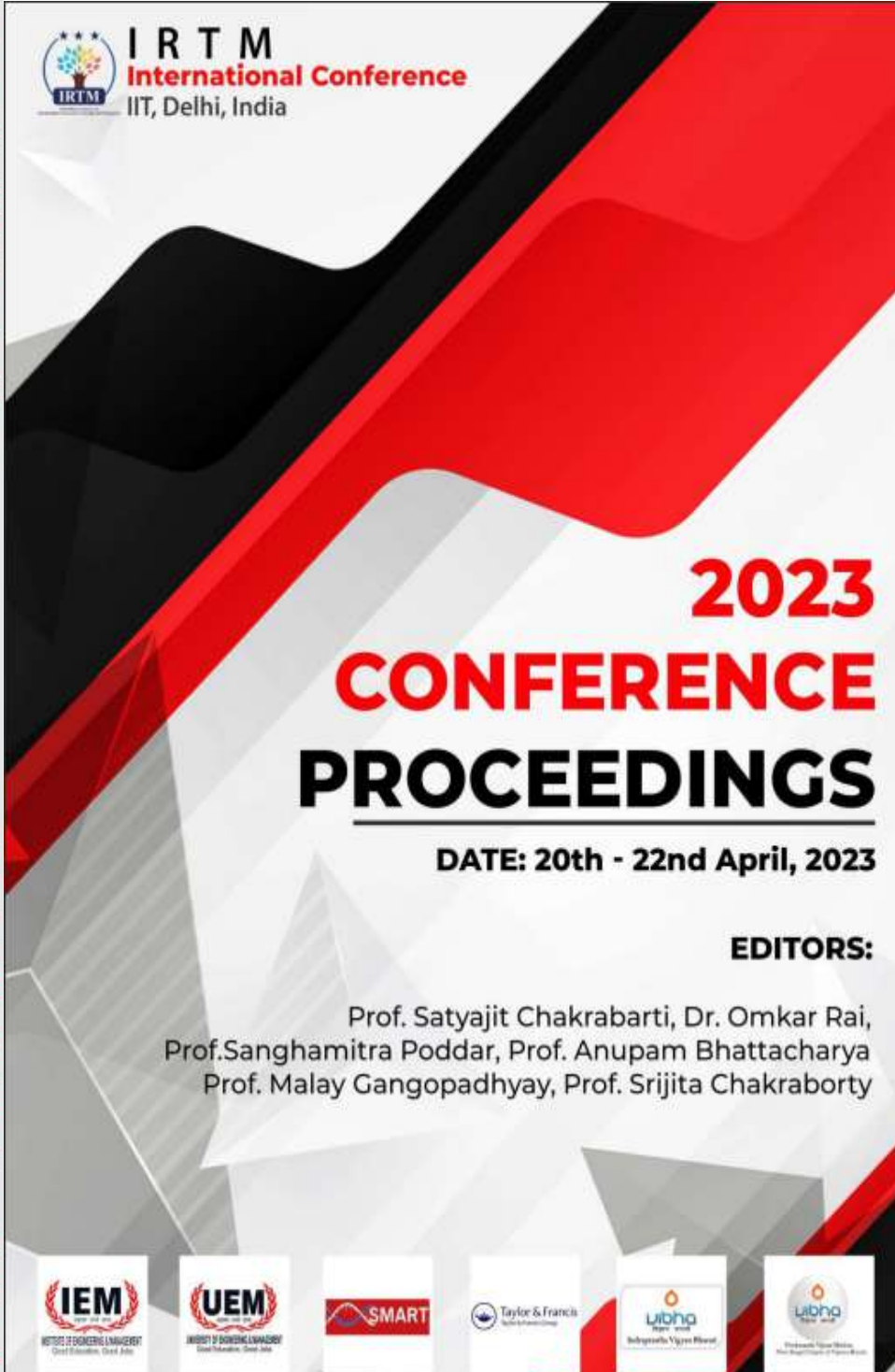
## LAMPIRAN A POSTER KEGIATAN

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**IRT M**  
International Conference  
IIT, Delhi, India

**2023**  
**CONFERENCE**  
**PROCEEDINGS**

**DATE: 20th - 22nd April, 2023**

**EDITORS:**

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## LAMPIRAN B

### KUESIONER LEMBAR KERJA FMEA

Code	Process Function (category)	Critical Assets	Potential Failure Modes (process defects)	Potential Effects of Failure	SE V	Potential Causes of Failure	O C C	Current Process Controls	DE T
HW01	Hardware	Server	Kebakaran server	Kegiatan operasional ataupun kinerja terhenti	4	Server mengalami overhead	3	Melakukan pengecekan ruangan server setiap hari	3
HW02			Kebakaran server	Kerugian finansial	10	Hubungan arus pendek (power failure)	3	Melakukan pengecekan terhadap infrastruktur TI yang rusak	2
HW03			Server Overhead	Kegiatan operasional ataupun kinerja terhambat	4	Ridak berfungsinya AC pada ruangan server	4	Melakukan pengecekan ruangan server setiap hari	3
HW04			Server Down	Kegiatan operasional ataupun kinerja terhambat	4	Terlalu banyaknya unit yang mengakses server pada waktu bersamaan atau serangan DDOS	4	Melakukan pengecekan terhadap infrastruktur TI yang rusak	3
HW05			Kerusakan server	Server tidak dapat digunakan	10	Tidak adanya proses controlling dan maintenance secara rutin	4	Melakukan pengecekan terhadap infrastruktur TI yang rusak	3
HW06			Kerusakan server	Kerugian finansial	9	Bencana alam seperti terkena reruntuhan bangunan (server terletak dilantai bawah)	1	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
HW07		Komputer PC	Kerusakan komputer	Kegiatan operasional ataupun kinerja terhambat	4	Adanya serangan virus	2	Adanya antivirus setiap PC	1
HW08			Komputer tidak dapat digunakan	Kegiatan operasional ataupun kinerja terhambat	1	Kesalahan dalam konfigurasi komputer	2	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
HW09			Perangkat computer out of dead	Kegiatan operasional ataupun kinerja terhambat	1	Usangnya teknologi yang digunakan	1	Monitoring perangkat sekali dalam setahun	5
HW10			Hilangnya komponen PC	Kerugian finansial	4	Pencurian	8	Pembatasan dan pengawasan	1

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								hak akses ruangan, mengunci ruangan dan nada CCTV	
HW11			Akses informasi PC secara ilegal	Mencuri informasi yang merusak reputasi instansi	10	Penjagaan hak akses lemah dan atau computer tidak diberi <i>password</i>	2	Memberikan <i>password</i> masing-masing PC pegawai, dan memantau terhadap infrastruktur TI yang rusak	1
HW12		Perangkat jaringan	Kegagalan jaringan	Kegiatan operasional ataupun kinerja terhambat	8	Manipulasi konfigurasi jaringan	2	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
HW13			Kerusakan perangkat jaringan	Kegiatan operasional ataupun kinerja terhambat	10	Bencana alam ( <i>force of nature</i> ) dan atau hewan	1	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
HW14			Hilangnya komponen perangkat jaringan	Kegiatan operasional ataupun kinerja terhambat	10	Pencurian	10	Pembatasan dan pengawasan hak akses ruangan dan adanya CCTV	5
SW01	Software	Antivirus sistem operasi <i>Ms.Office</i>	Kegagalan <i>software</i>	Kegiatan operasional ataupun kinerja terhambat	1	Lisensi <i>software</i> yang digunakan sudah melebihi batas waktu	3	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
SW02			Kegagalan sistem	Kegiatan operasional ataupun kinerja terhenti	6	Keterbatasan <i>buffer</i> disistem <i>database</i>	3	Maintenance sistem dilakukan oleh pusat	5
PP01	People	Admin dan Operasional	Kegagalan manusia ( <i>human failure</i> )	Profesionalitas kinerja	10	Kesalahan dalam penginputan data dan penggunaan perangkat sistem	3	Pelatihan sekali dalam setahun dan adanya SOP	2
PP02			Pemalsuan atau penyalahgunaan hak akses	Reputasi instansi	10	Adanya kerjasama dengan pihak luar untuk melakukan pemalsuan tanda tangan yang tercatat pada sistem	3	Tidak adanya hak akses edit ataupun hapus	5

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DA01	Data	Data	Penuhnya kapasitas	Tidak dapat menyimpan data	10	Kurangnya pengontrolan kapasitas memori <i>server</i>	4	Melakukan pengecekan terhadap infrastruktur TI	5
DA02			Pembobolan data/informasi	Kerahasiaan data	10	Penyebaran informasi rahasia oleh pegawai (berbagi <i>password</i> )	4	Adanya aliran data (bertingkat) dalam akses data	5
DA03			Data hilang	Integritas dan ketersediaan data	10	Kegagalan <i>software</i> , jaringan	4	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
NT01	Network	Internet	Koneksi jaringan putus	Sistem tidak dapat diakses	10	Kegagalan jaringan	5	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5
NT02			Koneksi jaringan putus	Sistem tidak dapat diakses	10	Rusaknya perangkat jaringan dan atau mati lampu	5	Melakukan pengecekan terhadap infrastruktur TI yang rusak	5

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### CONFERENCE CERTIFICATE



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OF PRESENTER

This is proudly presented to

***Mutiara Rahmadani***

For paper titled

***Risk Management Assessment Using  
Failure Mode Effect Analysis (FM&A)  
and Information Security***

At IRTM 2023 held from 20th - 22nd April 2023  
**Measurement with ISO/IEC  
27004:2016**

Prof. Satyajit Chakrabarti,  
Director, IEM, India

Shekhar C. Mande, General  
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#### Payment #312037

Code	Description	Attendee	Event date / paper	Registered	Invoice amount	Canceled
T8:Foreign students	IRTM 2023	Mutiara Rahmadani	#1570895568 <i>Risk Management Assessment Using Failure Mode Effect Analysis (FMEA) and Information Security Measurement with ISO/IEC 27004:2016</i>	Apr 5, 2023 00:28 America/New_York	₹10,335.28	
<b>Total INR</b>					<b>₹10,335.28</b>	

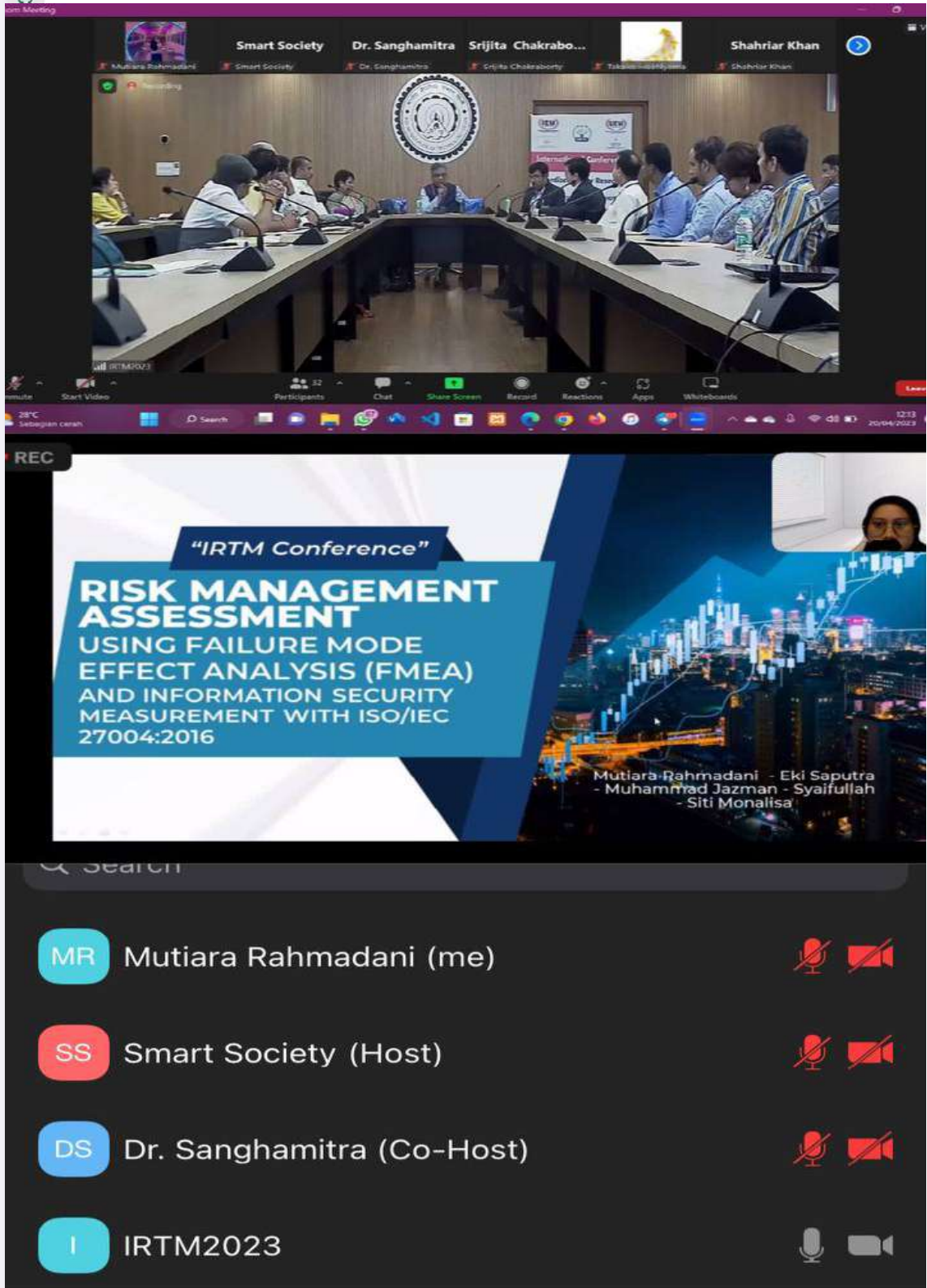
Account	2033764 (Mutiara Rahmadani)
Paid	Apr 11, 2023 08:47 America/New_York
Payment method	creditcard
Credit card number and transaction	...2101: ch_3MvgbRFqsBG0Rsn90nSSJiOp
Amount paid	₹10,335.28
Address	Ms. Mutiara Rahmadani Science and Technology Department Universitas Islam Negeri Sultan Syarif Kasim Riau Indonesia

## LAMPIRAN E

### DOCUMENTATION IRTM CONFERENCE 2023

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The image shows a Zoom meeting interface. The top part displays a video feed of a conference session with participants seated around a long table. The bottom part shows a presentation slide titled "IRTM Conference" with the main topic "RISK MANAGEMENT ASSESSMENT USING FAILURE MODE EFFECT ANALYSIS (FMEA) AND INFORMATION SECURITY MEASUREMENT WITH ISO/IEC 27004:2016". The slide also lists the presenters: Mutiara-Rahmadani, Eki Saputra, Muhammad Jazman, Syaifullah, and Siti Monalisa. Below the slide is a list of participants in the meeting:

Participant	Role	Microphone	Video
MR	Mutiara Rahmadani (me)	Off	Off
SS	Smart Society (Host)	Off	Off
DS	Dr. Sanghamitra (Co-Host)	Off	Off
I	IRTM2023	On	On



## DAFTAR RIWAYAT HIDUP

Mutiara Rahmadani lahir di Kota Pekanbaru, pada tanggal 15 November 2001. Peneliti merupakan anak dari Bapak Eky Eriawan dan Ibu Masridawati. Peneliti merupakan anak kedua dari dua bersaudara, yang mana Rezky Eka Putri adalah kakak kandung peneliti satu-satunya. Pada tahun 2006 peneliti memulai pendidikan dengan masuk TK Zamrud di Kota Pekanbaru dan lulus pada tahun 2007. Lalu melanjutkan pendidikan Sekolah Dasar di SD Negeri 001 Rambah yang ada di Pasir Pengaraian, Kab. Rokan Hulu. Peneliti menyelesaikan pendidikan Sekolah Dasar pada tahun 2013. Setelah itu peneliti melanjutkan pendidikan tingkat SLTP di MTs Negeri Rambah yang sekarang sudah berganti nama menjadi MTsN 3 Rambah, Pasir Pengaraian. Kemudian, setelah menyelesaikan pendidikan di MTsN 3 Rambah, pada tahun 2016 peneliti melanjutkan pendidikan tingkat SLTA di SMA Negeri 1 Rambah dengan mengambil jurusan IPA. Dan menyelesaikan pendidikan di SMA Negeri 1 Rambah pada tahun 2019. Setelah itu peneliti pun melanjutkan pendidikan dengan mendaftar ke beberapa Universitas yang ada di Indonesia. Dan *alhamdulillah* pada tahun 2019 peneliti diterima menjadi mahasiswa di Program Studi Sistem Informasi Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau melalui jalur Mandiri. Selama menjadi mahasiswa, peneliti selalu aktif diberbagai kegiatan kampus terutama kegiatan yang ada di Program Studi Sistem Informasi ini. Peneliti juga tergabung dalam Himpunan Mahasiswa Sistem Informasi (HIMASI) pada periode 2021/2022 sebagai Sekretaris Divisi Sosial, Masyarakat, dan SDM. Selain itu peneliti juga bergabung dalam Study Club yang bernama *Information System Organization Culture (ISOC) Research* pada tahun 2021. Akhir kata peneliti mengucapkan rasa syukur yang tak terhingga serta ribuan terimakasih atas bantuan dari seluruh pihak yang terkait sehingga selesainya Tugas Akhir yang berjudul "*Risk Management Assessment Using Failure Mode Effect Analysis (FMEA) and Information Security Measurement With ISO/IEC 27004:2016*" yang *alhamdulillah* Tugas Akhir peneliti ini diterima dan akan terbit di *Interdisciplinary Research in Technology and Management (IRTM) 2023 International Conference Taylor and Francis* terindex dalam Scopus.

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