

A STUDY ON SIX SIGMA APPLICATIONS IN HR PRACTICES AT PNC INFRA TECH

^{#1}Ms. M. RAVALI REDDY, *Assistant Professor,*

^{#2}MUSAPETA SUSMITHA, *PG Student,*

Department of MBA,

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS), HYDERABAD.

ABSTRACT: This study looks into how Six Sigma is used in human resources at PNC Infratech, a well-known Indian company that builds infrastructure. A company's human resources department plays a crucial role in the pursuit of operational excellence by lowering process variation, raising worker output, and guaranteeing employee happiness. Six Sigma has helped PNC Infratech streamline their training processes, reduce staff attrition, increase hiring speed, and fortify their performance management standards through the use of DMAIC and data-driven decision-making. In order to determine how effective the process improvement was, the study first investigates the most pressing issues, then applies quality management approaches to identify their root causes. Shorter cycle times, more accurate hiring processes, and improved employee productivity are just a few of the quantitative benefits that have been discovered through implementing Six Sigma in human resources. The study's findings point to Six Sigma as a promising framework for transforming HR processes. The infrastructure sector has a systematic strategy to enhancing strategic HR efficiency that might have a significant impact.

KEY WORDS: *Process Improvement, Variation Reduction, Data-Driven Decision Making, Employee Performance Metrics, Root Cause Analysis (RCA), Continuous Improvement (Kaizen)*

1. INTRODUCTION

Human resource management activities like as recruiting, training, conducting performance reviews, and employee retention could all benefit from Six Sigma's emphasis on process improvement. Human resources become more efficient, expenses decrease, and employee satisfaction and retention rise with Six Sigma's data-driven examination of waste. By reducing errors and output variation, Six Sigma seeks to improve the quality of human resource projects and activities. Since Motorola introduced it in the 1980s, businesses worldwide have been using it.

"Six Sigma" is a statistical method for evaluating the efficacy of a process, and "Sigma" refers to the standard deviation of the outcome.

The extremely low defect rate of 3.4 per million possibilities achieved by Six Sigma procedures demonstrates an exceptionally high degree of quality.

The acronym "DMAIC" stands for "Define, Measure, Analyze, Improve, and Control." It is a structured approach to problem-solving that is derived from the Six Sigma methodology. This strategy is used to identify the underlying causes of problems, develop solutions, and implement them to enhance process performance. Only then is the growth expressed as a percentage. To apply Six Sigma, one must systematically gather and analyze data in order to



discover process improvements and approaches to decrease variation. Additionally, control measures should be put in place to guarantee that efficiency goals are met and that improvements are maintained over time.

Success in business is proportional to an organization's skill in managing its human resources. Still, many companies have HR issues that reduce productivity, increase absenteeism, increase turnover, decrease morale, and ultimately, decrease profits. Six Sigma's core principles in HR include prioritizing customer needs, monitoring and quantifying process performance, involving people in improvement activities, always seeking ways to improve, and using data and analysis to make things better.

OBJECTIVES OF THE PAPER:

- To reduce inconsistencies and errors in critical human resources functions such as recruiting, payroll, and performance evaluation.
- To use data-driven methodologies to locate the best possibilities, and to improve the quality of hiring.
- To make workers happier, identify and remove process bottlenecks.
- To reduce cycle times and streamline procedures to increase the efficiency of HR operations.
- To facilitate the use of numerical data and statistical analysis in the making of sound judgments.

2. REVIEW OF LITERATURE

Gorhe, Leena P. — 2025. The purpose of this study is to examine the DMAIC and DMADV frameworks, which are strategic tools in Six Sigma, and how they might be used by human resources departments to increase production and align HR results with the organization's objectives. In addition to outlining a comprehensive method for identifying HR "defects" such inconsistent onboarding and lengthy hiring processes, the author demonstrates how to use measurement and statistical analysis to improve the consistency of HR outcomes. The study lays out a number of critical HR measures, including time-to-hire, training efficiency, and changes in attrition rates, and demonstrates how control charts and process mapping may be applied to HR operations. A number of concise case studies illustrate how a focus on hiring and training staff was resulted from a root-cause study. The author examines the aspects of organizational readiness that have an impact on the successful completion of a project. Data accessibility, leadership support, and training opportunities for entry-level HR professionals are all factors to consider. The article argues that HR policymaking should be approached using Six Sigma principles on an ongoing basis rather than as an isolated incident. There are caveats and recommendations for more practical testing in different industries. Human resource professionals might benefit from models that outline the steps involved in a typical DMAIC project.

Leena P. Gorhe.— 2025. Important HR responsibilities can be addressed by applying Six Sigma principles, and the article compares Six Sigma to other techniques in the sector, such as Total Quality Management and Lean. Using a variety of conceptual literature, it demonstrates the necessary adjustments to the application of statistical methods in human-centered processes and establishes a connection between Six Sigma metrics and HR



performance metrics. The hiring process, performance reviews, training methods, and the administration of salaries and benefits are some of the main areas that are being focused on. In order to keep HR initiatives from becoming impersonal, the study highlights the significance of integrating quantitative process indicators with qualitative insights, such as employee feedback. It also features a taxonomy of typical HR issues and practical tools for assessing them, such as process records, polls, and key performance indicator dashboards. Issues such as a lack of data, cultural opposition, and adequate HR analytics expertise are addressed with recommendations. The author urges more empirical research in other locations to determine the results' generalizability.

A. Fayyaz — 2025. Companies that have implemented Lean Six Sigma (LSS) in HR have seen an uptick in employee satisfaction, cost savings, and process consistency, according to this multi-case study. The study examined case studies that demonstrated how LSS reduced onboarding errors, decreased hiring time, and raised training completion rates to determine how much better things were when data was accessible. Enhancing the reliability and efficiency of HR services can be achieved by integrating Six Sigma's focus on minimizing variation with Lean's elimination of waste. The authors propose a four-pronged approach to implementing Lean Six Sigma: stakeholder alignment, DMAIC initiative piloting, growth through metrics and governance, and continuous HR belt training. Changes to statistical approaches to account for fewer HR occurrences and maintaining change momentum following a successful test project were among the issues identified. The analysis concludes with a research agenda that provides helpful recommendations for HR directors responsible for LSS programs and focuses on investigations of the long-term effects of these programs.

Vicente, I. — 2024. While the focus of this essay is on ergonomics and LSS together, there is a sizable section on human-centered process improvement that is directly applicable to HR duties. The author demonstrates how human resources should use Six Sigma to address physical challenges, such as job design and individual variations, in order to discourage workers from engaging in unhealthy behaviors. Things like employee weariness, mistake rate, and work quality are examined in training plans and job descriptions using the DMAIC method. Using metrics like error-per-shift and workload that account for both people and the process can be beneficial in the long term, according to the report. It establishes guidelines for the ethical collection of human-centered data and how to incorporate it into Six Sigma statistical tools. Further research integrating Six Sigma, ergonomics, and HR analytics is recommended by the study for the purpose of improving performance and well-being management.

F. Cantoni.— 2024. According to this IT-specific empirical study, firms have a hard time implementing Six Sigma in HR due to resistance to change, inadequate HR data infrastructure, and a lack of belt-level knowledge on HR teams. Finding the primary causes of HR Six Sigma project failure or delay, the report employs project audits and interviews. Some examples of this include picking the wrong challenges, not receiving adequate support from sponsors, and lacking strategies for long-term control. A readiness-assessment tool to determine whether HR processes are prepared to become Six Sigma candidates and the assignment of Six Sigma champions to HR during the test phase are two examples of the coaching-based techniques suggested by the authors. According to the survey, the successful



examples also had the following characteristics: leadership buy-in, an easy-to-understand breakdown of the ROI (in terms of both time and money saved), and evaluation tools that work with limited HR data. It is recommended to begin with more frequent operations, such as payroll, which require accurate transactional data, and then proceed on to less frequent processes, such as leadership development.

D. M. Utama— 2024. Hiring, onboarding, performance evaluations, training, and firing are some of the most typical issues covered in this practitioner-oriented publication. Additional HR-specific Lean Six Sigma principles are incorporated. Human resources experts can learn how to form interdisciplinary teams, select high-volume, repeatable tasks with measurable outcomes—known as "pilot projects"—and present their results in an easily digestible dashboard format. Important actions that line managers and HR directors should do are outlined in the article. Reducing administrative cycle times and eliminating unnecessary data entry are two examples of the fast gains that will help create trust. Human resources experts should educate themselves in basic statistical methodologies, such as Pareto charts and basic process capacity analysis, and acquire a Yellow Belt certification before advancing to more advanced studies. Human resources professionals will find this brief but informative guide more suited to their needs than a lengthy research study.

Cantoni, F. — 2024. This study examines the potential application of Six Sigma in SMEs and the implications for HR, particularly in regards to job redesign, position changes, and skill development requirements. Both the manufacturing and services case studies of small businesses demonstrate how Six Sigma initiatives led to more accurate job descriptions, more uniform training programs, and the development of new KPIs that better reflected the aims of process improvement. The author is in favor of employing simplified DMAIC, one of the Six Sigma approaches, which are tailored to small and medium-sized enterprises. They also touch on issues that are exclusive to these companies, like HR employees who are multitaskers and a lack of analytics expertise. The successful implementation of Six Sigma requires adjustments to human resources and processes, as well as investments in leadership and skill, according to one key notion. Policy recommendations for small company executives on how to assess HR-related outcomes and formulate plans are provided in the study.

Pankaj M. Madhani— 2023. Less paperwork, better training and onboarding, more consistent performance management, better problem-solving, and a higher return on investment for focused training are the six most important HR benefits listed in this presentation. It also makes Six Sigma concepts easier to understand and apply in practical HR settings. Using the paper as a resource, human resources professionals can educate themselves on fundamental analyses (Pareto, root-cause) and data examples (standard deviation of time-to-hire, onboarding defect rates). Practical implementation procedures, guidance on belt training, and mini-case studies from prominent adopters like GE and Motorola are all part of the package. In place of academic validation, the practitioner-oriented handbook will provide HR teams with a brief operational framework.

I. Daniyan— 2023. This informative study details a DMAIC-driven project that defines roles, tracks cycle durations, and examines specific innovations (such as standardized interview templates and quicker shortlisting) that can reduce an organization's time to fill available positions. The team achieved a statistically significant reduction in lead time and changes by

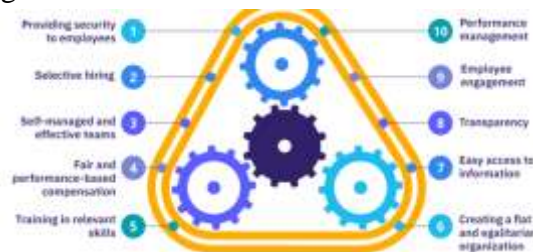


utilizing basic process data and basic hypothesis testing. The study highlights the importance of project governance practices, such as weekly standups and clearly defined roles and responsibilities, in enhancing the candidate experience and streamlining operations. The research demonstrates the implementation of conventional DMAIC techniques to an HR process with the use of contrasting before and after images.

Anna Trubetskaya— 2023. Based on the results, this research recommends a five-stage Six Sigma implementation methodology for use in HR departments. Additional topics included include data capturing infrastructure, Belt training, and support from the CEO, which are all considered institutional demands. Key performance indicators for monitoring continuous control after improvement and sample process maps for HR transactional services including payroll, leave processing, and hiring are also part of the study. By outlining the positive aspects of the increased monitoring, the author offers communication advice that will assist employees feel less scared by the change and emphasize the significance of change management. Time and error rates have decreased, according to multiple project reports. The paper provides HR leaders with practical and actionable recommendations that can aid in the development of an implementation strategy.

3. HR BEST PRACTICES TO IMPLEMENT

Human resources professionals should fully comprehend HR best practices before implementing them. A management professor and business theorist, Jeffrey Pfeffer authored two books: *The Human Equation: Building Profits by Putting People First* (1998) and *Competitive Advantage via People* (1994). By adhering to specific best practices, these books demonstrate how businesses can increase their profits. All of these HR concepts are stronger when put together. Among the most effective methods of human resources management are:



1. Providing security to employees: Even though everything around us is constantly evolving, people still seek stability in their professions. People are more loyal to their employers and give their all on the job when they have a sense of security in their positions. Saving time and money on training and recruiting new staff is a direct result of this consistency's emphasis on rewards and loyalty, which in turn reduces employee turnover. For the most part, people go to work so that they can provide for their family. Indeed, many international HR management approaches revolve around the concept of job security. According to a survey of 1,100 British workers, job security is among the top three considerations when seeking a new position. The connection between a supervisor and employee can be formal (including payment for services rendered) or informal (with mutual support for going above and beyond).

2. Selective hiring: Hiring the right people: Choosing the appropriate people: When a company takes its time choosing new employees, it increases the likelihood that it will

choose people who are well-suited to the position and will contribute maximum value. Compared to typical performers, elite achievers are 200-300% more productive, according to research. Therefore, a crucial HR best practice and necessity for gaining a competitive advantage is recruiting the appropriate individuals.

Nowadays, it's much easier to find the right candidate for a job because to the abundance of online hiring tools. In order to gauge their performance in this area, an increasing number of organizations are monitoring their job data.

3. Self-managed and effective teams: Successful companies have cohesive teams that work together to achieve their goals. When a team is self-managed, its members each do their part to achieve the team's objectives and collaborate to make choices. New ideas are generated through the process of examining and combining existing ones. Researchers have shown that the most effective teams include of people with stable mental states who also have diverse perspectives. This allows team members to freely discuss and share their ideas, as well as generate new ones.

4. Fair and performance-based compensation: is critical for efficient human resource management. To attract and retain top talent, you need to provide competitive compensation in addition to a generous benefits package.

Compensation packages sometimes include both base pay and benefits. Many of the top talent may originate from outside your business, so it's wise to monitor developments in both yours and adjacent fields. Your company's compensation package and the typical salary should now be clear to you.

5. Training in relevant skills: It is critical to ensure that the top candidates maintain their status as industry leaders once they are appointed. Considering the current tenfold acceleration in technological advancement, this is of the utmost importance. How can we structure our company so that learning occurs at a pace commensurate with the velocity of change? Learning and development have recently emerged as a means to outpace rivals, expedite progress, and foster fresh concepts.

6. Creating a flat and egalitarian organization: Human resources best practices in Japan are based on the country's inclusive management philosophy. Even if we know that some individuals are more crucial to the expansion of the business than others, it would be inappropriate to state such. Recognizing and caring for each employee is essential because they are all valuable parts of the company. The fact that Japanese companies have common areas like cafeterias and uniforms as well as identical policies on vacation and sick days is evidence of this. People are more likely to speak their minds in these types of communities because they adhere to the egalitarian principle that states everyone should be treated equally.

7. Easy access to information Making ensuring that employees can easily discover the information they need and get in contact with the correct individuals inside the firm is the main objective of information accessibility. Especially in larger firms with multiple information divisions, this is often difficult to accomplish due to the way things are structured. In order for workers to accomplish their tasks efficiently and without wasting time searching for data or locating the appropriate individuals to speak with, it is imperative that they have immediate access to relevant information.



8. Transparency: Being open means more than just making data easily accessible. It also encompasses the kind of the information shared and the degree to which it is discussed openly, particularly in relation to major decisions, issues, and changes within the organization. Honesty requires leaders to not only provide information, but to be forthright and honest with everyone involved. Transparency in action is exemplified when executives assist employees in comprehending the company's strategic direction and the rationale behind decisions. They are very candid about discussing their achievements and setbacks. When employees hear the reasons from leadership rather than hearing them explained, they are better equipped to handle difficult situations and make challenging decisions.

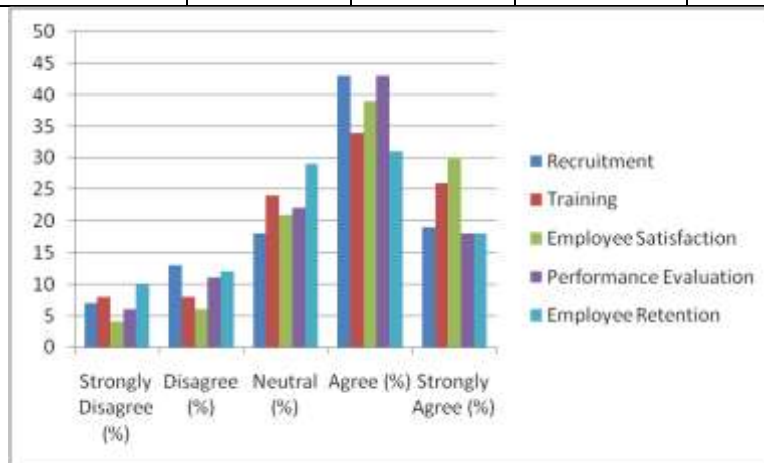
9. Employee engagement: As a catchphrase in human resources, "employee engagement" has been around for quite some time. The expected effect has not been achieved despite persistent attempts to increase staff involvement. A Gallup study found that the economy loses \$8.9 trillion due to the continued disengagement of 62% of the global workforce. Human resources professionals should seek out more information on what motivates people to work for their respective companies.

10. Performance management: The term "performance management" refers to a systematized approach to guiding and improving employees' work by supervisors through interaction and feedback. Contributions to organizational success include staff development and advancements in strategic objectives.

4. ANALYSIS AND DISCUSSIONS

TABLE 1: PERCENTAGE ANALYSIS OF EMPLOYEE RESPONSES ON SIX SIGMA IMPLEMENTATION

| HR Dimension | Strongly Disagree (%) | Disagree (%) | Neutral (%) | Agree (%) | Strongly Agree (%) |
|------------------------|-----------------------|--------------|-------------|-----------|--------------------|
| Recruitment | 7 | 13 | 18 | 43 | 19 |
| Training | 8 | 8 | 24 | 34 | 26 |
| Employee Satisfaction | 4 | 6 | 21 | 39 | 30 |
| Performance Evaluation | 6 | 11 | 22 | 43 | 18 |
| Employee Retention | 10 | 12 | 29 | 31 | 18 |



DISCUSSIONS: According to the data in the graphic, the majority of respondents feel that Six Sigma techniques have improved critical HR processes like recruiting, training, performance evaluations, and employee satisfaction. The majority of the comments was positive about employee happiness (69%), which implies that it has the potential to improve the workplace. On the flip side, fewer people are in agreement (49%), which indicates that retention strategies still demand improvement.

TABLE 2: MEAN SCORE ANALYSIS OF HR DIMENSIONS AFTER SIX SIGMA

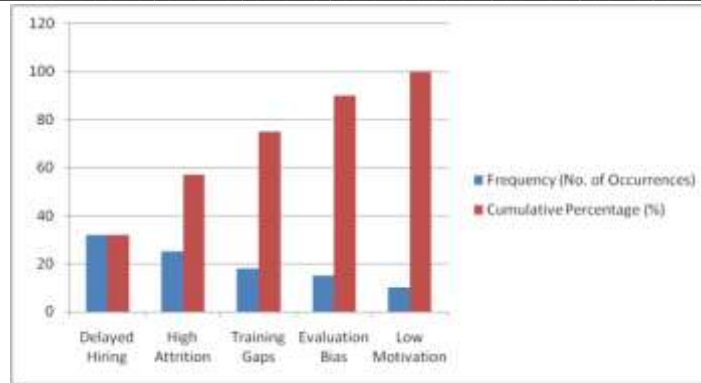
| HR Practice Area | Mean Score |
|------------------------|------------|
| Employee Satisfaction | 3.85 |
| Training Effectiveness | 3.62 |
| Performance Evaluation | 3.56 |
| Recruitment Efficiency | 3.54 |
| Employee Retention | 3.35 |



DISCUSSIONS: Staff satisfaction had the highest average score (3.85), indicating that Six Sigma methodologies have increased engagement and morale among employees. Training, performance evaluation, and recruiting all had moderate average scores, indicating progress but with space for improvement. Given its low average score (3.35), employee retention is a critical area that necessitates concentrated Six Sigma efforts.

TABLE 3: PARETO ANALYSIS OF MAJOR HR ISSUES AT PNC INFRA TECH

| HR Issue | Frequency (No. of Occurrences) | Cumulative Percentage (%) |
|-----------------|--------------------------------|---------------------------|
| Delayed Hiring | 32 | 32 |
| High Attrition | 25 | 57 |
| Training Gaps | 18 | 75 |
| Evaluation Bias | 15 | 90 |
| Low Motivation | 10 | 100 |



DISCUSSIONS: Long hiring processes and excessive employee turnover account for 57% of HR issues, according to the Pareto study. Because of this, they are the top issues requiring Six Sigma intervention right now. Handling the two primary issues can significantly enhance overall HR performance, as they constitute nearly half of all difficulties. Employee satisfaction, output, and the efficiency of the process are all impacted by the lingering issues of inadequate training, biased evaluations, and lack of motivation.

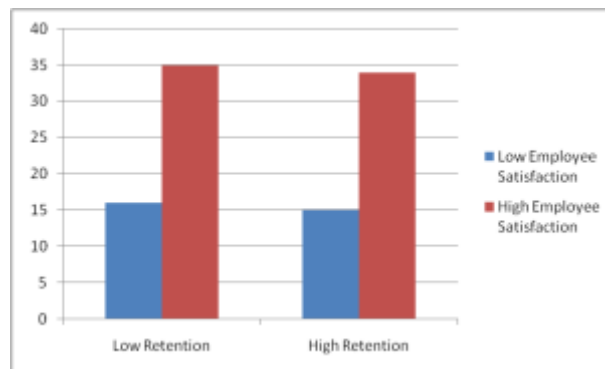
TABLE 4: HYPOTHESIS TESTING – CHI-SQUARE TEST

Hypothesis

H0: Six Sigma does not significantly improve employee retention.

H1: Six Sigma significantly improves employee retention.

| HR Issue | Low Retention | High Retention |
|----------------------------|---------------|----------------|
| Low Employee Satisfaction | 16 | 15 |
| High Employee Satisfaction | 35 | 34 |



DISCUSSIONS: The contingency table reveals that compared to dissatisfied employees, highly satisfied workers have a higher retention rate of 34. Similarly, it is believed that the majority of patients with poor retention rate (16) are not very happy. Making workers happier might encourage them to remain with the company, proving that there is a positive correlation between employee satisfaction and retention.

5. CONCLUSION

Overall, HR management is substantially improved by integrating Six Sigma into HR operations, which offer a structured and data-driven approach. Important human resources functions, such as recruiting, onboarding, training, and performance management, can be



made more efficient and error-free with its support. Human resources departments may boost engagement, retention, and satisfaction by identifying and addressing root causes with data-driven solutions. At the end of the day, the company as a whole benefits from a more efficient, transparent, and goal-oriented human resources department thanks to Six Sigma's implementation.

REFERENCES:

1. Gorhe, L. P. (2025). Six Sigma as a strategic HR tool: Applying DMAIC and DMADV frameworks for HR efficiency and organizational alignment. Research paper.
2. Gorhe, L. P. (2025). Six Sigma, Lean, and TQM integration in human resource management: A conceptual review. Review article.
3. Fayyaz, A. (2025). Lean Six Sigma deployment in human resources: A multi-case review. Research article.
4. Vicente, I. (2024). Integrating ergonomics and Lean Six Sigma: Implications for human-centric HR processes. Journal article.
5. Cantoni, F. (2024). Six Sigma implementation challenges in HR: Evidence from the IT sector. Journal article.
6. Daniyan, I. (2023). Improving recruitment cycle time using DMAIC: An applied study. Research article.
7. Trubetskaya, A. (2023). Implementing Six Sigma in HR: A five-step model. Research article.
8. Utama, D. M. (2024). Lean Six Sigma for HR practitioners: An operational guide. Book.
9. Madhani, P. M. (2023). Six Sigma in human resource management: A practical guide. Book.
10. Cantoni, F. (2024). Six Sigma adoptions in SMEs: HR implications and organizational transformation. Humaninprogress.com. Website article.

