A Statistical Approach for the Continuous Improvement of the Energy Utilization in the Technology Building Laboratories

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Abstract

This project focuses on improving the electricity energy utilization in the Technology Building Laboratories. School of Engineering has spent a significant amount of capital irrigating the computers in the labs. In our study, we found that the electricity expense on each student is $115.95 per year, and the total electricity expense on students is $25,736 annually. Since number of students going to the labs is normally distributed, we try to explore methods of increasing number of students utilizing the computers to decrease the per capita electricity expense, and thus an optimized energy utilization will be achieved.

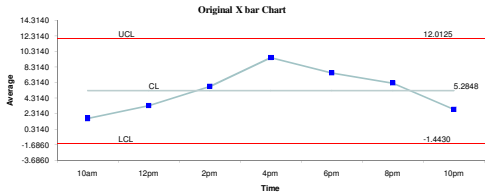

Figure 1:X bar Chart of No. of Students

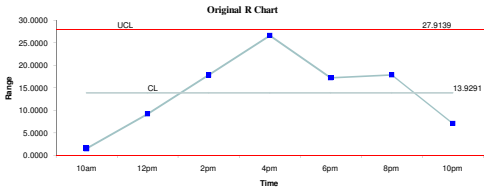

Figure 2:R Chart of No. of Students

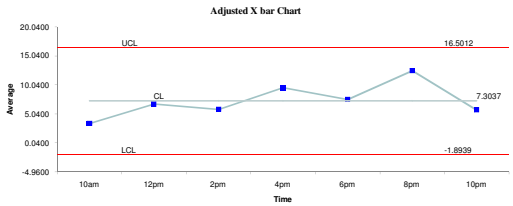

Figure 3:Adjusted X bar Chart of No. of Students

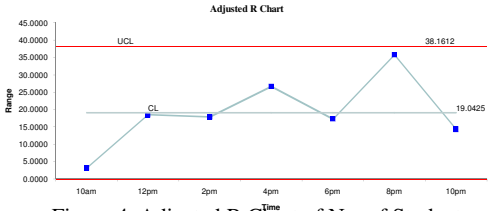

Figure 4: Adjusted R Chart of No. of Students

Based on Shewhart rules [1], the original X bar & R chart indicates that the process is out of control. By increasing the number of students during morning and evening hours, adjusted X bar & R chart suggests that the methodology is feasible.

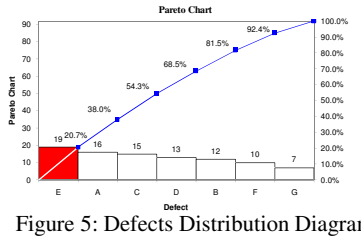

Figure 5: Defects Distribution Diagram

Table 1: Defects Table

Defects	Problem description
A	Location (because of neighborhood)
B	Too dirty (residue food)
C	Air quality bad (poor ventilation)
D	Poor facilities
E	Software insufficiency
F	Internet speed too slow
G	Too many constraints

This Pareto diagram provides information regarding all the defects found in the process. The first three defects will be further anatomized by applying Ishikawa diagram.

Figure 6: The Technology Management Building Laboratory

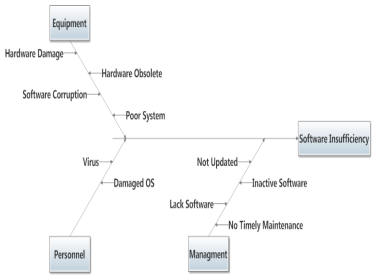

Figure 7: Ishikawa 1 Software Insufficiency

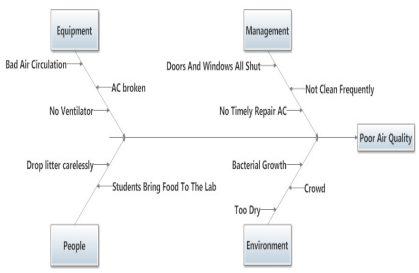

Figure 8: Ishikawa 2 Poor Air Quality

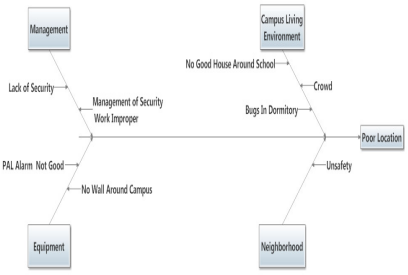

Figure 9: Ishikawa 3 Poor Location

Results and Conclusions

School of Engineering has exerted too many resources including capital and physical equipments to create a learning environment for its engineering students. Yet it turns out low equipment usage along with huge amount of electricity energy waste [2]. In our study, we find that quantity of student in the mornings and evenings is too small. a methodology of providing some food for student could increase the quantity of student in the mornings and evenings. This indicates the possibility of increasing number of students with specific methods. We believe that unless there is a radical change leaded by management, the same problem detected in the process will repeat again and again.

References

[1] Clive, B. (2002). 7 - Energy monitoring, targeting and waste avoidance *Energy: Management, Supply and Conservation* (pp. 103-116). Oxford: Butterworth-Heinemann.

[2] H.J, P. (1982). The importance of design for efficient energy utilization. *Journal of Mechanical Working Technology, 6*(2-3), 253-266.