Innovation Training Module

Pareto Analysis

The 80/20 Rule of Success

What is Pareto Analysis

Pareto Analysis is a statistical technique in decision-making used to select a limited number of tasks that produce a significant overall effect. This is also known as the **Pareto Principle** and sometimes called the **80/20 Rule**. It suggests that **80% of results come from 20% of efforts,** meaning that a small portion of our actions often leads to the biggest outcomes. By understanding and practicing this principle, both Teachers and Students save time by focusing on Vital things and ignore Trivial ones. That is why, this technique is also referred to as **Vital Few and Trivial Many.**

Italian Economist **Vilfredo Pareto** introduced this concept based on his observation that 80% of Italy's wealth belonged to just 20% of the population. It was popularised by Romanian-born American Engineer Joseph M. Juran in the late 1940's.

Pareto Principle can help Teachers in **identifying the teaching strategies that have the most impact** on student learning. Instead of trying to cover everything with equal effort, teachers can focus on the **20% of lessons, activities, or teaching methods that lead to 80% of student understanding and engagement**. For example, interactive discussions or visual aids help students grasp concepts faster. Similarly, a small number of students require the majority of their attention. By recognizing these patterns, teachers can streamline their efforts, reduce stress, and create a more effective learning environment.

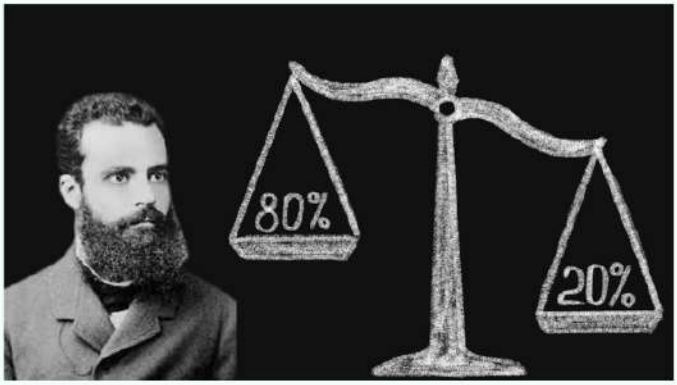
This principle is a powerful tool for students' time management. Students can focus on the most important 20% of topics that will likely contribute to 80% of their academic success, achieve better results with less effort.

For instance, understanding key formulas, concepts, or themes can help in performing well in exams.

Pareto analysis does not provide solutions to issues, but only helps identify and narrow down the most significant causes of problems based on past data. Also, be cautious that the Pareto Ratio is only a rule of thumb, and in practice, one should not expect to see this as an exact ratio.

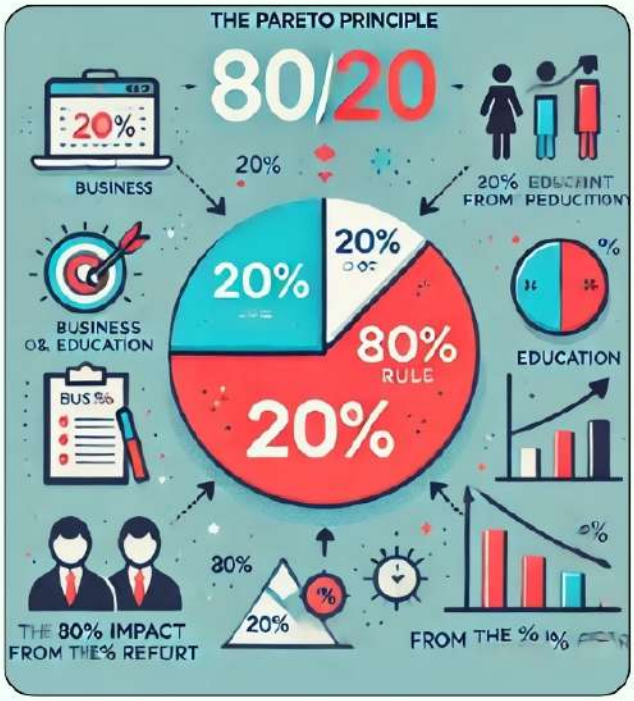
Examples of Pareto Analysis

One good way to understand the application of Pareto Principle is by looking at a few examples. Here are some real-world applications across different subjects.



- **Student Performance:** Educators may discover that 20% of students create 80% of classroom disruptions. Targeting interventions for this small group can improve overall classroom dynamics.
- **Study Techniques:** Students might realize that 20% of their study efforts lead to 80% of their learning outcomes, helping them focus on the most effective methods.
- **Identify Core Factors for Success:** Review past editions of the awards to identify the 20% of factors that result in 80% of successful and innovative projects. Create a pre-competition workshop focusing on these core factors, guiding students toward impactful topics and providing resources to kickstart their projects.

- **Optimize Resource Allocation:** Analyze which 20% of resources (e.g., advanced research materials, expert guidance) contribute to 80% of project quality. This could include partnering with local institutions to provide lab access, offering resource kits for top-performing students during initial rounds.
- **Mentor Involvement:** Identify that 20% of mentors guide 80% of winning or high-quality projects. Pair students with experienced mentors early in the process. Consider creating a "Mentor Spotlight Program" to highlight and involve the most impactful mentors, ensuring their insights are accessible to all participants.



- **Encourage Innovation Through Topics:** Past data may reveal that a small number of themes drive most impactful submissions. Curate and recommend such innovative themes. Organize brainstorming webinars to inspire topic selection, ensuring students focus on areas with high societal relevance.
- **Streamline Evaluation:** A few key evaluation criteria likely determine most of the scores (e.g., innovation, feasibility, societal impact). Design a clear strategy to maximize scores.
- **Promote Success Stories:** A handful of past winning projects might inspire the majority of new participants. Create short videos or case studies featuring these successes. Share them widely through social media, school networks, and **GETA's platform** to motivate and guide future participants.
- **Improve Registration and Participation:** Review outreach methods and identify the 20% of strategies (e.g., school partnerships, digital campaigns) that yield 80% of registrations. Focus more resources on these effective methods.
- **Enhance Student Engagement:** Identify the activities (e.g., interactive webinars, hands-on workshops) that engage 20% of participants but drive 80% of active involvement. Conduct online Q&A sessions with past winners to inspire participants. Organize virtual field trips to science labs or innovation hubs.
- **Focused Teacher Involvement:** Analyze teacher contributions and determine that 20% of teachers mentor 80% of the high-performing students. Offer rewards or recognition to these influential teachers to motivate them to guide more students effectively.
- **Special Recognition Awards:** Identify that 20% of unique project attributes (e.g., community impact, originality) lead to 80%

of audience appreciation during award ceremonies. Introduce special awards like "Most Innovative Solution" or "Best Social Impact." Involve audience voting for categories to boost excitement and engagement.

- **Regional Representation:** Participation data might reveal that 20% of regions or schools dominate 80% of submissions. Focus outreach and promotion efforts on underserved regions. Offer travel allowances or virtual participation options for students from remote areas.
- **Post-Competition Opportunities:** 20% of follow-up activities (e.g., scholarships or internships) may lead to 80% of long-term student impact. Partner with organizations or institutions to offer internships or funding for top projects. Create an alumni network for past participants to share their journeys and inspire new students.

Some more...

- **Assess Student Strengths and Interests:** Evaluate the skills, interests, and resources of students to determine the 20% who may contribute 80% of the innovative ideas. Provide them with tailored mentorship and opportunities.
- **Focus on High-Impact Activities:** Identify activities or initiatives that lead to the majority of successful innovations. For example, prioritize hackathons, project-based learning, or competitions like the Young Scientist Avishkar Awards.
- **Streamline Resources:** Allocate resources (funding, time, or mentorship) to the 20% of tools, materials, or programs that contribute the most to student innovation success.
- **Simplify Idea Validation:** Focus on the 20% of criteria (e.g., feasibility and potential impact) that validate 80% of good ideas. Simplify the evaluation process for students, so they can focus on refining their concepts.
- **Recognize and Promote Success Stories:** Identify the top 20% of student projects that inspire the majority of others. Use these as case studies to motivate and guide new participants.

Here are some more motivating examples...

- 20% of App Features = 80% of User Engagement
- 20% of Brainstorming = 80% of Innovative Ideas
- 20% of Budget = 80% of Essential Expenses
- 20% of Collaborators = 80% of Valuable Contributions
- 20% of Daily Tasks = 80% of Results
- 20% of Effort = 80% of Results
- 20% of Experiments = 80% of Breakthrough Discoveries

- 20% of Feedback = 80% of Improvements
- 20% of Focus Time = 80% of Productivity
- 20% of Ideas = 80% of Innovation
- 20% of Innovations = 80% of Functional Applications
- 20% of Interruptions = 80% of Productivity Loss
- 20% of Planning = 80% of Project Success
- 20% of Preparation = 80% of Awards Won
- 20% of Presentation = 80% of Impact
- 20% of Problems = 80% of Project Roadblocks
- 20% of Questions = 80% of Clarity
- 20% of Resources = 80% of Outcomes
- 20% of Tasks = 80% of Project Progress
- 20% of Techniques = 80% of Project Efficiency

Steps to do Pareto Analysis

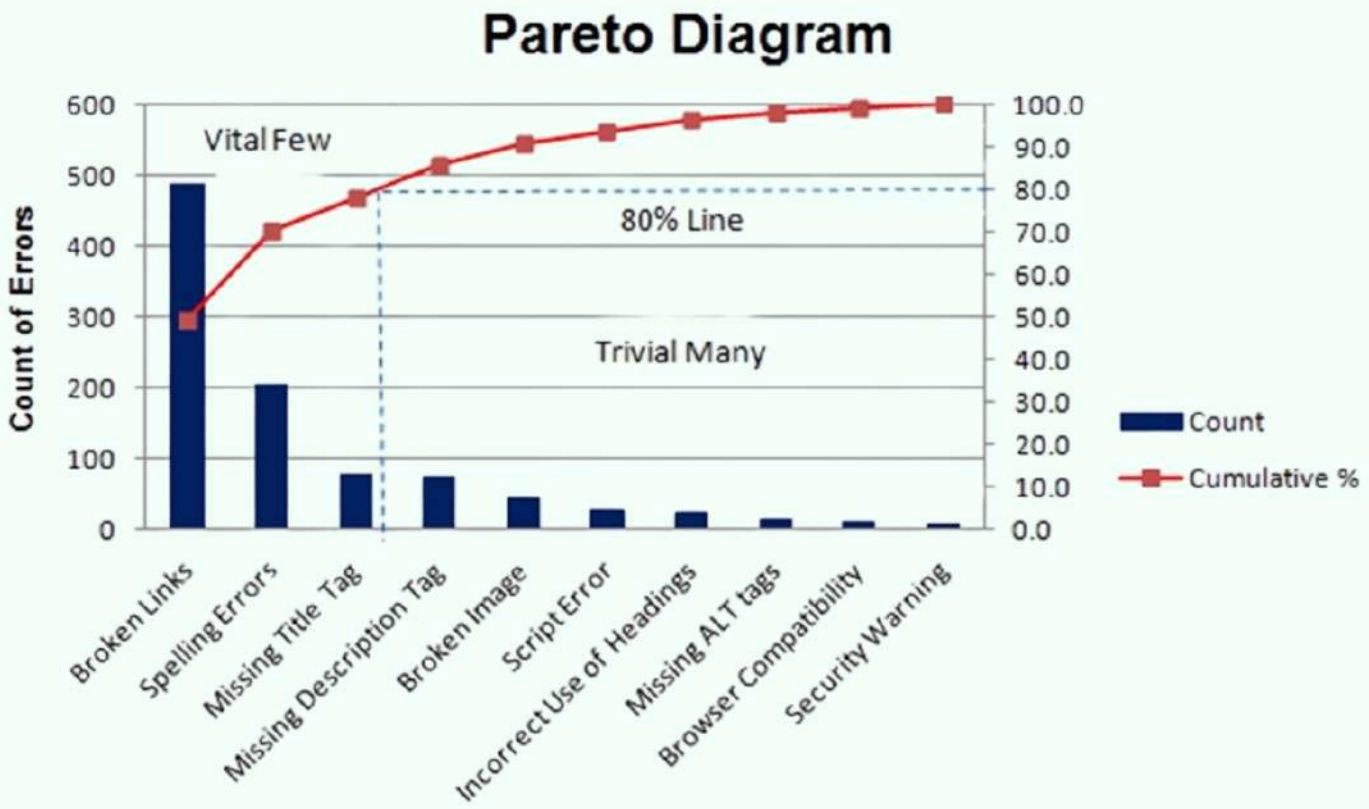
Let us look at simple steps in implementing Pareto Analysis. Let us take a business scenario.

- **Identify a list of problems:** Ideally, the list is gathered through feedback from various stakeholders like employees, clients, or customers. Common examples include anonymous complaint/feedback forms and customer surveys.
- **Identify the cause of each problem:** Why did the problem occur? Make sure to think about the root cause, which might be hidden under the surface.
- **Score each problem:** Assign a number to each problem based on the negative impact associated with it. The scoring system will depend on the type of problem trying to be solved.

Group the problems together: Group all of the similar problems together and calculate the collective scores. The problem with the highest score will most likely be the one you should try to resolve first and provide the highest return.

A common part of Pareto analysis is to graphically depict the occurrence of each variable being tracked. This depiction is called a Pareto chart. Here are steps to build a Pareto Chart.

- Create a vertical bar chart with causes on the x-axis and count (number of occurrences) on the y-axis.
- Arrange the bar chart in descending order of causes, the cause with the highest count first.
- Calculate the cumulative count for each cause in descending order.
- Calculate the cumulative count percentage for each cause in descending order. Percentage calculation: {Individual Cause Count} / {Total Causes Count}*100
- Create a second y-axis with percentages descending in increments of 10 from 100% to 0%.
- Plot the cumulative count percentage of each cause on the x-axis.
- Join the points to form a curve.
- Draw a line at 80% on the y-axis, running parallel to the x-axis. Then drop the line at the point of intersection with the curve on the x-axis. This point on the x-axis separates the important causes on the left (vital few) from the less important causes on the right (trivial many).



Example of a Pareto chart on causes for errors on websites

Summary

Pareto Analysis, also known as 80/20 Rule, is a good time-saving technique for Teachers as well as Students. It states that 20% of Efforts yield 80% of the Results. While working on Science and Innovation Projects, this concept helps focus on those 20% important subjects instead of giving equal attention to all aspects, i.e., the Vital Few over Trivial Many.

India Science Festival (ISF)

India Science Festival, popularly known as ISF, is a two-day celebration of science, technology, and innovation. It provides a platform for scientists, researchers, students, and the public to engage in popular science talks, interdisciplinary panel discussions, immersive exhibits, interactive installations, hands-on workshops, policy roundtables, book launches, film screenings and performances, we aim to bring out the excitement of science, its linkages with culture and society, and highlight its role in addressing current and future challenges.

The ISF is India's largest non-governmental event for celebrating science organized by Foundation for Advancing Science and Technology (FAST India). It is being conducted annually since 2019. Every year, there is a theme and a different venue. ISF so far was held Pune and Hyderabad on themes like *Ideas to Impact - Science for the People, Towards Infinity - Mind, Machines, and the Endless Frontier, Future is Now, Continuum,* and so on.