Mantik Journal, 8 (4) (2025), ISSN 2685-4236 (Online)

Published by:Institute of Computer Science (IOCS)

Jurnal Mantik

Journal homepage: www.iocscience.org/ejournal/index.php/mantik

Information technology procurement risk management in fast moving consumer goods industry

Fabiola Julia Yovita Louwisia[1], Aditya Andika[2]

[1,2]Department of Industrial Engineering, Faculty of Engineering, Bina Nusantara University, Indonesia

A R T I C L E I N F O

Article history:

Received Jan 01, 2025
Revised Jan 07, 2025
Accepted Jan 16, 2025

Keywords:

FMCG;
FMEA;
Information technology;
Procurement;
Risk management.

ABSTRACT

Information Technology procurement is very crucial for companies in the Fast Moving Consumer Goods industry. The rapid product cycles of the industry require continuous launches of new products. This calls for the implementation of modern information technologies in every aspect of the supply chain in order to run operations smoothly and to be competitive. Fast Moving Consumer Goods companies need to ensure that information technologies that are needed for such purpose are procured and implemented. However, there are various risks that arise from IT Procurement in the Fast Moving Consumer Goods industry. To address this matter, this study developed an FMEA-based risk management template that are adjusted to the context of Fast Moving Consumer Goods industry. This study found 27 risks that are related to IT Procurement and develop risk treatment strategies for each of the risks. The risks with the highest RPN scores are mostly related to technological issues and vendor issues. Fast Moving Consumer Goods companies can use this FMEA-based risk management template as a starting point to develop a risk management strategy that are adjusted to their situation and context.

Corresponding Author:

Aditya Andika,
Departement of Industrial Engineering, Faculty of Engineering,
Bina Nusantara University.
Jl. Kyai H. Syahdan No. 9, Kemanggisan, Palmerah, Jakarta Barat, Indonesia 11480.
Email: aditya.a@binus.ac.id

1. INTRODUCTION

Companies globally spend significant amount for information technology (IT) spending. The amount of IT spending worldwide in 2025 is estimated at $5.74 trillion, which is a 9.3% increase from 2024 (Gartner, 2024). The procurement of IT-related items is categorized as Indirect Procurement. The amount of Indirect Procurement cost is usually between 5 - 15% of turnover (Öhrberg, n.d.). Companies tend to pay less attention to Indirect Procurement when compared to Direct Procurement because Indirect procurement tend to be less vulnerable to shortage and surplus risks (SAP, 2024), however spending on Indirect Procurement can reach about 40 percent of a company's total spending, which means it has substantial impact on companies' operating expenses (Procurify, 2024). Usually. Indirect procurement consists of low-volume but high frequency purchases, meaning that paying more attention to Indirect Procurement can potentially produce significant cost savings (Brown et al., 2021). Examples of Indirect

Procurement are IT equipment and software, office equipment, maintenance equipment, advertising, consultancy, travel services, and health plans (Abubakar et al., 2016).

In the Fast Moving Consumer Goods (FMCG) industry, spending on IT-related items is very high, approximately about 5% of total revenue in 2023 (Sherif, 2024). Therefore, procurement of IT-related items in the FMCG industry needs to be planned strategically and meticulously in order for the company to gain the benefits of IT implementation, such as the reduction of cost; efficiency in operations; improvement in process; reliable, and accurate information; collaboration and integration; products or services differentiation (De Barros et al., 2015). Company leaders and managers need to understand IT products that they plan to procure and understand how those IT products can affect the financial outcomes of their company. This understanding is crucial because about 30% of companies' technology spending is wasted (Currie, 2023). In other words, companies tend to buy technologies that they do not need or technologies that they could not use. These kinds of behaviors affect the companies' profitability, which in turn affect the companies' value (Yoewono, 2023).

Furthermore, company leaders and managers need to pay close attention to procurement of IT-related items and their implementation because it contains risks for the whole organization. For example, if a company purchase a low quality IT system, it has the potential to crash and cost the company substantially. The average cost of an IT downtime is about $5,600 per minute to $9,000 per minute (Shepherd, 2024). The management of risk in IT Procurement is very important because it affects companies' bottom line and productivity. As an added benefit, it also contributes to employees' job satisfaction because a well thought out IT Procurement risk management system will ensure that employees get the suitable IT-related items that they need to have in order to their jobs well (Tran, 2022). A high level of job satisfaction will improve organizational citizenship behavior (Aldrin & Yunanto, 2019), which in turn affects employee performance positively (Qalati et al., 2022).

Different industries also have different risk factors. The FMCG industry, which characteristics include low profit margin, vast network of distribution, high volume sales, rapid inventory turnover, high demand volatility, short product life cycles, and complex supply chains (David Olanrewaju Olutimehin et al., 2024; Gulati, 2015), has different risk challenges than other industries, including the risks challenges related to IT Procurement. Because of the intense level of competition, high level of complexity, and fast-paced nature of the industry, FMCG companies have to adopt the latest information technologies rapidly. FMCG companies rely on rapid technological adoption to compete in the market. Even minor delays in the procurement and implementation of IT-related items could have an enormous effect. For example, a minor delay in the implementation of a sales mobile app and its supporting hardware can lead to disappointments among retail partners, stock-out situations, and a shrinking market share. A poor IT procurement process in the FMCG industry can certainly decrease revenues and lower profit margins in both short term and long term. FMCG companies, especially those that operate globally, must have an excellent IT procurement process that can handle various risks because those companies have to be able to procure IT-related items from all around the world on-time, on-spec, on-budget and have to be able to synchronize and integrate multiple IT systems across the globe in order to minimize delays and tackle problems, even minor delays and problems, because they often cause a massive effect. This is in contrast with other industries that have slower pace and less complexity, such as education. Minor delays or minor problems in IT implementations in the education industry are less likely to cause a significant effect.

There are also differences in acceptable risks and failures between different companies from the same industry that arise from various factors, such as financial resources, technological resources, and management expertise (Bahrami et al., 2012). This is also true for companies in the FMCG industry. Therefore, this study will develop a

risk management template that are adapted to the context of IT procurement in the FMCG industry. The template will be developed by using the Failure Mode and Effects Analysis (FMEA) method. FMEA is a method the focuses on risk identification and prevention (Sharma & Srivastava, 2018). It is analytical tool that establishes the relationships between causes and effects of failures or risks and formulate ways to address them accordingly (Barosz et al., 2018). FMEA ranks failures or risks based on their Risk Priority Number (RPN) and focuses to address failures or risks that have high RPN values (Hąbek & Molenda, 2017).

The FMEA-based risk management template developed in this study can be used by FMCG companies as a foundation in developing IT procurement risk management strategies that are suitable for their situation and context. Furthermore, the FMEA-based risk management template can also be utilized as part of companies' knowledge management system for risk management. A knowledge management system supports the codification and sharing of knowledge (Marie et al., 2018). By developing an FMEA-Based risk management template, companies can convert tacit knowledge into explicit knowledge about risk that can be understood by their employees. In order to implement this FMEA-based risk management template, an FMCG company needs to educate its employees with FMEA-based risk management concept. After that, the company needs to conduct a workshop to fine-tune this template based on the company's situation and context. Following that, the company needs to continuously monitor the risks and the impact of the risk treatment strategies to decide which risks are still relevant and which risk treatment strategies need to be fine-tuned.

2. RESEARCH METHOD

The development of the FMEA-based risk management template development was conducted through interview and Focus Group Discussion (FGD) sessions with an Information Technology Procurement department of a Fast Moving Consumer Goods (FMCG) company in Indonesia. The first step of FMEA was identifying the risks (Fabis-Domagala et al., 2021).

Each of the risks was then assessed and scored based on three criteria, which are Severity, Occurrence, and Detection. The scoring value is between 1 – 10. The scoring system for each criteria is as follows (Koomsap & Charoenchokdilok, 2018): Severity (1 = None, 2 = Very minor, 3 = Minor, 4 = Low, 5 = Moderate, 6 = Significant, 7 = Major, 8 = Extreme, 9 = Serious, 10 = Hazardous); Occurrence (1 = Near, 2 = Remote, 3 = Low, 4 = Relatively Low, 5 = Moderate, 6 = Moderately high, 7 = High, 8 = Repeated failure, 9 = Very high, 10 = Extremely high); Detection (1 = Almost certain, 2 = Very high, 3 = High, 4 = Moderately high, 5 = Moderate, 6 = Low, 7 = Very low, 8 = Remote, 9 = Very remote, 10 = Absolutely uncertain). This study uses 10 point-scales because more scale points are better than fewer because they can capture a broader spectrum of responses (Yukhymenko-Lescroart et al., 2022). A broader spectrum of responses can help ensure the relevance and accuracy of the risk assessment. In this study, a consensus was made on each of the values Severity, Occurrence, and Detection to solve different opinions among FGD participants.

After each risk was scored, the Risk Priority Number (RPN) was then calculated. RPN is the product of Severity, Occurrence, and Detection (Alshehhi et al., 2023; Boccaletti et al., 2021; Curkovic et al., 2015). Afterwards, the risks were ranked based on their RPN value. Risks with higher RPN values mean that those risks need to be prioritized. Following that, risk treatment strategies will be developed for addressing the risks.

3. RESULTS AND DISCUSSIONS

The results for the FMEA-based risk management template development for IT Procurement in FMCG Industry is shown in Table 1.

Table 1. FMEA-Based Risk Management Template for IT Procurement in FMCG Industry

#	Risk	S	O	D	RPN	Treatment	Risk Treatment Strategy
1	Technological obsolescence	7	6	9	378	Mitigate	Develop a technology development monitoring system in order to plan for technology upgrades
2	Inaccurate IT-related items requirement forecasting	6	7	8	336	Mitigate	Improve forecasting method and implement a rolling procurement plan
3	Non-compliance with global IT procurement policies	8	7	5	280	Mitigate	Regular training and compliance checks.
4	Fluctuating costs of IT services	7	5	8	280	Transfer	Use fixed-price contracts and budget contingencies.
5	Incompatibility of procured hardware with existing systems	9	7	4	252	Mitigate	Conduct thorough compatibility testing before procurement and include a buy-back clause in the contract
6	Cybersecurity vulnerabilities in third-party software	10	5	5	250	Mitigate	Implement rigorous cyber security assessments
7	Vendor capacity constraints during high-demand periods	7	7	5	245	Mitigate	Develop alternative vendors and increase inventory.
8	Delays in obtaining software updates from vendors	8	5	6	240	Mitigate	Include clear update schedules in the contract and maintain close relationships with vendors.
9	Limited availability of specialized IT vendors in remote areas	8	5	6	240	Mitigate	Develop a diverse vendor base and consider remote service options.
10	Lack of skilled IT procurement staff familiar with regional markets	8	5	6	240	Mitigate	Provide targeted training and development programs and hire region-specific experts.
11	Poor quality of IT equipment	9	6	4	216	Mitigate	Establish quality control checks and supplier audits.
12	Contract disputes	7	6	5	210	Mitigate	Clear contract terms and legal reviews.
13	Delays in procurement due to complex approval processes	6	7	5	210	Mitigate	Streamline approval processes and use automated systems.
14	Budget overruns due to currency fluctuations	7	4	7	196	Transfer	Use hedging strategies and fixed-price contracts.
15	Inadequate vendor evaluation for IT services	8	6	4	192	Mitigate	Develop comprehensive supplier evaluation criteria.
16	Lack of integration between new software and existing platforms	8	4	6	192	Mitigate	Ensure thorough integration testing and use middleware solutions.
17	Vendor bankruptcy in emerging markets	9	3	7	189	Transfer	Diversify vendor base and use credit insurance.
18	Inconsistent service levels from regional IT vendors	9	5	4	180	Mitigate	Establish strict SLAs and conduct regular performance reviews.
19	Inadequate IT infrastructure to support new software	9	4	5	180	Mitigate	Conduct infrastructure assessments and upgrade as needed.
20	Vendor lock-in with proprietary software	7	4	6	168	Avoid	Prefer open standards and negotiate flexible contract

							terms.
21	Inadequate contract management for IT procurement	7	6	4	168	Mitigate	Implement contract management software and regular reviews.
22	Environmental compliance issues with IT hardware disposal	8	5	4	160	Mitigate	Regular environmental audits and compliance checks.
23	Vendor non-compliance with data protection regulations	10	3	4	120	Mitigate	Conduct regular compliance audits and enforce strict contractual terms.
24	Wasted IT spending	3	8	4	96	Mitigate	Ensure alignment between business needs and IT procurement plan
25	Fraudulent activities	9	3	3	81	Mitigate	Implement fraud detection systems and conduct regular audits.
26	Intellectual property theft	10	2	3	60	Mitigate	Strengthen IP protection measures and legal agreements.
27	Political instability affecting vendors	7	4	2	56	Transfer	Diversify vendor locations and use political risk insurance.

Based on the interview and FGD sessions, there are 27 risks identified. As can be seen in Table 1, each of the risks are scored based on severity, occurrence, and detection. Afterwards, the RPN of each risk are computed. The risks are the ranked from the highest to the lowest based on their RPN values. Risk treatment strategy is developed for each risk. In-depth discussion will be conducted in the following passages for 10 risks with the highest RPN values.

Technological obsolescence is the risk with the highest RPN value. Technological obsolescence happens because of rapid technological growth. The implementation of new technologies often requires the latest hardware and software. This makes older hardware and software obsolete. This risk in inevitable as companies have to constantly update their technologies in order to have a competitive advantage. In the context of FMCG industry, new product launches happen continuously. Companies need to ensure that they have the appropriate information technology for product management activities, such as product data management, marketing campaigns coordination, and sales channels synchronization. However, there are risks that the technology that is adopted for such purposes becomes obsolete without anyone in the company realizes. Such thing could happen because the technology for such purposes evolves very quickly, especially since the advent of Artificial Intelligence. Therefore, one of the way to treat this risk is to develop a technology development monitoring system in order to plan for technology upgrades.

Inaccurate IT-related items requirement forecasting is the risk with the second highest RPN value. The fast changing nature of the FMCG industry makes it hard to forecast the needs of IT-related items that companies require. Oftentimes, companies need to suddenly change marketing or supply chain strategy. A small change in marketing or supply chain strategy can cause massive changes in the type and the number of IT-related items that are required in the execution of that strategy. In order to treat this risk, companies can choose to utilize Artificial Intelligence in forecasting to improve its accuracy and at the same time implement a rolling procurement plan.

Non-compliance with global IT procurement policies is the risk with the third highest RPN value. Multinational FMCG companies usually have global IT procurement policies that have to be followed by their subsidiaries all around the world. The risk of subsidiaries not following the policies does exist. This can happen because of several reasons, such as ignorance and negligence from the employee's side and loose policy implementation policy from the subsidiary's side. In order to mitigate this risk,

companies can routinely train their employees globally about global IT procurement policies. Furthermore, companies can conduct regular compliance checks on their subsidiaries to check their level of compliance.

Fluctuating costs of IT services is the risk with the fourth highest RPN value. The fluctuating costs can be caused by several factors, such as inflation rates, market conditions, and unforeseen events. This risk can cause major damage to companies, especially in an economic downturn when revenues decrease and costs increase. Companies cannot suddenly stop using IT services just because their prices increased significantly because it would damage their operations. To remedy this, companies can negotiate for fixed-price contracts with IT vendors. Furthermore, companies can allocate budget contingencies.

Incompatibility of procured hardware with existing systems is the risk with the fifth highest RPN value. Hardware that are not compatible with a company's existing systems cannot be used. Procurement of such items will cause losses for the company because they cannot be utilized by the company and they cannot easily be resold to another party at a reasonable price. One of the way to treat this risk is by conducting thorough compatibility testing before procurement. Another way to treat this risk is to include a buy-back clause in the contract when the hardware is found to be incompatible with the company's existing systems.

Cybersecurity vulnerabilities in third-party software is the risk with the sixth highest RPN value. Risks in third-party software exist in all phases, starting from selection, integration, development, and implementation (Arora & Singh, 2014). Cyber risks can be simply categorized based on two factors (Creazza et al., 2022): perpetrator (internal / external) and intention (malicious and non-intentional). This risk can be treated by implementing rigorous cyber security assessments. Companies can choose to utilize a more detailed FMEA model that is specifically developed for cybersecurity risks identification and assessment (Asllani et al., 2018).

Vendor capacity constraints during high-demand periods is the risk with the seventh highest RPN value. During high-demand periods, certain IT equipment are hard to acquire. Starting in 2020, companies around the world has been affected by the global chip shortage (Mohammad et al., 2022). This chip shortage created difficulties for companies in acquiring IT-related products because chip is used in IT-related products. One of the way to treat this risk is by developing alternative vendors and increase inventory. Over reliance on a small number of IT vendors can cause major disruption in FMCG companies' operations because IT products have been embedded in every aspect of FMCG companies' operations.

Delays in obtaining software updates from vendors is the risk with the eight highest RPN value. The risks associated with delays in software updates can come in the form of cybersecurity breaches, bugs, and incompatibilities. Making sure that software are updated is important in sustaining system security (Li et al., 2019). Companies can defend against adverse cybersecurity events by installing security updates (Rajivan et al., 2020). Collaborative approach with vendors is required in order to tackle cybersecurity-related issues (Harju et al., 2024). However, sometimes vendors do not provide software updates on-time. To treat this risk, companies can include clear update schedules in the contract and maintain close relationships with vendors.

Limited availability of specialized IT vendors in remote areas is the risk with the ninth highest RPN value. Acquiring specialized IT equipment in big cities is difficult, let alone in remote areas. FMCG companies distribute their products everywhere, including remote areas. They need some form of IT infrastructure to manage their day-to-day operations along their supply line. The issue is that a lot of IT vendors are clustered in big cities and do not serve remote areas. One of the way to treat this risk is to develop a diverse vendor base and consider remote service options. Companies cannot only rely on

large prominent IT vendors but also must consider using the services of smaller region-specific IT vendors in fulfilling their IT needs in remote areas.

Lack of skilled IT procurement staff familiar with regional markets is the risk with the tenth highest RPN value. In multinational FMCG companies, the IT procurement department can consist of cross-region teams. Team members do not necessarily reside in the region where they are responsible for the procurement activities. For example, a team member assigned to conduct procurement activities of certain IT equipment in country A could be residing in country B. This may create a lack of familiarity with the region that the team member is assigned. In order to mitigate this risk, companies can conduct targeted training and development programs and hire region-specific experts as senior managers or advisors.

Aside from developing risk management strategies for IT procurement, FMCG companies should also consider developing the skills of their IT procurement team members in order for them to succeed at their jobs, including in managing risks. There are various essential skills that members of the IT Procurement department at FMCG companies, especially at multinational FMCG companies, must possess in the current world that is full of uncertainty: change management, vision setting, communication skills, flexibility, agility, cultural awareness, frustration tolerance, stress management, cross-generational teamwork. and Artificial Intelligence (Delke et al., 2023). FMCG companies should also prioritize the development of IT skills of its employees, including members of the IT Procurement department, because the lack of IT knowledge and expertise will have an adverse effect on their competitiveness (George & Hovan George, 2023). The transfer of IT knowledge and skills to the whole organization should be enabled by the top management support and allocation of time for the employees to study and familiarize themselves with the information technologies that is implemented (Jung & Shim, 2013). IT infrastructure when coupled with high level of IT skills will have a long lasting effect on company productivity (Paletta & Vieira Junior, 2013).

4. CONCLUSION

FMCG companies need to have a risk management strategy for IT Procurement. This study developed an FMEA-based risk management template for IT Procurement that has been customized for the Fast Moving Consumer Goods (FMCG) industry. It provides insights and solutions to risks that are most likely encountered in IT Procurement of FMCG companies. Companies can measure the effectiveness of the risk treatment strategies that they developed from this template by monitoring the RPN of each of the risks after they implemented the risk treatment strategies. If the RPN of a certain risk decreased, it is an indication the risk treatment strategies are suitable. Otherwise, the risk treatment strategy of that certain risk is not suitable and needs to be fine-tuned. The limitation of this study is that this study is only conducted with only one FMCG company. Therefore, this study may have limited generalization to the risks faced by companies in the FMCG industry. FMCG companies should not treat this template as a complete list of risks and their treatment strategies but as a starting point in their IT Procurement risk management development and then develop it further to make it more relevant to their situation, resources, and context. Furthermore, the risk management template developed in this study only use the FMEA methodology that may not be able to capture complex and real-time risks. It is suggested that FMCG companies complement the implementation of this FMEA-based risk management template with real-time risk analytics capabilities that are enhanced with Artificial Intelligence in order to create comprehensive risk management systems that are relevant in the era of Big Data and Artificial Intelligence.

REFERENCES

Abubakar, N., Peszynski, K., Azizan, N., Pandiyan, V., & Sundram, K. (2016). Abridgment of Traditional Procurement and E-Procurement: Definitions, Tools and Benefits, Journal of Emerging Economies and Islamic Research. *Journal of Emerging Economies and Islamic Research*, *4*(1), 1–18. https://doi.org/10.24191/jeeir.v4i1.9080

Aldrin, N., & Yunanto, K. T. (2019). Job Satisfaction as a Mediator for the Influence of Transformational Leadership and Organizational Culture on Organizational Citizenship Behavior. *The Open Psychology Journal*, *12*(1), 126–134. https://doi.org/10.2174/1874350101912010126

Alshehhi, K., Cheaitou, A., & Rashid, H. (2023). Fuzzy Failure Modes Effect and Criticality Analysis of the Procurement Process of Artificial Intelligent Systems/Services. *International Journal of Advanced Computer Science and Applications*, *14*(10), 562–570. https://doi.org/10.14569/IJACSA.2023.0141060

Arora, P., & Singh, H. (2014). Identification of Critical Risk Phase in Commercial-off-the-Shelf Software (CBSD) using FMEA Approach. *Global Journal of Computer Science and Technology (C)*, *14*(2). https://gjcst.com/index.php/gjcst/article/download/1239/1233/2466

Asllani, A., Lari, A., & Lari, N. (2018). Strengthening information technology security through the failure modes and effects analysis approach. *International Journal of Quality Innovation*, *4*(1), 1–14. https://doi.org/10.1186/s40887-018-0025-1

Bahrami, M., Bazzaz, D. H., & Sajjadi, S. M. (2012). Innovation and improvements in project implementation and management; using FMEA technique. *Procedia-Social and Behavioral Sciences*, *41*, 418–425. https://doi.org/10.1016/j.sbspro.2012.04.050

Barosz, P., Dudek-Burlikowska, M., & Roszak, M. (2018). The application of the FMEA method in the selected production process of a company. *Production Engineering Archives*, *18*(18), 35–41. https://doi.org/10.30657/pea.2018.18.06

Boccaletti, B. C., de Brito Mello, L. C. B., & de Paula Bastos, I. (2021). Principal causes and challenges for reducing product returns: Applying FMEA in a case study. *Gestao e Producao*, *28*(2), 1–23. https://doi.org/10.1590/1806-9649-2020V28E5115

Brown, J., Flynn, R., Addicoat, A., & Kilpatrick, J. (2021, October 26). Tap Indirect Procurement as a Source of Savings. *Wsj.Com*. https://deloitte.wsj.com/cfo/tap-indirect-procurement-as-a-source-of-savings-01635188295

Creazza, A., Colicchia, C., Spiezia, S., & Dallari, F. (2022). Who cares? Supply chain managers' perceptions regarding cyber supply chain risk management in the digital transformation era. *Supply Chain Management*, *27*(1), 30–53. https://doi.org/10.1108/SCM-02-2020-0073

Curkovic, S., Scannell, T., & Wagner, B. (2015). Using FMEA for Supply Chain Risk Management. *Managing Supply Chain Risk*, *March 2016*, 40–57. https://doi.org/10.1201/b18610-5

Currie, M. (2023, June 11). Wasted Tech Spend is 30% of IT Spend. *Cio-Office.Com*. https://cio-office.com/wasted-tech-spend-is-30-of-it-spend/

David Olanrewaju Olutimehin, Ekene Ezinwa Nwankwo, Onyeka Chrisanctus Ofodile, & Chinonye Esther Ugochukwu. (2024). Strategic Operations Management in FMCG: a Comprehensive Review of Best Practices and Innovations. *International Journal of Management & Entrepreneurship Research*, *6*(3), 780–794. https://doi.org/10.51594/ijmer.v6i3.935

De Barros, A. P., Ishikiriyama, C. S., Peres, R. C., & Gomes, C. F. S. (2015). Processes and benefits of the application of information technology in supply chain management: An analysis of the literature. *Procedia Computer Science*, *55*, 698–705. https://doi.org/10.1016/j.procs.2015.07.077

Delke, V., Schiele, H., & Buchholz, W. (2023). Differentiating between direct and indirect procurement: roles, skills, and Industry 4.0. *International Journal of Procurement Management*, *16*(1), 1–30. https://doi.org/10.1504/IJPM.2022.10050671

Fabis-Domagala, J., Domagala, M., & Momeni, H. (2021). A concept of risk prioritization in FMEA analysis for fluid power systems. *Energies*, *14*(20), 6482. https://doi.org/10.3390/en14206482

Gartner. (2024, October 23). Gartner Forecasts Worldwide IT Spending to Grow 9.3% in 2025. *Gartner.Com*. https://www.gartner.com/en/newsroom/press-releases/2024-10-23-gartner-forecasts-worldwide-it-spending-to-grow-nine-point-three-percent-in-2025

George, A. S., & Hovan George, A. S. (2023). Digital Dilemma: The Consequences of Insufficient IT Expertise in the Fast-Moving Consumer Goods Industry. *Partners Universal International Innovation Journal (PUIIJ)*, *1*(03), 1–24. https://doi.org/10.5281/zenodo.8066759

Gulati, N. (2015). Enterprise Risk Management in FMCG Sector. *International Journal of Science, Technology & Management*, *04*(01), 1–10. https://www.ijstm.com/images/short_pdf/105a.pdf

Hąbek, P., & Molenda, M. (2017). Using the FMEA method as a support for improving the social responsibility of a company. *International Conference on Operations Research and Enterprise Systems*, *2*, 57–65. https://doi.org/10.5220/0006118600570065

Harju, A., Schaëfer, K., Hallikas, J., & Kähkönen, A. K. (2024). The role of risk management practices in IT service procurement: A case study from the financial services industry. *Journal of Purchasing and Supply Management*, *30*, 100899. https://doi.org/10.1016/j.pursup.2024.100899

Jung, G., & Shim, S. (2013). Migration of Workers' Knowledge into Information Systems: Managerial Issues from the Case of e-Procurement Service Company. *The Journal of Society for E-Business Studies*, *18*(2), 47–67. https://doi.org/10.7838/jsebs.2013.18.2.047

Koomsap, P., & Charoenchokdilok, T. (2018). Improving risk assessment for customer-oriented FMEA. *Total Quality Management and Business Excellence*, *29*(13–14), 1563–1579. https://doi.org/10.1080/14783363.2016.1274229

Li, F., Rogers, L., Mathur, A., Malkin, N., & Chetty, M. (2019). Keepers of the machines: Examining how system administrators manage software updates for multiple machines. *Fifteenth Symposium on Usable Privacy and Security (SOUPS 2019)*, 273–288. https://www.usenix.org/conference/soups2019/presentation/li

Marie, I. A., Sugiarto, D., Surjasa, D., & Witonohadi, A. (2018). Knowledge management system for risk mitigation in supply chain uncertainty: Case from automotive battery supply chain. *IOP Conference Series: Earth and Environmental Science*, *106*(1). https://doi.org/10.1088/1755-1315/106/1/012018

Mohammad, W., Elomri, A., & Kerbache, L. (2022). The Global Semiconductor Chip Shortage: Causes, Implications, and Potential Remedies. *IFAC-PapersOnLine*, *55*(10), 476–483. https://doi.org/10.1016/j.ifacol.2022.09.439

Öhrberg, C. (n.d.). Indirect procurement: Significate cost but rarely in focus. *Axholmen.Com*. https://axholmen.com/indirect-procurement/

Paletta, F. C., & Vieira Junior, N. D. (2013). ICT Lifecycle and its major Role in the Development of Strategic Intelligence. *Journal of Intelligence Studies in Business*, *3*(2), 62–78. https://doi.org/10.37380/jisib.v3i2.70

Procurify. (2024, October 22). Direct vs Indirect Procurement: What's the Difference? *Procurify.Com*. https://www.procurify.com/blog/direct-vs-indirect-procurement/

Qalati, S. A., Zafar, Z., Fan, M., Sánchez Limón, M. L., & Khaskheli, M. B. (2022). Employee performance under transformational leadership and organizational citizenship behavior: A mediated model. *Heliyon*, *8*(11). https://doi.org/10.1016/j.heliyon.2022.e11374

Rajivan, P., Aharonov-Majar, E., & Gonzalez, C. (2020). Update now or later? Effects of experience, cost, and risk preference on update decisions. *Journal of Cybersecurity*, *6*(1), 1–12. https://doi.org/10.1093/CYBSEC/TYAA002

SAP. (2024, July 24). Direct vs. indirect procurement—what's the difference? *SAP.Com*. https://www.sap.com/resources/direct-vs-indirect-procurement

Sharma, K. D., & Srivastava, S. (2018). Failure mode and effect analysis (FMEA) implementation: a literature review. *J Adv Res Aeronaut Space Sci*, *5*(1–2), 1–17. https://www.adrjournalshouse.com/index.php/Jof-aeronautics-space-science/article/view/381

Shepherd, D. (2024, March 18). Why DNS exploits continue to be a top attack vector in 2024. *Tahawultech.Com*. https://www.tahawultech.com/insight/why-dns-exploits-continue-to-be-a-top-attack-vector-in-2024/

Sherif, A. (2024, June 14). IT spending as share of company revenue in 2022 and 2023, by industry. *Statista.Com*. https://www.statista.com/statistics/1105798/it-spending-share-revenue-by-industry/

Tran, C. (2022, February 3). Why It's Important To Equip Your Employees With The Right Tools. *Forbes.Com*. https://www.forbes.com/councils/forbescommunicationscouncil/2022/02/03/why-its-important-to-equip-your-employees-with-the-right-tools/

Yoewono, H. (2023). The Influence of Company Size , Leverage , Profitability and Liquidity on Company Value (Study of Consumer Goods Industry Companies Listed on the Indonesian Stock Exchange in Period 2018-2020). *INSOMA International Journal of The Newest Social and Management Research*, *1*(2), 112–122. https://doi.org/10.59693/insoma.v1i2.26

Yukhymenko-Lescroart, M. A., Goldman, S. R., Lawless, K. A., Pellegrino, J. W., & Shanahan, C. R. (2022). Assessing information synthesis within and across multiple texts with verification tasks: a signal detection theory approach. *Educational Psychology*, *42*(5), 549–566. https://doi.org/10.1080/01443410.2020.1811840