

Chapter 6

Problem Identification and Market Gaps

LEARNING OBJECTIVES

After completing the chapter, the readers will be able to:

- Identify real-world problems by distinguishing root causes from symptoms.
- Analyse user needs and pain points through observation and research.
- Evaluate the impact of problems on individuals, society, and industries.
- Perform market gap analysis to identify unmet customer needs and opportunities.
- Develop clear and actionable problem statements.
- Prioritise problems based on feasibility, impact, and innovation potential.
- Apply problem identification tools and analytical frameworks.
- Evaluate existing solutions to identify innovation opportunities.
- Validate problems using evidence-based research methods.
- Design innovative, user-centred solutions that create sustainable value.

CHAPTER OUTLINE

- Introduction
- Identifying Root Causes from Symptoms
- Understanding User Needs and Pain Points through Observation and Research
- Measuring the Impact of Problems on Individuals, Society, and Industries
- Performing Gap Analysis to Identify Unmet Market Needs
- Converting User Pain Points into Clear and Actionable Problem Statements
- Prioritising Problems based on Feasibility, Impact, and Innovation Potential

CHAPTER OVERVIEW

This chapter introduces a systematic approach to problem identification, root cause analysis, and validation using techniques such as observation, user interviews, surveys, empathy mapping, and market research.

Learners will explore market gap analysis, evaluate the impact of problems, and use tools such as the Five Whys, Fishbone Diagram, SWOT, PESTLE, Problem Tree Analysis, User Journey Mapping, and Gap Analysis to identify opportunities. The chapter also explains how to develop clear problem statements and prioritise ideas based on feasibility, impact, and innovation potential. Through real-world case studies, activities, worksheets, and mini-projects, learners will build the skills to identify, analyse, validate, and prioritise problems, enabling them to create innovative, user-centred, and sustainable solutions.

INTRODUCTION

Innovation begins with identifying real-world problems and understanding user needs. Problem identification involves observing situations, analysing challenges, and distinguishing root causes from symptoms. By identifying unmet needs and market gaps, innovators can develop sustainable, user-centred solutions that create social and economic value.

IDENTIFYING ROOT CAUSES FROM SYMPTOMS

Effective problem solving requires understanding the difference between **symptoms** (visible effects) and **root causes** (underlying reasons). Addressing only symptoms provides temporary relief, while solving root causes leads to lasting solutions. Techniques such as observation, stakeholder interaction, and root cause analysis help innovators identify the actual problem and develop effective innovations. Table 6.1 presents the differences between symptoms and root causes and Figure 6.1 summarises how to identify real-world problems by distinguishing root causes from symptoms.

Table 6.1: Differences between symptoms and root causes

Symptoms	Root causes
Visible signs that indicate a problem exists	Fundamental reasons responsible for the problem
Usually occurs after the problem has developed	Exist before the symptoms become visible
Temporary solutions often address symptoms	Permanent solutions target root causes
Focus on immediate effects	Focus on underlying reasons
Symptoms may reappear if only they are treated	Eliminating the root cause prevents recurrence

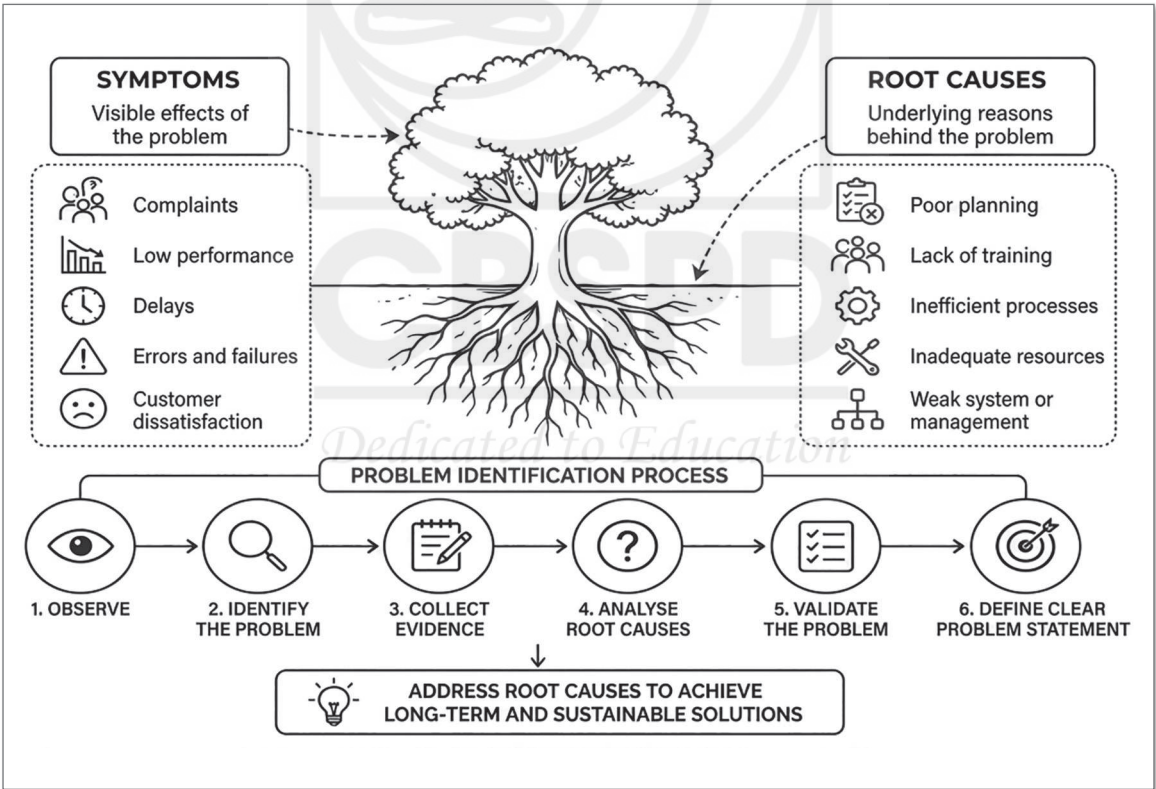


Fig. 6.1: Identifying real-world problems by distinguishing root causes from symptoms

Importance of Root Cause Analysis

Identifying root causes improves decision-making, reduces recurring problems, optimises resources, and increases customer satisfaction. It enables entrepreneurs, engineers, healthcare professionals, and educators to design innovative, reliable, and sustainable solutions that address genuine user needs.

Methods for Distinguishing Root Causes from Symptoms

Root causes can be identified using tools such as the Five Whys, Fishbone (Ishikawa) Diagram, and Problem Tree Analysis, along with observation, interviews, surveys, and data analysis. These methods help uncover the actual causes of problems rather than their visible effects.

Example: In the field of Education, low mathematics examination scores are a symptom of a deeper problem rather than the problem itself. The root causes may include weak conceptual understanding, limited practice, and ineffective teaching methods. An effective solution is to implement interactive teaching strategies, provide remedial classes, conduct regular formative assessments, and use digital learning resources to improve students' understanding and academic performance.

Activity 6.1: Root Cause Detective

Step 1. Observe (10 Minutes): Observe your surroundings (college campus, classroom, hostel, library, cafeteria, parking area or nearby community). Identify one real-world problem that affects people regularly.

Examples of real-world problems include long queues in the cafeteria, overflowing dustbins, poor internet connectivity, water leakage, traffic congestion near the college gate, and low attendance in classes. These everyday challenges can be observed, analysed to identify their root causes, and used as opportunities to develop practical and innovative solutions.

Step 2. Identify the symptom (10 minutes): Write down the visible problem and the symptom that people experience.

Example: In a college cafeteria, students may have to wait 20 minutes to receive their food. The problem is the delay in cafeteria service, while the symptom is the long waiting time experienced by students.

Step 3. Ask 'Why?' five times (15 minutes): Use the Five Whys technique to identify the root cause. Let us understand this by continuing the example from Step 2.

Whys	Answers
Why 1	Only one billing counter is open.
Why 2	There is staff shortage during lunch hours.
Why 3	Employee schedules are not adjusted for peak demand.
Why 4	No analysis of customer traffic has been conducted.
Why 5	There is a lack of operational planning.

Root cause: Inefficient operational planning.

Step 4. Discuss (10 minutes): Students work in groups of four to compare their observations, discuss whether they have identified the same root cause for the problem, and collaboratively propose one practical and feasible solution. This group discussion encourages critical thinking, teamwork, and the evaluation of different perspectives before finalising the most appropriate solution.

Step 5. Present (10 minutes): Each group presents its findings to the class by clearly explaining the identified problem, the visible symptom, the underlying root cause, and the proposed solution. This presentation allows students to share their analysis, receive feedback, and learn from different approaches to problem-solving.

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Student Worksheet: Root Cause Analysis**Part A: Problem Observation**

Questions	Student response
Where did you observe the problem?	
What problem did you observe?	
Who is affected by this problem?	
How often does this problem occur?	
What evidence supports your observation?	

Part B: Symptom Identification

Visible symptom:

Part C: Five Whys Analysis

Whys	Answers
Why 1	
Why 2	
Why 3	
Why 4	
Why 5	

Part D: Root Cause

The actual root cause is:

Part E: Proposed Solution

Suggest one innovative and practical solution.

Part F: Reflection Questions

1. Why is it important to identify the root cause instead of only treating the symptom?
2. What challenges did you face while identifying the root cause?
3. How can solving the root cause create a long-term impact?
4. What skills did you develop through this activity?

UNDERSTANDING USER NEEDS AND PAIN POINTS THROUGH OBSERVATION AND RESEARCH

Understanding user needs and pain points is the process of discovering the challenges, expectations, and preferences of users through systematic observation and research (Fig. 6.2). By gathering information from observations, interviews, surveys, feedback, and data analysis, innovators gain a clear understanding of real-world problems and unmet needs. This evidence-based approach enables the development of practical, user-centred, and innovative solutions that improve user experience and deliver meaningful value.

Understanding User Needs

User needs are the expectations and requirements people have when using a product, service or system. Understanding these needs helps develop practical, user-centred, and valuable solutions.

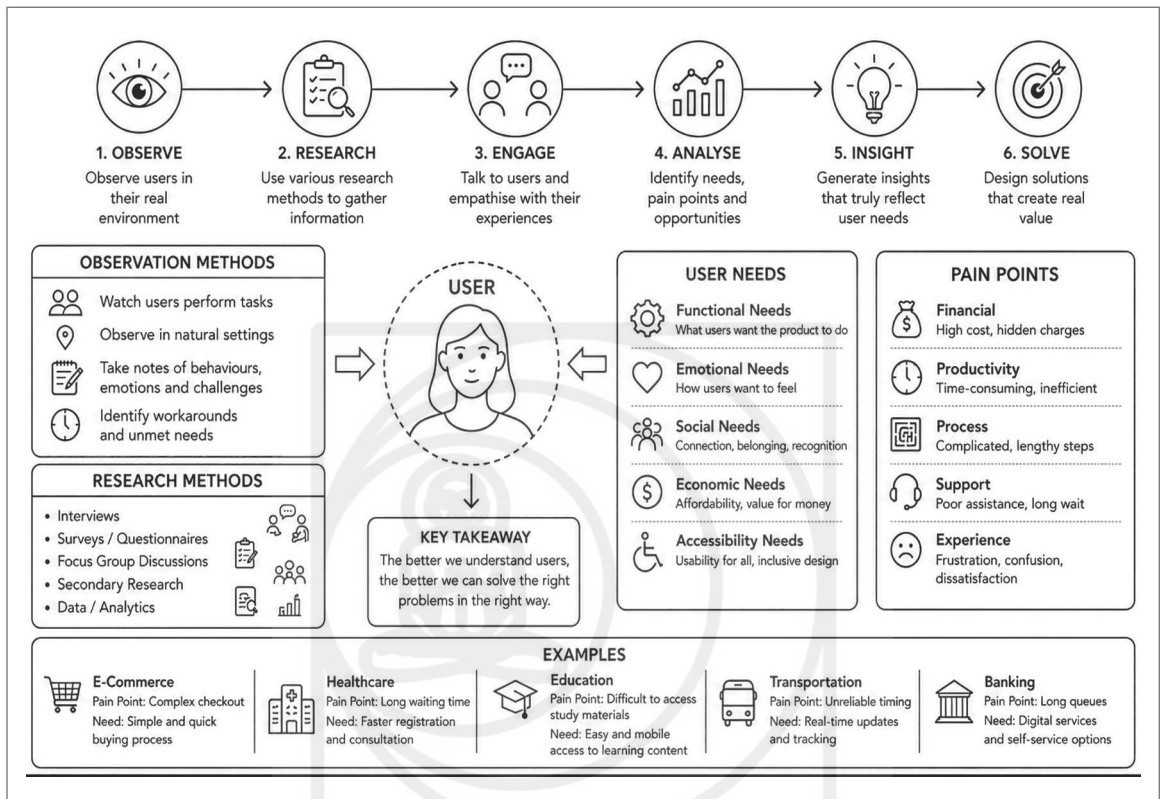


Fig. 6.2: Understanding user needs and pain points through observation and research

- **Functional needs:** Products should perform their intended tasks efficiently and reliably (e.g., a navigation app providing accurate directions).
- **Emotional needs:** Users expect experiences that are comfortable, trustworthy, and stress-free (e.g., compassionate healthcare services).
- **Social needs:** Users value communication, collaboration, and a sense of belonging (e.g., interactive online learning platforms).
- **Economic needs:** Products should be affordable and offer good value for money (e.g., energy-efficient appliances).
- **Accessibility needs:** Products and services should be easy to use for people of all ages and abilities (e.g., ramps and audio announcements in public transport).

Understanding User Pain Points

User pain points are the challenges, frustrations or obstacles people face while using a product or service. Identifying these issues helps innovators develop solutions that address real user problems. Common pain points include financial (high or hidden costs), productivity (time-consuming or inefficient processes), process (complex procedures), and support (poor or delayed customer assistance). Understanding these pain points enables the design of user-centred products and services that improve efficiency and satisfaction.

Observation as a Research Method

Observation is an effective research method for understanding how users actually behave in real-life situations. By watching users perform tasks in their natural environment, innovators can identify hidden challenges, inefficiencies, and opportunities for improvement. Observation is often combined with interviews, surveys, focus group discussions, secondary research, and digital analytics to gain a deeper understanding of user needs and behaviours.

Examples: Route optimisation in food delivery, smart water bottles, online hospital registration, digital library management, and smart irrigation systems were all developed by observing user behaviour and identifying real-world problems.

Importance of Understanding User Needs and Pain Points

Understanding user needs and pain points helps create solutions that solve real problems, improve customer satisfaction, reduce development risks, and increase product success. Evidence-based user research enables entrepreneurs, engineers, healthcare professionals, and policymakers to design practical, innovative, and sustainable solutions that meet changing user expectations.

MEASURING THE IMPACT OF PROBLEMS ON INDIVIDUALS, SOCIETY, AND INDUSTRIES

Measuring the impact of problems involves evaluating how challenges affect individuals, society, and industries using qualitative and quantitative evidence (Fig. 6.3). It helps determine the severity, scale, and long-term consequences of a problem, enabling innovators to prioritise critical issues and develop effective solutions. Impact assessment supports evidence-based decision-making, efficient resource allocation, and the creation of innovative solutions that deliver maximum social, economic, and environmental value.

Understanding Impact Assessment

Impact assessment is the process of determining the extent to which a problem influences individuals, organisations, communities, industries, and the environment. It considers both immediate and long-term consequences by examining measurable indicators such as financial losses, productivity reduction, health outcomes, environmental damage, customer dissatisfaction, and social well-being.

The impact of a problem is generally evaluated using three key dimensions that are as follows:

1. **Severity:** It refers to the seriousness of the consequences caused by a problem. Problems that threaten human life, significantly reduce productivity or cause substantial financial losses are considered highly severe.
Example: A cybersecurity attack that exposes millions of customer records has a much greater severity than a temporary website slowdown.
2. **Frequency:** It indicates how often a problem occurs. Problems that occur repeatedly may require urgent intervention even if each individual occurrence appears relatively minor.
Example: Frequent power outages in a manufacturing plant disrupt production schedules and increase operational costs over time.
3. **Scale:** It refers to the number of people, organisations or geographical areas affected by a problem. A large-scale problem often has widespread social and economic consequences.

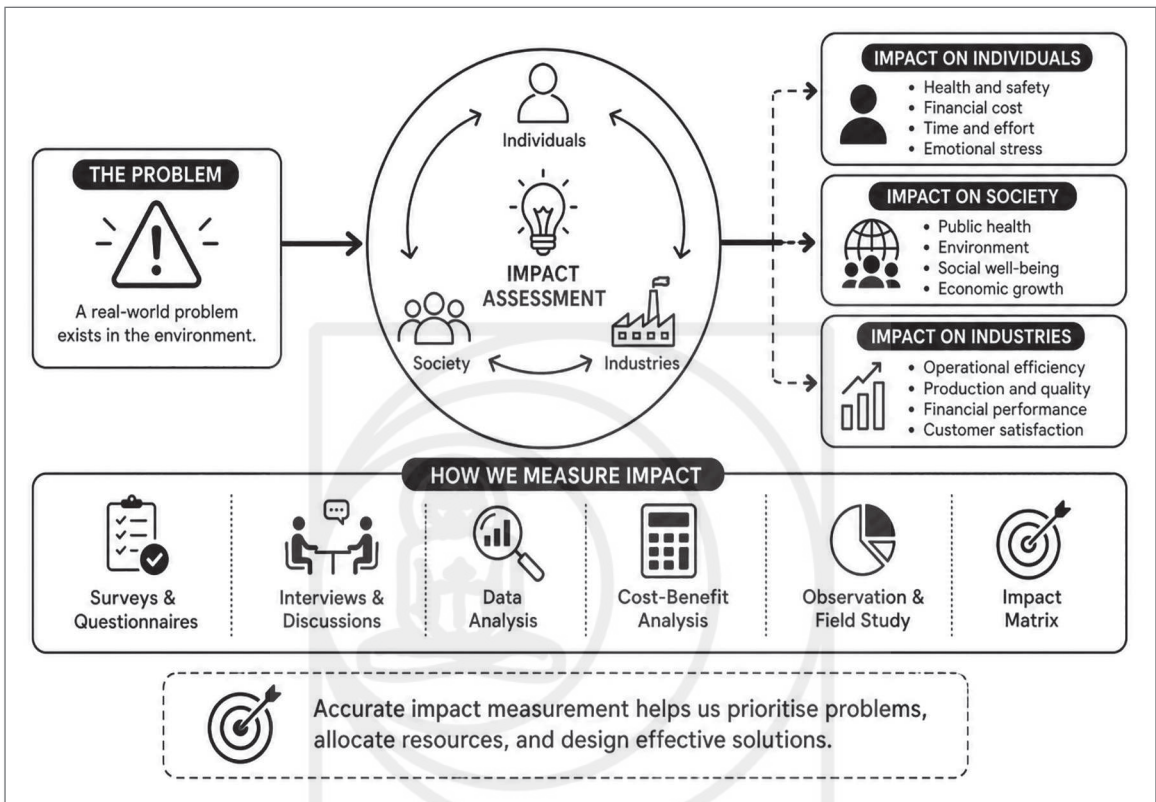


Fig. 6.3: Measuring the impact of problems on individuals, society, and industries

Example: Air pollution affects millions of people across cities, making it a large-scale public health and environmental challenge.

Impact on Individuals

Individuals experience problems in ways that directly influence their quality of life, health, finances, education, safety, and emotional well-being. Measuring these impacts helps identify user pain points and develop solutions that improve everyday experiences.

Problems can have multiple types of impacts. Health impacts affect physical well-being and may increase medical expenses, such as limited access to clean drinking water leading to waterborne diseases. Financial impacts create economic burdens, for example, rising fuel prices increasing transportation costs. Educational impacts reduce learning opportunities and academic performance, such as poor internet access affecting online learning. Psychological and emotional impacts increase stress, anxiety, and frustration, as seen when long hospital waiting times cause discomfort for patients and their families.

Impact on Society

Societal impacts refer to the effects of problems on communities, public services, social relationships, and overall quality of life.

Problems can also have a broader impact on society. Public health impacts increase the burden on healthcare systems and reduce workforce productivity, such as the spread of infectious diseases. Environmental impacts damage ecosystems and natural resources, for example, improper disposal of electronic waste polluting soil and water. Economic impacts reduce productivity and increase costs, as seen with traffic congestion causing fuel wastage and delays. Social impacts affect public well-being and equality, such as limited access to quality education widening the gap between urban and rural communities.

Impact on Industries

Industries experience operational, financial, technological, and reputational impacts when problems remain unresolved.

Problems also affect organisational performance in several ways. Operational impacts reduce efficiency through production delays and process disruptions, such as frequent machine failures. Financial impacts increase costs and reduce revenue due to waste, poor inventory management or declining sales. Customer impacts lower satisfaction and brand loyalty, as seen with slow customer support services. Technological impacts arise from outdated systems that reduce productivity, limit innovation, and increase cybersecurity risks.

Methods for Measuring Impact

Organisations and researchers use various methods to evaluate the significance of problems. Surveys and questionnaires collect user opinions, interviews provide detailed insights, and observation helps understand real-world user behaviour. Data analytics examines operational data and performance indicators, while cost-benefit analysis compares the cost of a problem with the benefits of solving it. An impact assessment matrix evaluates problems based on their severity, frequency, and social, economic, and environmental impact.

Real-World Examples of Problem Impact

- **Traffic congestion:** Increases travel time, fuel costs, stress, pollution, and logistics delays
Solution: Smart traffic management and improved public transport
- **Plastic waste pollution:** Causes health risks, environmental damage, and higher waste management costs
Solution: Recycling, biodegradable materials, and circular economy practices
- **Cybersecurity breaches:** Lead to financial losses, data theft, and business disruptions
Solution: Multifactor authentication, cybersecurity training, and regular security audits
- **Water scarcity:** Affects households, agriculture, and industries, reducing productivity and food security
Solution: Rainwater harvesting, smart irrigation, and water recycling
- **Air pollution:** Increases health problems, lowers productivity, and harms the environment
Solution: Renewable energy, electric vehicles, and emission control technologies

Importance of Measuring Impact

Measuring the impact of problems helps organisations prioritise issues that require immediate attention and allocate resources efficiently. It enables entrepreneurs to identify high-value business opportunities, assists engineers in improving system reliability, supports policymakers in developing evidence-based public policies, and encourages researchers to focus on challenges with the greatest societal significance. Impact assessment also facilitates monitoring and evaluation by providing measurable indicators that can be used to assess whether implemented solutions have achieved their intended objectives.

Activity 6.2: Impact of a Problem

Step 1. Select a real-world problem: Each group should select one problem from the given list or choose another issue relevant to their local community. Possible topics include traffic congestion, plastic waste pollution, water scarcity, food wastage, air pollution, cybersecurity threats, unemployment, power outages, poor public transportation or electronic waste. The selected problem will be analysed to understand its impact on individuals, society, and industries.

Step 2. Identify stakeholders: Identify and list the stakeholders affected by the selected problem. These may include individuals, families, students, businesses, government agencies, local communities, industries, and the environment, depending on the nature of the problem.

Step 3. Measure the impact: Discuss how the selected problem affects each stakeholder by analysing its economic, social, environmental, health, technological, and productivity impacts. This helps understand the overall significance of the problem and its consequences.

Support your observations with examples, statistics or news reports whenever possible.

Step 4. Rate the severity: Assign a score from 1 (very low) to 5 (very high) for each impact category. Calculate the total impact score.

Step 5. Classify the problem: Based on the total score, classify the problem as **low impact, moderate impact, high impact or critical impact**. This classification helps prioritise problems for effective decision-making and solution development.

Step 6. Recommend solutions: Suggest one short-term solution and one long-term innovative solution that could reduce the impact of the problem.

Step 7. Present your findings: Each group will present its analysis in 5–7 minutes, explaining the problem, stakeholders, impact assessment, and recommended solutions.

Student Worksheet**Part A: Problem Selection**

- Selected problem:
- Reason for selection:

Part B: Stakeholder Analysis

Stakeholders	How are they affected?

Part C: Impact Assessment

Impact categories	Description	Rating (1–5)
Economic impact		
Social impact		
Environmental impact		
Health impact		
Technological impact		
Productivity impact		
Total score: _____/30		

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Part D: Interpretation

Based on the total score, classify the impact.

- Low impact (1–10)
- Moderate impact (11–18)
- High impact (19–24)
- Critical impact (25–30)

Provide justification for your classification.

Part E: Solution Development

- Short-term solution:
- Long-term innovative solution:

Part F: Reflection Questions

1. Which stakeholder is affected the most, and why?
2. Which type of impact is the most severe?
3. What additional data would improve your analysis?
4. How can innovation reduce the impact of this problem?

PERFORMING GAP ANALYSIS TO IDENTIFY UNMET MARKET NEEDS

Gap analysis is a systematic process of comparing the current state of a product, service, process or market with the desired or expected state to identify differences, deficiencies, and opportunities for improvement. In the context of innovation and entrepreneurship, performing gap analysis to identify unmet market needs involves examining customer expectations, existing market offerings, competitor performance, and emerging trends to discover areas where customer needs are not fully satisfied (Fig. 6.4). These unmet needs represent market opportunities that can be transformed into innovative products, services or business models. Gap analysis enables entrepreneurs, engineers, researchers, and organisations to develop customer-centric solutions that create value, improve competitiveness, and address real-world challenges.

Every successful innovation begins by identifying opportunities that others have overlooked. Customers continuously seek products and services that are more affordable, efficient, reliable, sustainable, and user-friendly. However, many existing solutions fail to satisfy all customer expectations due to technological limitations, high costs, poor design, inefficient processes or changing consumer preferences. These differences between what customers expect and what is currently available in the market are known as market gaps.

Gap analysis is an essential strategic tool that helps organisations identify these opportunities by comparing customer needs with existing products and services. Rather than focusing solely on what competitors are offering, innovators study what customers still require but cannot obtain from the current market. This customer-focused approach enables organisations to develop differentiated solutions that provide greater value and achieve long-term competitive advantage.

In today's rapidly evolving business environment, customer expectations change continuously because of technological advancements, digital transformation, globalisation, and increasing environmental awareness. Organisations that regularly perform gap analysis can anticipate future market trends, respond quickly to changing customer demands, and create innovative solutions before competitors.

Consequently, gap analysis plays a critical role in product development, business strategy, engineering design, healthcare innovation, educational services, and public policy.

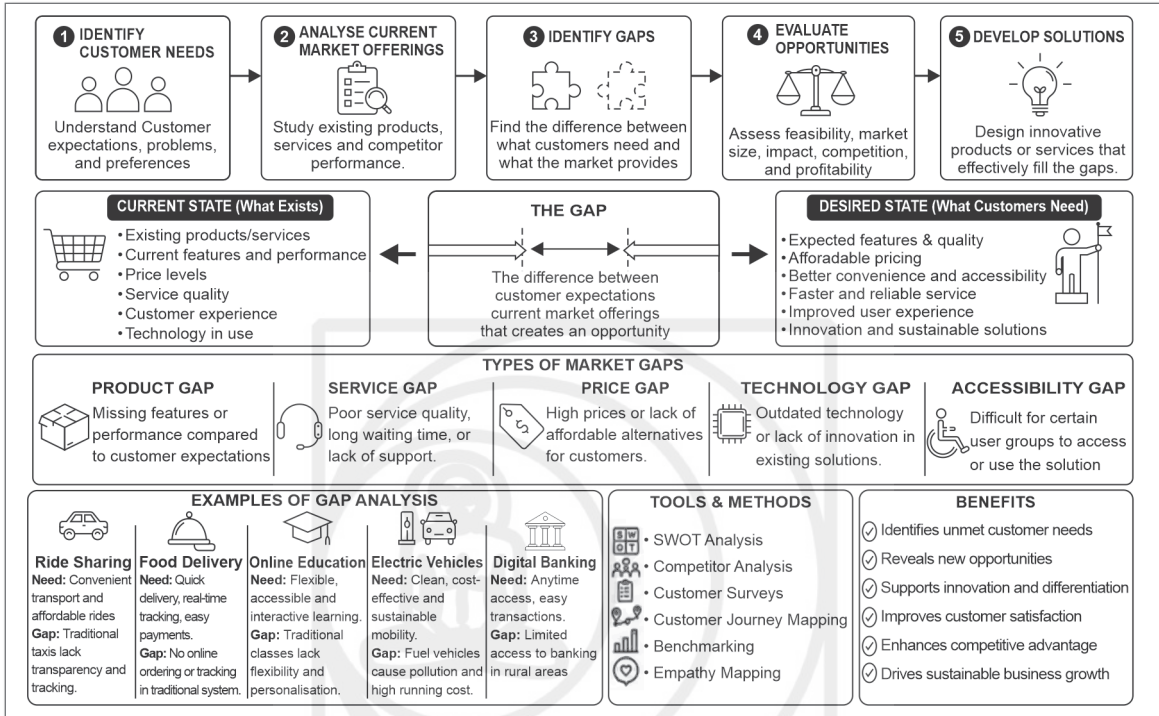


Fig. 6.4: Performing gap analysis to identify unmet market needs

Understanding Gap Analysis

Gap analysis compares two important conditions:

- Current state:** The existing products, services, technologies or processes available in the market
- Desired state:** The level of performance, quality, convenience, affordability or functionality expected by customers

The difference between these two states represents the market gap. This gap highlights opportunities where innovation can improve customer satisfaction and generate new business value.

For example, many people prefer environmentally friendly transportation, but traditional fuel-powered vehicles contribute to air pollution and rising fuel costs. The introduction of electric vehicles addressed this market gap by providing cleaner, energy-efficient transportation. Similarly, customers increasingly expect contactless payment methods, leading to the rapid growth of digital payment platforms and mobile banking applications.

Types of Market Gaps

- Product gap:** A product gap exists when available products fail to provide the features or performance customers expect.

Example: Many consumers required smartphones with longer battery life. Manufacturers responded by developing high-capacity batteries, fast-charging technologies, and energy-efficient processors.

2. **Service gap:** A service gap occurs when customers are dissatisfied with the quality, speed, accessibility or reliability of services.
Example: Long waiting times in hospitals encouraged healthcare providers to introduce online appointment booking systems and telemedicine services.
3. **Price gap:** Customers may require affordable alternatives to expensive products or services.
Example: High-priced software encouraged the development of subscription-based cloud software and open-source alternatives that offer similar functionality at lower costs.
4. **Technology gap:** Technological advancements often create opportunities to replace outdated systems with more efficient solutions.
Example: Traditional classroom teaching methods evolved into digital learning platforms that provide flexible and interactive education.
5. **Accessibility gap:** Products and services should be accessible to all users, including people with disabilities and those living in remote areas.
Example: Banking institutions introduced mobile banking applications to provide financial services to rural communities with limited access to physical bank branches.

Steps in Performing Gap Analysis

Step 1. Identify customer needs: The first step involves understanding customer expectations through observation, interviews, surveys, focus group discussions, online reviews, and market research.

Example: Restaurant customers may expect faster service, hygienic food preparation, digital payment options, and home delivery.

Step 2. Analyse existing solutions: Study current products and services available in the market by evaluating competitors, customer reviews, pricing strategies, product features, and service quality.

Example: A startup developing an online grocery delivery service compares existing applications based on delivery speed, pricing, product variety, and customer support.

Step 3. Identify market gaps: Compare customer expectations with existing products and services to identify market gaps. Common gaps include high prices, poor customer service, limited availability, complex user interfaces, lack of personalisation, slow delivery, poor product quality, and limited sustainability features.

Step 4. Evaluate the opportunity: Not every market gap leads to a successful business opportunity. Evaluate each opportunity based on market size, customer demand, technical feasibility, investment requirements, competition, revenue potential, and scalability to identify the most promising ideas for innovation and entrepreneurship.

Step 5. Develop innovative solutions: Design a product or service that addresses the identified market gap and delivers greater value to customers. Focus on key factors such as simplicity, affordability, sustainability, digital transformation, automation, personalisation, and an enhanced user experience.

Tools Used for Gap Analysis

Organisations use several analytical tools to identify unmet market needs, which are as follows:

SWOT analysis: Evaluates organisational strengths, weaknesses, opportunities, and threats

Competitor analysis: Compares products, pricing, customer satisfaction, features, and market positioning

Customer journey mapping: Visualises customer experiences to identify pain points and improvement opportunities

Empathy mapping: Helps understand customer thoughts, emotions, behaviours, and expectations

Survey and questionnaire analysis: Collects direct customer feedback regarding satisfaction and unmet needs

Benchmarking: Compares organisational performance with industry leaders to identify improvement opportunities

Ride-sharing platforms: Solved the lack of reliable taxis by offering Global Positioning System (GPS) tracking, digital payments, transparent pricing, and driver ratings

Online food delivery: Addressed the need for convenient food ordering through online ordering, live tracking, and cashless payments

Smart home technology: Improved convenience, security, and energy efficiency using Internet of Things (IoT)-enabled smart devices

Electric mobility: Met the demand for eco-friendly transportation with electric vehicles and charging infrastructure

Digital education: Bridged learning gaps through online classes, interactive content, digital assessments, and self-paced learning

Importance of Gap Analysis

Gap analysis provides organisations with a structured approach for identifying opportunities that competitors may overlook. It enables businesses to understand changing customer expectations, improve product quality, reduce business risks, and develop innovative solutions that create sustainable competitive advantages. By focusing on unmet customer needs rather than existing products alone, organisations can design solutions that improve customer satisfaction and increase market acceptance.

For entrepreneurs, gap analysis reduces uncertainty during product development by ensuring that new ideas solve genuine customer problems. Engineers use gap analysis to improve product performance and reliability, healthcare professionals identify opportunities for better patient care, educators enhance learning experiences, and governments improve public service delivery. In every sector, gap analysis supports evidence-based decision-making and continuous innovation.

Benefits of Gap Analysis

Performing gap analysis:

- Identifies unmet customer needs and market opportunities
- Supports customer-centred product and service development
- Improves strategic planning and resource allocation
- Encourages innovation and competitive differentiation
- Reduces the risk of product failure
- Enhances customer satisfaction and loyalty
- Supports sustainable business growth
- Enables organisations to adapt to changing market conditions

CONVERTING USER PAIN POINTS INTO CLEAR AND ACTIONABLE PROBLEM STATEMENTS

Converting user pain points into clear and actionable problem statements is the systematic process of transforming users' challenges, frustrations, unmet needs, and difficulties into well-defined problem descriptions that can guide innovation and solution development. A problem statement clearly identifies who is experiencing the problem, what the problem is, why it occurs, where it occurs, and how it affects

users without immediately suggesting a solution. It serves as a bridge between understanding user needs and generating innovative ideas. A well-written problem statement is evidence-based, specific, measurable, user-centred, and focused on the underlying problem rather than assumptions or predetermined solutions. It provides a clear direction for engineers, entrepreneurs, designers, researchers, and decision-makers to develop effective and sustainable solutions.

Understanding User Pain Points

User pain points represent the obstacles that users encounter while interacting with products, services, systems or processes. These pain points may be functional, emotional, financial, operational or accessibility-related. Understanding these challenges requires careful observation and evidence-based research rather than relying on assumptions.

For example, customers may become frustrated when an online shopping platform requires multiple payment verification steps, resulting in delayed purchases. Students may struggle to access learning resources because library books are unavailable or difficult to locate. Patients may experience anxiety because of lengthy waiting times before receiving medical consultation. These situations represent user pain points that require deeper investigation to understand their underlying causes.

Identifying pain points involves asking questions such as:

- What task is the user trying to accomplish?
- What difficulties are preventing success?
- How frequently does the problem occur?
- What are the consequences of the problem?
- What evidence supports the existence of the problem?

Answers to these questions help transform observations into clearly defined problems that can be investigated further.

What is a Problem Statement?

A problem statement is a concise and evidence-based description of a specific problem experienced by a clearly identified user or stakeholder. It explains the nature of the problem, its root causes, and its impact without proposing a solution. The purpose of a problem statement is to ensure that everyone involved in the innovation process understands exactly what challenge needs to be addressed.

An effective problem statement answers five fundamental questions:

1. What is the problem?
2. Who is affected by the problem?
3. Where does the problem occur?
4. Why does the problem exist?
5. How does the problem affect users or organisations?

A well-constructed problem statement creates a common understanding among stakeholders and establishes a strong foundation for brainstorming, design thinking, engineering analysis, and entrepreneurial innovation.

Characteristics of an Effective Problem Statement

A high-quality problem statement should possess the following characteristics:

- **User-centred:** The statement focuses on the needs and experiences of users rather than organisational assumptions.

- **Specific:** The problem is described clearly without ambiguity or unnecessary details.
- **Evidence-based:** The statement is supported by observations, interviews, surveys or research findings.
- **Actionable:** The problem is defined in a way that enables solution development and further investigation.
- **Solution-neutral:** The statement does not suggest a predetermined solution but concentrates on defining the challenge accurately.
- **Measurable:** Whenever possible, the statement includes measurable information such as frequency, duration, cost or the number of users affected.

Steps for Converting Pain Points into Problem Statements

Steps for converting pain points into problem statements have been summarised in Figure 6.5.

Example problem statement: *“College students experience long waiting times during lunch because the cafeteria operates only one billing counter during peak hours. This results in lost study time, overcrowding, and reduced customer satisfaction.”*

Notice that the statement defines the problem without recommending a specific solution.

Real-World Example

Healthcare

User pain point: Patients wait several hours before consulting doctors.

Problem statement: *“Patients visiting government hospitals experience excessive waiting times because appointment scheduling and patient registration are managed manually, resulting in delayed medical consultation, increased stress, and reduced patient satisfaction.”*

Common Mistakes When Writing Problem Statements

Many beginners make errors while defining problems. Common mistakes include:

- Describing symptoms instead of root causes
- Including a proposed solution within the problem statement
- Making assumptions without collecting evidence
- Writing vague or overly broad statements
- Ignoring the perspective of the user
- Failing to explain the impact of the problem

Avoiding these mistakes improves the quality of innovation and increases the likelihood of developing successful solutions.

Importance of Problem Statements in Innovation

Problem statements provide direction throughout the innovation process. They ensure that teams remain focused on solving meaningful challenges rather than pursuing unnecessary features or technologies. Entrepreneurs use problem statements to validate business opportunities, engineers define technical requirements, healthcare professionals improve patient care, educators enhance learning experiences, and governments design effective public policies.

A well-written problem statement also supports communication among stakeholders by providing a shared understanding of the challenge. It reduces misunderstandings, improves collaboration, and enables more efficient allocation of time, financial resources, and technical expertise.

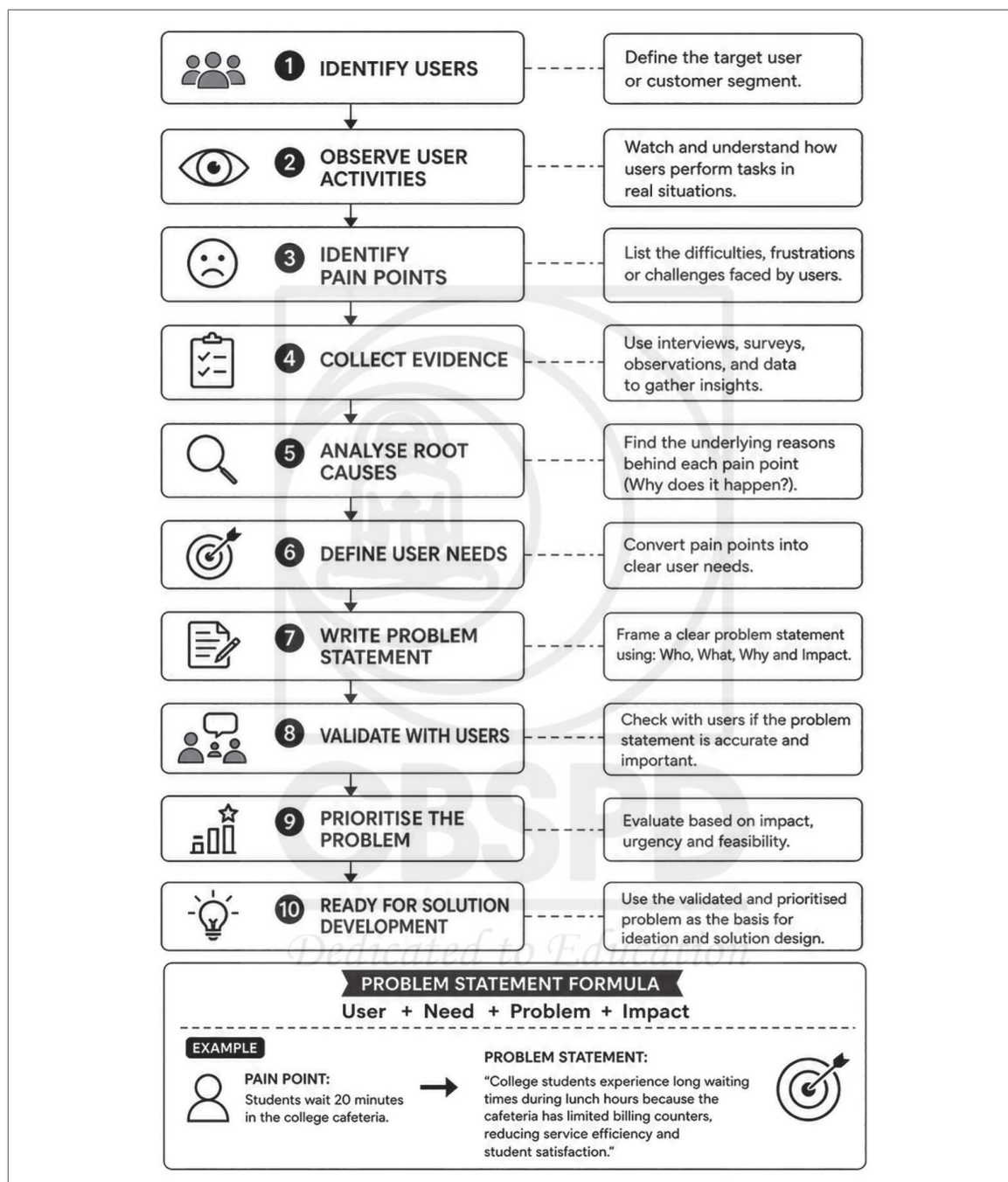


Fig. 6.5: Steps for converting pain points into problem statements

Summary of converting user pain points into a problem statement has been given in Figure 6.6.

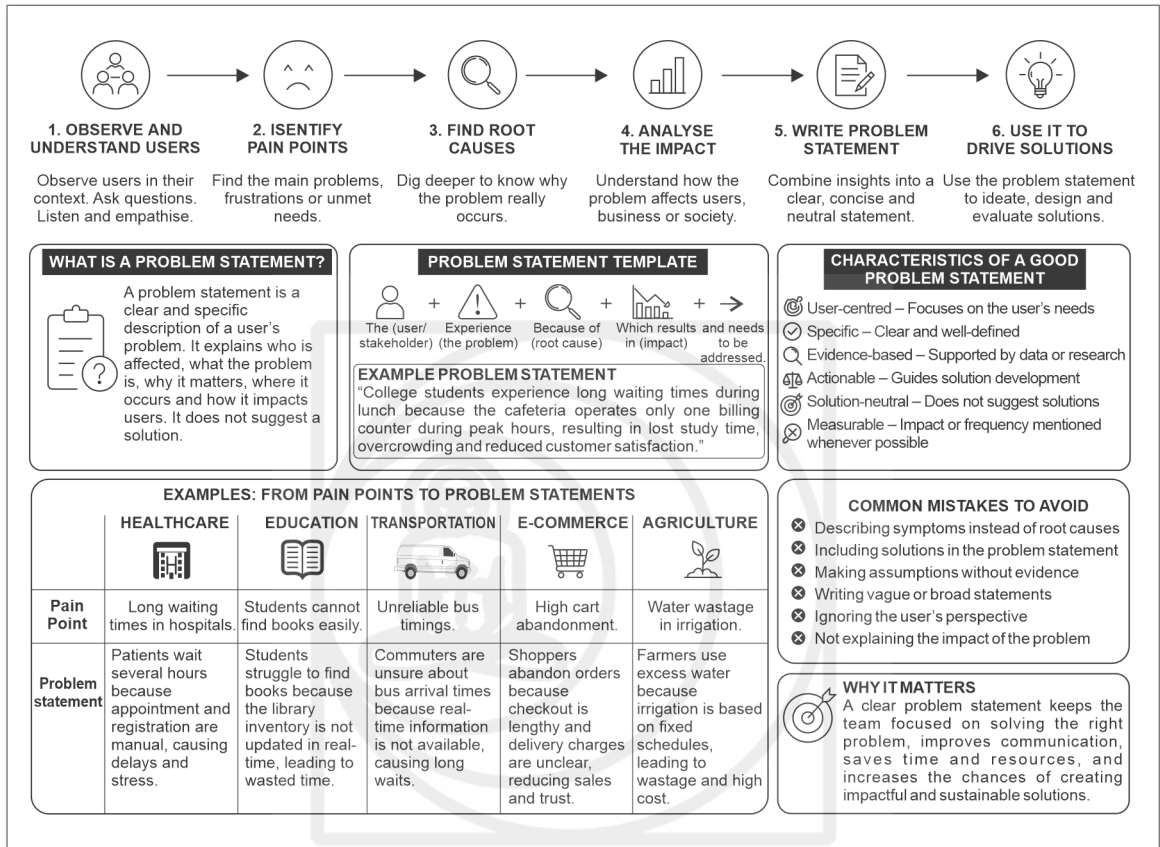


Fig. 6.6: Converting user pain points into clear and actionable problem statements

Activity 6.3: Converting Pain Points into a Statement

Step 1. Select a user: Choose one user or stakeholder from the following categories:

User groups	Examples of needs
Student	Easy access to learning resources and quality education
Faculty member	Efficient teaching tools and academic support
Hospital patient	Timely, affordable, and quality healthcare services
Farmer	Reliable irrigation, market access, and modern farming support
Shopkeeper	Increased sales, efficient inventory, and secure digital payments
Office employee	Productive work environment and efficient digital tools
Public transport passenger	Safe, reliable, and punctual transportation
Senior citizen	Accessible healthcare, transportation, and user-friendly services
Small business owner	Affordable technology, financial support, and business growth opportunities

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Step 2. Identify user pain points: Observe or interview the selected user and list at least five challenges they experience during their daily activities.

Pain points	Description
Long waiting time	Delays in receiving services or completing tasks
High service cost	Services or products are expensive or unaffordable.
Poor accessibility	Difficulty accessing products, services or facilities
Lack of information	Insufficient or unclear information for decision-making
Equipment failure	Malfunctioning equipment disrupts normal operations.
Complex procedures	Complicated processes that waste time and effort
Safety concerns	Risks that threaten the health or safety of users

Step 3. Analyse the pain points: For each identified pain point, describe what is happening, why it is occurring, who is affected, what impact it creates, and what evidence or observations support the existence of the problem. This analysis helps develop a clear and evidence-based problem statement.

Step 4: Write a problem statement: Use the following template to convert the pain point into a clear and actionable problem statement.

Problem statement template: *“The (user/stakeholder) experiences (specific problem) because (root cause), resulting in (impact). Therefore, there is a need for (desired improvement or opportunity).”*

Example: *“College students experience long waiting times during lunch because the cafeteria has only one billing counter, resulting in overcrowding and loss of study time. Therefore, there is a need for an efficient queue management and digital ordering system.”*

Step 5. Validate the problem statement: Review your problem statement using the following checklist:

- Is the problem based on real evidence?
- Is the affected user clearly identified?
- Is the root cause included?
- Is the impact clearly explained?
- Does the statement avoid suggesting a specific solution?
- Can the problem be investigated further?
- Revise the statement if necessary

Step 6: Present and discuss: Present your problem statement to your classmates. Discuss:

- Is the problem clearly defined?
- Is it specific and measurable?
- Can it lead to an innovative solution?

Revise the statement based on peer feedback.

PRIORITISING PROBLEMS BASED ON FEASIBILITY, IMPACT, AND INNOVATION POTENTIAL

Prioritising problems based on feasibility, impact, and innovation potential is a systematic decision-making process used to evaluate multiple problems and determine which should be addressed first. Criteria, process,

matrix example, and benefits of problem prioritisation, along with common mistakes in problem prioritisation and examples of problems prioritised in different sectors, are summarised in Figure 6.7.

Importance of Problem Prioritisation in Innovation and Entrepreneurship

Problem prioritisation is one of the most important decision-making activities in entrepreneurship and innovation. Successful startups rarely attempt to solve every identified problem. Instead, they concentrate on high-impact challenges that are technically feasible and commercially attractive. Engineers prioritise projects that improve safety, reliability, and efficiency. Healthcare professionals focus on interventions that benefit the greatest number of patients. Governments allocate resources to issues that generate maximum public welfare. In every sector, systematic prioritisation ensures that innovation efforts create meaningful and sustainable value.

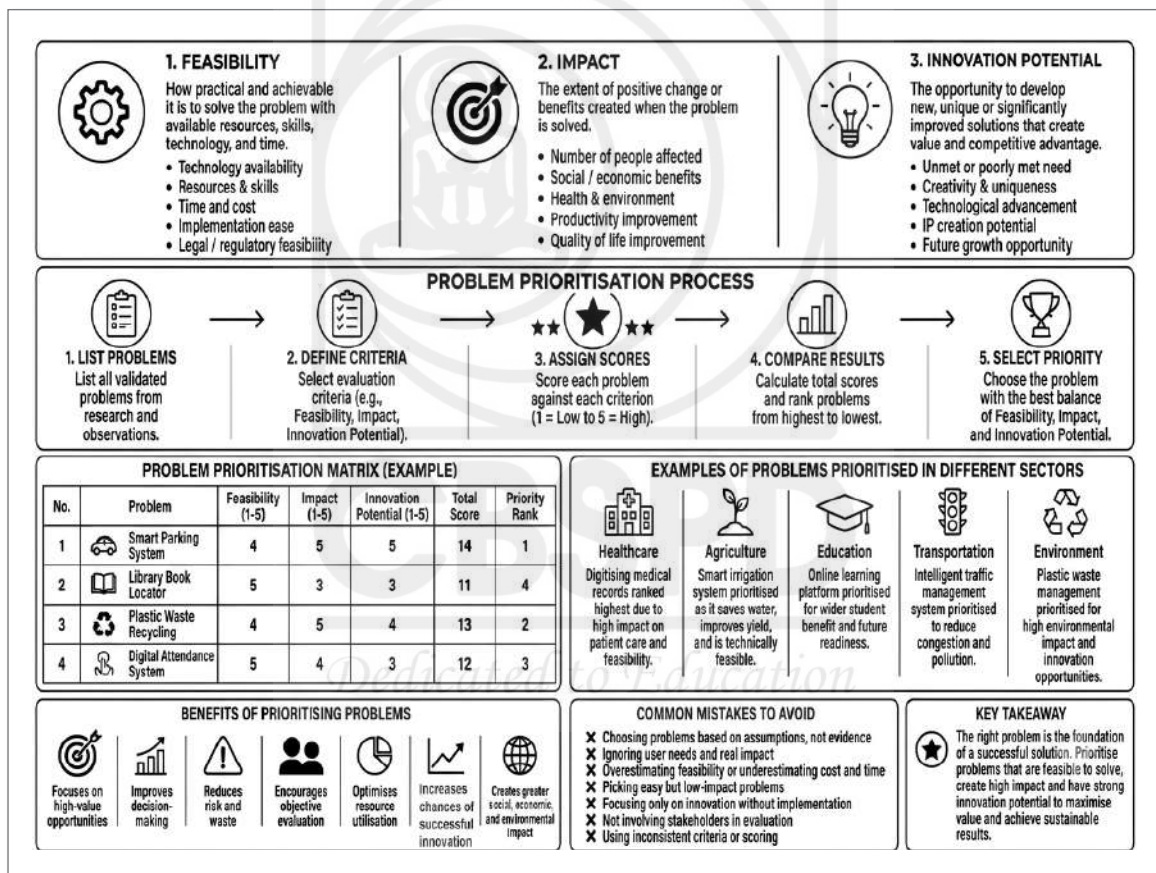


Fig. 6.7: Prioritising problems based on feasibility, impact, and innovation potential

Activity 6.4: Prioritising Problems

Step 1. Identify problems: Each group should list five real-world problems identified through observation, surveys, interviews or previous classroom activities.

Examples of problems that can be analysed and prioritised include long waiting times in the college cafeteria, plastic waste on campus, inefficient public transportation, water leakage in hostels, lack of parking space, food wastage in the canteen, and limited accessibility for persons with disabilities. Students can evaluate these issues based on their impact, feasibility, and urgency to identify the most suitable problem for developing an innovative solution.

Step 2. Define evaluation criteria: Evaluate each problem using the following criteria:

- **Feasibility:** Can the problem be solved with available technology, skills, and resources?
- **Impact**
 - How many people are affected?
 - How significant are the social, economic or environmental consequences?
- **Innovation potential**
 - Does the problem provide opportunities for creative or unique solutions?
 - Is there potential for entrepreneurship or commercialisation?

Assign a score from 1 (very low) to 5 (very high) for each criterion.

Step 3. Complete the problem prioritisation matrix: Calculate the total score for each problem. The problem with the highest total score should receive the highest priority for further investigation and solution development.

Step 4. Justify your ranking: Discuss why the selected problem received the highest priority. Support your decision with evidence gathered through observation, interviews, surveys or secondary research.

Step 5. Present your findings: Each group will present the identified problems, their evaluation scores, the priority ranking, the justification for selecting the highest-priority problem, and one innovative solution to address the selected challenge.

Student Worksheet

Part A: List of Identified Problems

Part B: Problem Prioritisation Matrix

Problems	Feasibility (1–5)	Impact (1–5)	Innovation potential (1–5)	Total score	Priority rank

Part C: Highest Priority Problem

- **Selected problem:**
- **Reason for selection:**

Part D: Proposed Innovative Solution

Describe one innovative solution for the selected problem.

Part E: Reflection Questions

1. Why is it important to prioritise problems before developing solutions?
2. Which evaluation criterion had the greatest influence on your decision, and why?
3. How can feasibility influence the success of an innovative idea?
4. If additional resources were available, would your priority change? Explain your answer.