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Engaging Lean Six Sigma Approach Using DMAIC Methodology for Supply Chain Logistics Recruitment Improvement

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Abstract: The purpose of this research paper is to demonstrate the adaptability of lean six sigma using the DMAIC method in reducing the time spent on recruiting new employees for the Supply Chain Logistics Department. Six Sigma is a data-driven, disciplined technique and methodology for reducing defects in any phase, to achieve six standard deviations between the mean and the closest design limit, as modeled by the DMAIC method (Define, Measure, Analyze, Improve, and Control). DMAIC is a method for optimizing, improving, and securing business processes and designs. The DMAIC improvement phase is a key component of Sig Sigma tools. The study focuses on the time spent in the recruiting process of new hires for the supply chain logistics site. The recruiter was interviewed to gather secondary data. Using the Lean Six Sigma DMAIC approach, process efficiency has increased, processes have become faster, and data is more easily accessible. Following the implementation of improvement solutions, the time from the improvement stages can be reduced with the current process using lean six sigma approaches. The company was able to make significant improvements by utilizing its lean six sigma implementation skills, saving time and money while improving quality. The study evaluates prior research and makes recommendations for future research.

Keywords: *Lean Management, Six Sigma, Supply Chain Management, DMAIC, Quality Improvement.*

1. Introduction

Motorola created the Six Sigma quality improvement management technique in 1985. Based on statistical indicators and standards, a new strategy for quality improvement has been proclaimed. The Six Sigma methodology seeks to enhance two areas of business operations: profitability and speed. The great majority of individuals in today's economy give services rather than generate things and products. The bulk of these services are inefficient, and if the same thing occurs in one facility, multiple manufacturers would generate an abnormally large quantity of faulty items and shut down rapidly. Six Sigma is a robust collection of tools for increasing the accuracy and quality of these services to levels only seen in precision manufacturing. At least 25% of the Fortune 200 companies have a dedicated Six Sigma program. However, the majority of these implemented programs are focused on large-scale improvements in error and process measures, which can be linked to employee motivation. Six Sigma has mostly been used for introduction since Motorola brought it to the commercial sector in 1985. Six Sigma is currently employed in many domains, including facilities management and maintenance, online market research, supply chain improvement, and non-manufacturing industries including healthcare management, management accounting, and supply chain logistics management (Sundram et al., 2016). In addition, the formula and the identification of relevant Six Sigma development theories have been supplied.

Problem Statement: Finding, recruiting, and retaining talented people is difficult in today's competitive work environment. Because there are fewer skilled people and competition is heating up. In light of this scarcity, organizations must meet stringent requirements to successfully recruit, select, and retain quality employees. Recruiting and hiring the right people is becoming increasingly complicated. Because of its high cost, talent acquisition has always been a stumbling block in terms of business productivity. This will require some time. Although study after study has shown that high employee turnover costs money, time, and productivity, hiring is frequently hurried and superficial. When it comes down to it, most managers are looking for a warm body. Recruiting employees is an expensive endeavor. This procedure is also required for any business to stay afloat in the marketplace. As a result, even hiring the right person can be costly.

The time cost of an internal recruiter, the time cost of a recruiter's assistant in reviewing resumes and performing other recruitment-related tasks, the time cost of the person conducting the interviews, drug screens, and background checks, and various pre-employment assessment tests are all examples of potentially high costs in the recruiting process alone. Organizations must go above and beyond merely paying a competitive wage to recruit talented individuals, particularly in the sector of supply chain logistics. Because there are so many job opportunities available right now, candidates are difficult to please. They are searching for organizations that can provide a range of rewards, possibilities for growth, and an atmosphere in which they may learn and flourish. If a firm does not fulfill these requirements, job seekers may seek employment with another company that does. As a consequence, organizations must first identify what they can offer prospective workers before emphasizing their greatest attributes when recruiting individuals. Focuses on large-scale gains in error and process measurements that may be connected to employee motivation. Six Sigma has mostly been used in production since Motorola brought it to the commercial sector in 1985. Six Sigma is currently employed in many domains, including facilities management and maintenance, online market research, supply chain improvement, and non-manufacturing industries including healthcare management, management accounting, and supply chain logistics management (Sundram et al., 2016). In addition, the formula and the identification of relevant Six Sigma development theories have been supplied.

2. Literature Review

Six Sigma is defined as the identification and management of consumer needs and requirements. To improve business processes and reduce costs (Brewer & Eighme, 2005). in the meantime, according to a study (Rudisill & Clary, 2014), Lean Six Sigma is technically defined as Realistic strategies, techniques, and tools for optimizing procedures and achieving transactions Achieving goals and solving problems to improve organizational efficiency. Six Sigma focuses on the number of opportunities in a process that can lead to defects rather than quantity defects to avoid quality problems. In terms of methodology, the basic and systematic DMAIC approach is recognized in this Six Sigma perspective as presented in Table 1. DMAIC is a method that is supposed to start from the definition of the problem and ends with solutions for lasting improvement as in Figure 1.

Table 1: DMAIC Steps and Descriptions

STEPS	DESCRIPTION
Define	Identifying the problem and project goals.
Measure	The process of measuring and identifying waste that occurs at each stage of the manufacturing process was carried out.
Analyze	Analyze the collected data and information to determine the root cause.
Improve	By modifying or redesigning, existing processes and procedures.
Control	Maintaining the improved processes to improve them in the future.

Figure 1: DMAIC Methodology



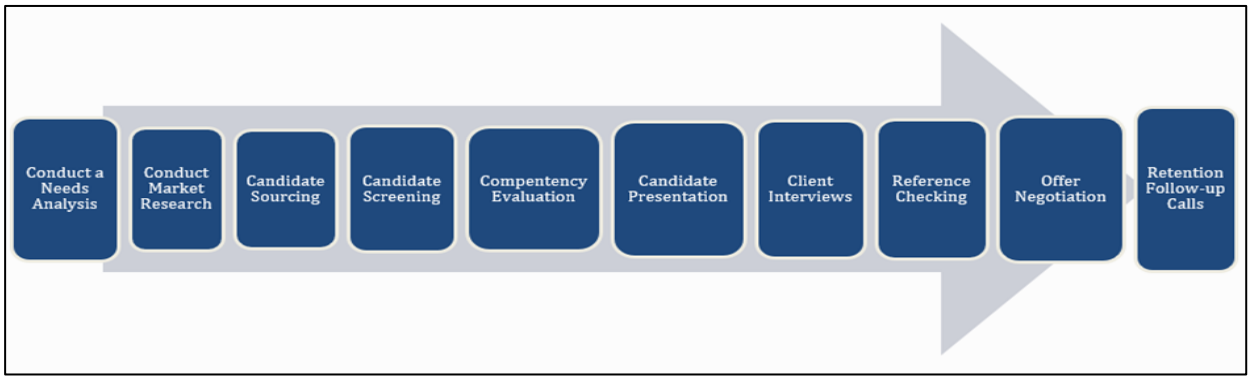
The defining phase aims to understand and determine the right project for the client's business needs and strategies. Studies show that brainstorming, tree diagrams, process flowcharts, and cause-and-effect

diagrams (fishbones) are Six Sigma methods that can help understand these processes (Almasarweh & Rawashde, 2016). The measurement phase, includes the current process baseline, data collection, measurement validation system, and determining the process capability concerning the objective. The identification and data validation is the most important activity in this process. The analysis phase is to understand the key input variables of the process that affect the project's goals and identify problems in the manufacturing process that cause defects. It is needed to ensure it generates the potential causes of why the problem occurred or not performing to complete the task. Improve phase aims to conduct the experiment in which all the information is gathered, and the list of potential solutions was developed to improve the flow of the projects that allow removing the problems' root causes. Finally, the control phase ensures that the action item generated in the Improve phase is well implemented and maintained adequately. To maintain long-term changes, all staff should be aware of how the enhanced process will result in operational and financial gains (Foster, 2007; Rasi, et al., 2021).

Introduction to Recruitment: Employees aim to acquire a competitive edge in Supply Chain Logistics Management via dedication and competent employees, which is a typical new approach to management (Munir et al., 2021; Vatumalae et al., 2022; Storey, 1992). Employees are emphasized as a vital resource for the organization in this new strategy. Supply Chain Logistics Management, which comprises a strategy plan for managing and motivating personnel and is regarded as a practice that helps an organization's performance (Ali et al., 2020; Syakirah et al., 2020; McKenna et al., Beech, 1995), is one of the primary contributors. Supply Chain Logistics management is a commercial and academic activity theory that seeks to generate a competitive edge in the market via the development of strategic plans for workforce management in an organization (Schuler & MacMillan, 1984). The next phase is to recruit applicants when the post has been established and the attributes of particular ideal candidates have been discovered (Robertson and Smith, 2001). Costello (2006) defines recruitment as "the processes used to obtain a talent ready to serve an organization at the right time and place so that both the people and the organization benefit." In other terms, recruitment is the process of supplying a company.

The process of recruiting qualified individuals for a position is known as recruitment. Jovanovic (2004) describes the selection method. Work planning and forecasting may help with successful recruiting. Finding the necessary technical skills and matching your chemistry to the company culture should be the first line of defense in building a complete team that brings out the best in each member (Noor Asleena et al, 2020). According to Barber, recruiting refers to an organization's processes, actions, and procedures for finding competent staff to assist it accomplish its objectives. Newell and Shackleton (2000) define recruitment as "the process of attracting candidates to contribute their skills, qualities, and competencies required to fulfill the job requirements for the organization." Figure 1 illustrated the definition of recruiting centers on an organization's attempts to find, attract, and influence the hiring choices of competent applicants.

Figure 2: Supply Chain People Recruitment Process

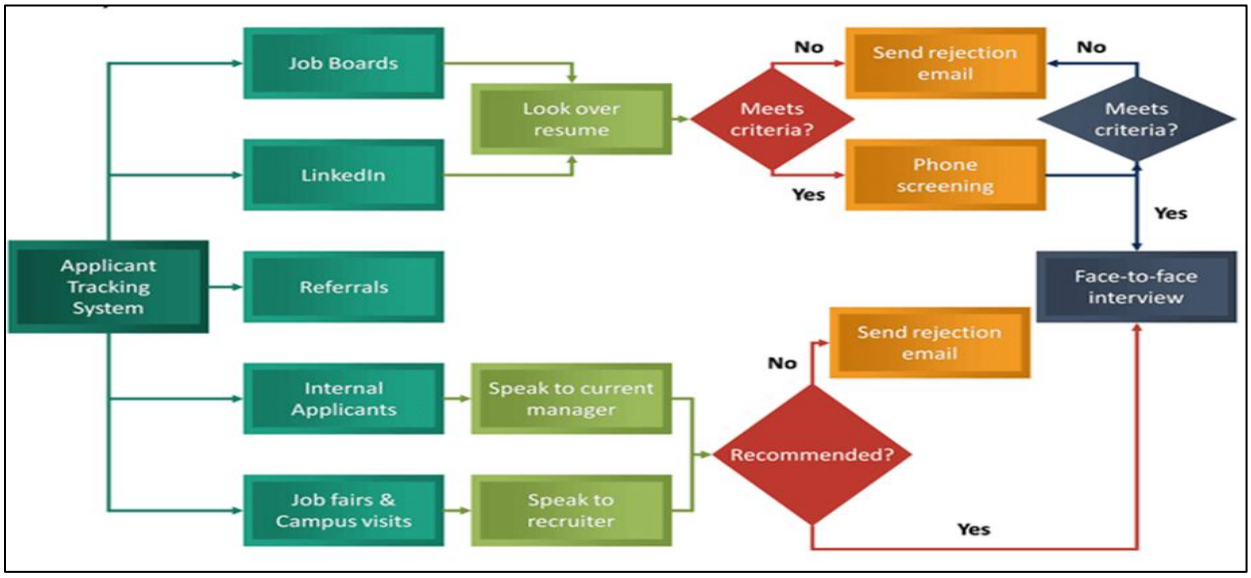


3. Research Methodology

Over the years, companies have implemented various tools into the Six Sigma technique throughout time to make it more effective and reduce any gaps during its implementation. (Thakore, Dave, Parsana, & Solanki,

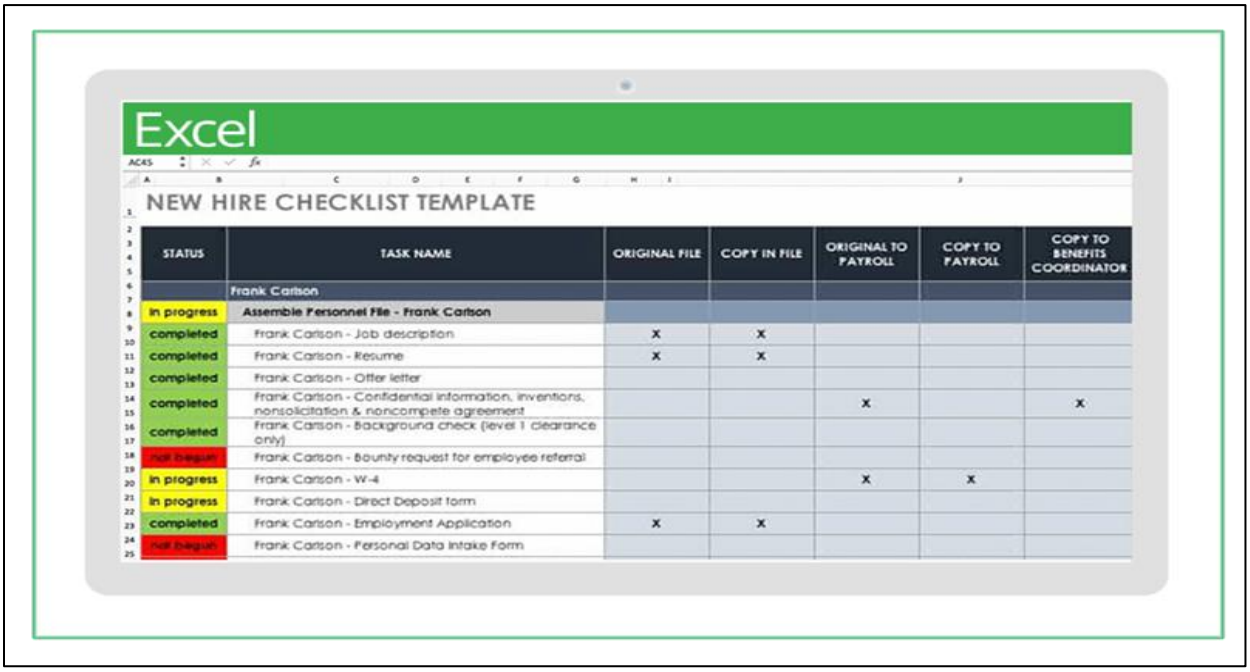
2014). Flow charts check sheets, Pareto diagrams, cause and effect diagrams, histograms, scatter diagrams, and control charts are seven basic methods to help with the quality improvement process. Figure 3 is a flowchart representing a process or procedure that uses symbols to describe the sequence of steps or phases involved. The studies showed that the defects using Pareto analysis could discover major and minor contributors to those defects. Then use the cause-and-effect diagram to identify the root cause of each error. This causal diagram (Fishbone diagram) is very useful for displaying process anomalies in the following formats: Excessive fluctuations in the process. The histogram is a quick and useful visualization tool that displays frequency distribution and historical data to identify process variability.

Figure 3: Supply Chain Recruitment Process



Check sheets as in Figure 4 are specific forms that can systematically help with a user's data in a document business. Data is collected and stored on a tally sheet to record the frequency of specific events during the data collection period. Error position check tables, tally check sheets and defect cause check sheets are three of the most common forms of testing leaves (Hensley & Dobie, 2005).

Figure 4: Check Sheet for Supply Chain People Recruitment



Excel

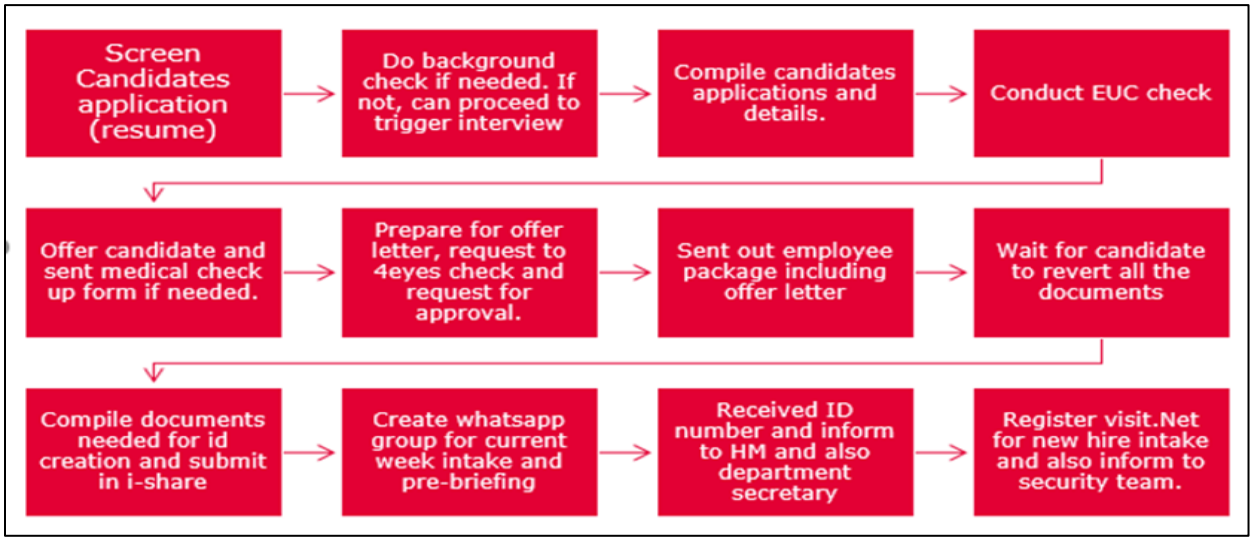
NEW HIRE CHECKLIST TEMPLATE

STATUS	TASK NAME	ORIGINAL FILE	COPY IN FILE	ORIGINAL TO PAYROLL	COPY TO PAYROLL	COPY TO BENEFITS COORDINATOR
	Frank Carlson					
In progress	Assemble Personnel File - Frank Carlson					
completed	Frank Carlson - Job description	X	X			
completed	Frank Carlson - Resume	X	X			
completed	Frank Carlson - Offer letter					
completed	Frank Carlson - Confidential information, inventions, nonsolicitation & noncompete agreement			X		X
completed	Frank Carlson - Background check (level 1 clearance only)					
not begun	Frank Carlson - Bounty request for employee referral					
in progress	Frank Carlson - W-4			X	X	
in progress	Frank Carlson - Direct Deposit form					
completed	Frank Carlson - Employment Application	X	X			
not begun	Frank Carlson - Personal Data Intake Form					

Now we want to understand how businesses can achieve better results with Six Sigma. Companies adopt the DMAIC. DMAIC (an acronym for Define, Measure, Analyze, Improve and Control) refers to a data-driven improvement cycle used for improving, optimizing, and stabilizing business processes and designs in the following way:

Define: Using suitable Six Sigma tools, failure to satisfy the SLA for recruiting was identified as a problem or issue. As illustrated in the figure below, the topic was made into a charter document that addressed the recruitment process from beginning to end. The goal of recruitment and selection is to develop methods that will help the HR department pick the best applicants for the position (Jaffal et al., 2017). In certain circumstances, the needed skills, talents, and understanding of the organization may be recruited. Smith et al. (1989) argue that the more efficient the recruiting stage is, the less essential the selection procedure becomes. When a firm chooses to hire to fill a vacancy, the first step is to do a job analysis. Following the completion of the job analysis, the organization will have a clear picture of the specific job requirement and will be able to begin the recruitment process to attract qualified candidates for the position. In certain circumstances, the needed skills of the organization may be gained via recruiting. A recruiting method is separated into three parts. The first stage is to do a job analysis to acquire all essential information about the job needs and set hiring criteria. The second portion deals with hiring. The selection technique, the third aspect, is used to measure the degree of success and compatibility of employees inside the organization by analyzing the candidate's talents and traits. From selection to the recruitment and selection process to ensure that the relevant abilities are recognized to guarantee performance (Rana & Kaushik, 2018). Figure 5 depicts the team-based recruiting procedure.

Figure 5: Recruitment Process in a Team



Measure: The employee develops a thorough map of the present process and completes CTQ Trees (Critical-to-Quality trees). CTQ trees are the primary quantifiable qualities of a product or process that must meet specified performance requirements or restrictions to satisfy the customer. CTQ Trees are used to divide requirements into more measurable components. It now records and assesses its present process performance at the enhanced goal sigma level.

Analyze Phase 1: Using appropriate six sigma techniques, the employee has now determined the factors affecting recruitment success. They are listed as:

- Full understanding of the recruitment needs of the department.
- Determine the right approach for the recruitment campaign
- Selecting the message
- Selecting the right media for recruitment.
- Shortlisting candidates.

- Make an offer with terms and conditions
- Referral and Referral Process.

Analysis Phase 2: The employee now identifies key factors for recruiting success. To do this, it surveys goods (selected people or those who have received an offer) who have not been on a recent trip.

Improve: The worker is now able to identify various courses of action by using strategies such as producing reflection and benchmarking. Recorded, piloted, verified, and finally put into use, the improved process map (new replacement method) is now complete. Employees will be able to realize profits with the next recruiting drive that is being conducted. Other advertising agencies are carrying on with business as usual. It does not have a process for learning from either its own errors or the mistakes of others (and it does not have an approach to conclusions that are driven by facts, and it does not have management support for acceptance of recommendations made upon arrival).

Control: During the process of making improvements, the worker should put in place appropriate control measures to achieve results that can be kept up for a considerable amount of time. It establishes a control plan and an assessment checklist to guarantee that the intended behavior change takes place, and it checks for errors in many locations along the process. Finally, once it has a better procedure in place, as well as the removal of vulnerabilities, delays, mistakes, and communication (in the appropriate locations), it can begin to recruit the greatest personnel more effectively. In a nutshell, the guiding principle behind the Six Sigma methodology is to use an approach that is methodical, scientific, and data-driven to produce the best possible process (since the best doesn't remain forever, it is necessary to engage in continuous improvement and to undertake more improvement projects periodically).

4. Conclusion

While Supply Chain Logistics is not a central element of most silo-operating businesses, HR processes have a substantial effect relating to the people management in an organization (Mkumbo et al., 2019; Nurul Syakirah et al., 2020; Rajagopal et al., 2016; Selvaraju et al., 2019; Siti Noor Roseamirah et al., 2020; Sundram et al., 2018a; Sundram et al., 2018b). It is the responsibility of the responsible staff to keep workers on board while also meeting the financial requirements of the company. Payroll, time and attendance management, leave policy, stock options, and a number of other aspects of compensation and benefits are all supported by the Supply Chain Logistics department. To improve these HR procedures, you may want to think about implementing some Six Sigma initiatives, such as shortening the amount of time needed to make cheque deposits or speeding up a study of whether or not an employee is eligible for a performance review. There is a possibility that Six Sigma initiatives, such as the enhancement of pay systems for remote workers, may be required. Errors in databases containing personnel information may be reduced by finding them. The HR staff has the responsibility of addressing problems such as employee absenteeism, the settlement of conflicts, health and safety concerns, union negotiations, interpersonal communication, and discrimination and harassment complaints.

Through compliance monitoring and auditing as well as systems that improve communication between employees and managers, it is possible to implement Six Sigma projects to combat discrimination and harassment in the workplace. Projects based on the Six Sigma methodology may, among other things, focus on career progression and succession planning, leadership, change management, workplace planning and organization, and performance improvement. The basic tasks of the recruiting team include things like staffing, doing background checks, choosing personnel, and training and retaining them. They are accountable for coming up with training and development programs, as well as scheduling such programs, for both new workers and those who are already employed. In addition to this, they are responsible for overseeing staff contracts, both permanent and temporary, as well as personnel relocation and outsourcing. In addition to this, they are required to conduct exit interviews and address concerns connected to the termination of employment. Employees might be given projects consisting of self-study and assessment modules to complete. Prompt answers to applicants, the removal of needless security checks, and Six Sigma projects that can be handled by the Supply Chain Logistics department are some examples of projects that boost the success rate of job offers.

References

Ali, S. N. R., Rajagopal, P., Sundram, V. P. K., Saihani, S. B. & Noranee, S. (2020). ERP System Implementation in a Leading LED Manufacturing in Malaysia: A Supply Chain Perspective. *International Journal of Supply Chain Management*, 9(2), 104.

Almasarweh, M. S. & Rawashdeh, A. M. (2016). The effect of using Six Sigma methodologies on the quality of health service: a field study at Prince Hashem Hospital, city of Aqaba. *Journal of Social Sci.*, 5(3), 396–407.

Brewer, P. & Eighme, J. (2005). Using Six Sigma to improve the finance function. *Strategic Finance*, 86(7), 27–33.

Costello, A. (2006). The recruitment process: An overview. Journal of Business and Psychology, 21(1), 23-29.

Foster, S. (2007). Does Six Sigma Improve Performance? *The Quality Management Journal*, 14(4), 7-19.

Hensley, R. L. & Dobie, K. (2005). Assessing readiness for six sigma in a service setting. *Managing Service Quality,* 15(1), 82-101.

Jaffal, M. S., Korkmaz, I. H. & Ozceylan, E. (2017). Critical success factors for Six Sigma implementation in Gaziantep carpet companies. *Industrial Eng. Let,* 7(2), 83–92.

Jovanovic, T. (2004). Job matching and the theory of turnover. Journal of Political Economy, 112(3), 599-625.

McKenna, E., & Beech, N. (1995). Human resource management: A contemporary perspective. Macmillan International Higher Education.

Mkumbo, F. A. E., Ibrahim, A. R., Salleh, A. L., Sundram, V. P. K. & Atikah S. B. (2019). The Influence of Supply Chain Practices and Performance Measurement Practices towards Firm Performance, *International Journal of Supply Chain Management*, 8(3), 809-819.

Munir, Z. A., Bhatti, M. A. & Sundaram, V. P. K. (2021). The determinants of humanitarian supply chain efficiency-a case study of flood disaster in Malaysia*. SMART Journal of Business Management Studies*, 17(2), 10-16.

Newell, S., & Shackleton, V. (2000). Recruitment and selection: Adding value through people. Prentice Hall.

Noor Asleena, A., Sundram V.P.K. & Shereen, N. (2020), The Influence of Professional Human Resources and Firm Infrastructure towards Supply Chain Performance, International Journal of Academic Research in Business & Social Sciences, Vol. 10, No. 12, 718-732. HR Management Academic Research Society.

Nurul Syakirah, M. Z., Rajagopal, P., Sundram, V. P. K., Raja Zuraidah, R., Nor Ratna, M. & Zamry, G. (2020). "Achieving Supply Chain Excellence through Effective Supplier Management: A Case Study of a Marine Organisation". *International Journal of Supply Chain Management,* 9(4), 11-23.

Rajagopal, P., Nur Atika, Z. Z., Atika, S. B., Appasamy, G. & Sundram, V. P. K. (2016). Determinants of Supply Chain Responsiveness among Firms in the Manufacturing Industry in Malaysia, *International Journal of Supply Chain Management*, 5(3), 18-24.

Rana, P. & Kaushik, P. (2018). Initiatives of Six-Sigma in an automotive ancillary unit: *a case study. Mgt. Sci. Let.,* 8, 569–580.

Rasi, R. Z., Rakiman, U., Radzi, R. Z. R. M., Masrom, N. R. & Sundram, V. P. K. (2021). A Literature Review on Blockchain Technology: Risk in Supply Chain Management. *IEEE Engineering Management Review,* 50(1), 186-200.

Robertson, I., & Smith, M. (2001). Personnel selection. Journal of Occupational and Organizational Psychology, 74(4), 441-472.

Rudisill, F. & Clary, D. (2014). The management accountant's role in Six Sigma. *Strategic Finance*, 85 (5), 35–39.

Schuler, R. S., & MacMillan, I. C. (1984). Gaining competitive advantage through human resource management practices. Human Resource Management, 23(3), 241-255.

Selvaraju, M., Bhatti, M. A., Sundram, V. P. K. & Saiful Azmir, K. (2019). The Influence of Critical Success Factor of Lean Six Sigma towards Supply Chain Performance in Telecommunication Industry, Malaysia, *International Journal of Supply Chain Management*, 8(6), 1062-1068.

Siti Noor Roseamirah, A., Rajagopal, P., Sundram, V. P. K., Shamsul Baharin, S. & Shereen, N. (2020). ERP System Implementation in a Leading LED Manufacturing in Malaysia: A Supply Chain Perspective, *International Journal of Supply Chain Management*, 9(2), 104-112.

Storey, J. (1992). Developments in the management of human resources: An analytical review. Blackwell Publishers.

Sundram, V. P. K., Bahrin, A. S. & Govindaraju, V. C. (2016). Supply chain management: Principles,

measurement, and practice. University of Malaya Press.

Sundram, V. P. K., Rajagopal P., Atikah S. B. & Subramaniam, G. (2018b). The Role of Supply Chain Integration on Green Practices and Performance in a Supply Chain Context: A Conceptual Approach to Future Research, *International Journal of Supply Chain Management*, 7(1), 95-104.

Sundram, V. P. K., Rajagopal P., Nur Atiqah Z. A., Atikah S. B. & Appasamy, G. Zarina, A. M. (2018a). Supply Chain Responsiveness in an Asian Global Electronic Manufacturing Firm: ABX Energy (M), *International Journal of Supply Chain Management*, 7(2), 23-31.

Syakirah, N., Rajagopal, P., Sundram, V. P. K., Zuraidah, R. R., Ratna, M. N. & Zamry, G. (2020). Achieving Supply Chain Excellence through Effective Supplier Management: A Case Study of a Marine Organization. *International Journal of Supply Chain Management*, 9(4), 11-23.

Thakore, R., Dave, R., Parsana, T. & Solanki, A. (2014). six sigma implementation practice in manufacturing industries. Int. *Journal of Engineering Research and Applications*, 4(11), 82-101.

Vatumalae, V., Rajagopal, P., Sundram, V. P. K. & Hua, Z. (2022). A study of retail hypermarket warehouse inventory management in Malaysia. *SMART Journal of Business Management Studies*, 18(1), 71-79.