A 3D illustration featuring several stylized human figures in various colors (orange, purple, red, teal, pink, blue, green) scattered across a white surface. Each figure has a speech bubble above it, and the word "NEED" is written inside each bubble in a color matching the figure. The bubbles are of varying sizes and orientations, creating a sense of dynamic communication. The background is a plain white surface with soft shadows under the figures and bubbles.

GNG1103 – Engineering Design

GNG1503 – Génie de la conception

Customer Needs Identification and Problem Statement Definition

Presented by: Emmanuel Bouendeu

Image from: <http://www.catalystinc.com/crm/using-market-research-uncover-unmet-customer-needs/>

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Agenda

- Quiz 1
- Reminders
- Reflection & Takeaways of Gift Giving Experience
- **Review Questions**
- **Customer Needs Identification**
 - What Is? Why? User & Customer
 - Process, Planning, Interview, Lead User
 - Case Study Application
 - ❖ Customers & Users
 - ❖ Conversion of Client Statements into Interpreted Needs
 - ❖ Organization & Prioritization of Interpreted Needs
- **Problem Definition**
 - Problem Statement & Attributes

Reminders

- Due date for **Deliverable A** (Team Contract): [Jan 19](#)
- Due date of **report of Lab1**: [Date of your Lab 2](#) (Arduino)
- **Client Meet 1**: [Jan 20](#), do some researches and prepare your questions.
- Due date for **Deliverable B** (Needs & Problem): [Jan 26](#)
- What is your summary of **Lecture 3**?
 - Definition of design thinking
 - Empathy and importance of beginner's mentality
 - Importance of rapid iterative prototyping
 - Steps involved in design thinking methodology

Gift Giving Experience: Reflection & Takeaways

1. How did engaging your partner **change the direction** of your prototype?

- ✓ *Identify What **matters most** to partner*
- ✓ *Allow to **change** something or **add** details*
- ✓ *Be able to **customize** the prototype*

2. How was showing an **unfinished product**?

- ✓ ***Annoying**, but **rewarding***
- ✓ *Chance to see the **difference** between your partner's vision and what you thought he wanted*

Gift Giving Experience: Reflection & Takeaways

3. How did the **pace** feel? (**Quick iterative cycles**)

- ✓ Sometime *crazy*
- ✓ Force to become *creative*
- ✓ *Inspire* the final solution

4. How will **design thinking** **impact** the way you will do things moving forward?

- ✓ Understand the importance of *empathy*
- ✓ Check the *right direction* of the work
- ✓ *Learn quickly* and save time

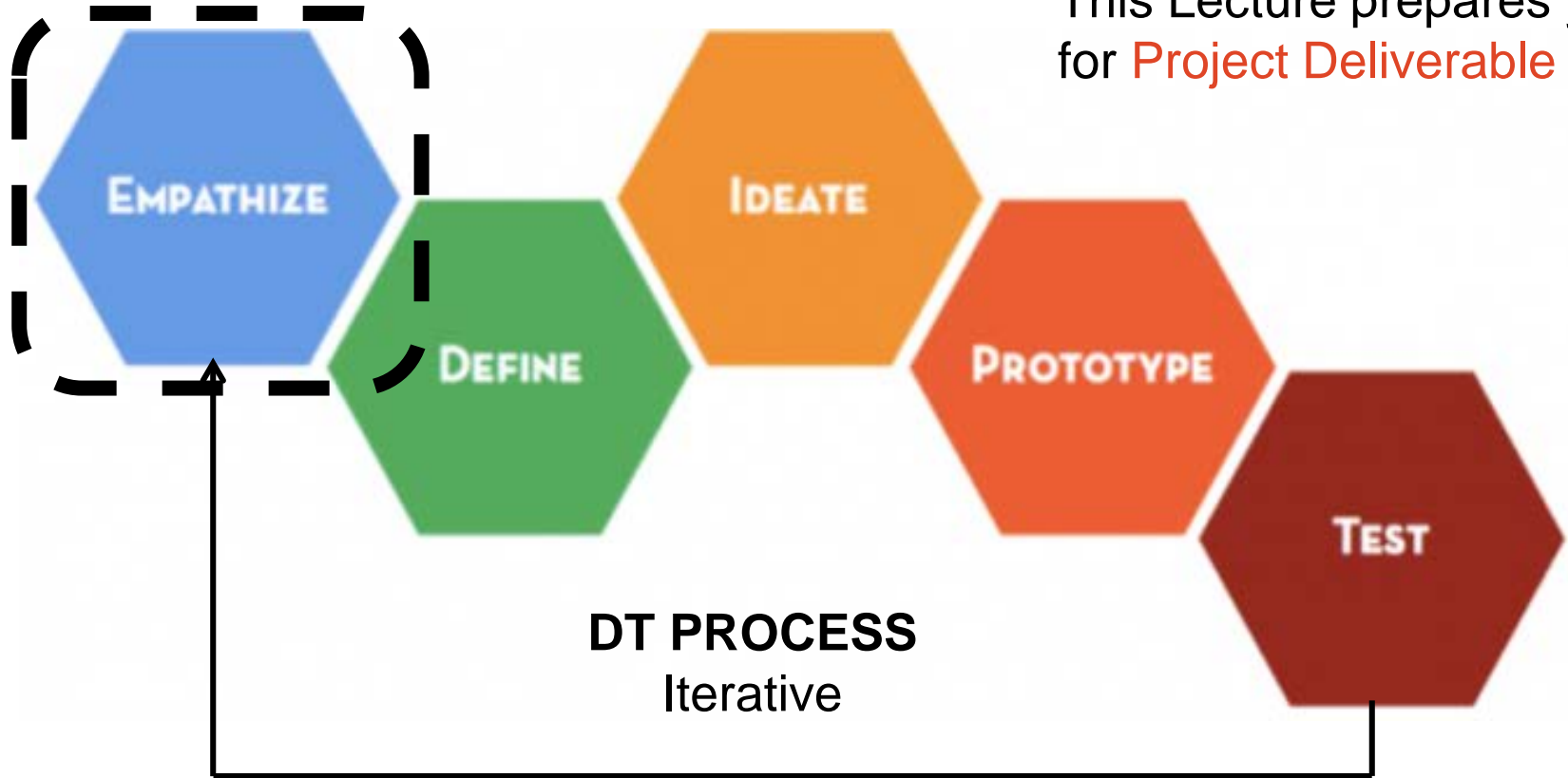
Review Questions

1. Describe the **process of customer needs identification** in engineering design.
2. What is the difference between a customer and a user? What is a **lead user**?
3. What are the considerations for a good interview as applied to the **client of your course project**?
4. What is a **problem definition**? List the **attributes** of a good problem statement.
5. Among the needs statements below, identify the good or bad ones
 - A. The stretcher must be controlled mechanically
 - B. The stretcher can be easy to stop
 - C. The customer needs an affordable stretcher
 - D. The stretcher can be portable and storable



Design Thinking Process

This Lecture prepares you for **Project Deliverable B**



What Is Customer Needs Identification?

Customer Needs Identification is the process of determining **what and how** a user interacts with a product. User needs are **non-technical**, and they reflect the users' perception of the product, **NOT** the actual design specifications. Although they are frequently closely related



Are They Customers or Users?

- A user is a person who **uses** the product
- Customer is the person who **pays** for the product
- They are sometimes the same **BUT** are often different
- In this course “customer” and “user” may be used interchangeably. However, **BE AWARE** of the relationship which exists between the two



Goals of Customer Needs Identification

- **Focuses** the product development process on the **actual needs** of the customer
- **Helps** to both **identify** the more obvious **explicit needs**, but also the less obvious **latent needs**



How Do We Identify Customer Needs?

1. Gather **raw data** from customers
2. **Interpret** the data in terms of customer needs
3. **Organize** the needs
4. Establish **relative importance** of needs
5. **Reflect** on the **results**



Before You Start.....: Planning

- Determine **who** the customers are
- Determine **what** information should be gathered from the customers
- Determine **how** that information should be gathered



1. How Do You Gather Raw Data?

- **Observation:** Seeing someone **struggle** with a problem is an easy way to get an understanding of the issue
 - **Passive:** **watch** a user in their **natural environment**
 - **Active:** **work side-by-side** with the user and gain an understanding of their problems from their perspective
- **Interviews:** **One-on-one meetings** with potential users. They frequently take place in the user's environment
- **Focus groups:** **Focus groups** are like expanded interviews. They involve about 8 to 12 customers. The group is led in a discussion by an interviewer

How Would You Gather Raw Data In The EWB Case?

- Go to India, live in the village for few days/weeks if possible
- Observe the villagers when they do their daily chores
- Interview the villagers (more than one)
- See if you can get a group together and form a focus group (town hall meeting?)



How Do You Prepare For a Successful Interview?

- Prepare an **interview script**, but don't be afraid to **deviate if appropriate**
- Ideally, interviews should be done with **all “customers”**
- **Suppress preconceived hypothesis** about the needs
- Have the user **demonstrate the product** and/or **typical related tasks**
- Be alert for **surprises** and the expression of needs you **hadn't considered**. Pursue surprising answers with **follow-up questions**
- Watch for **non-verbal information**

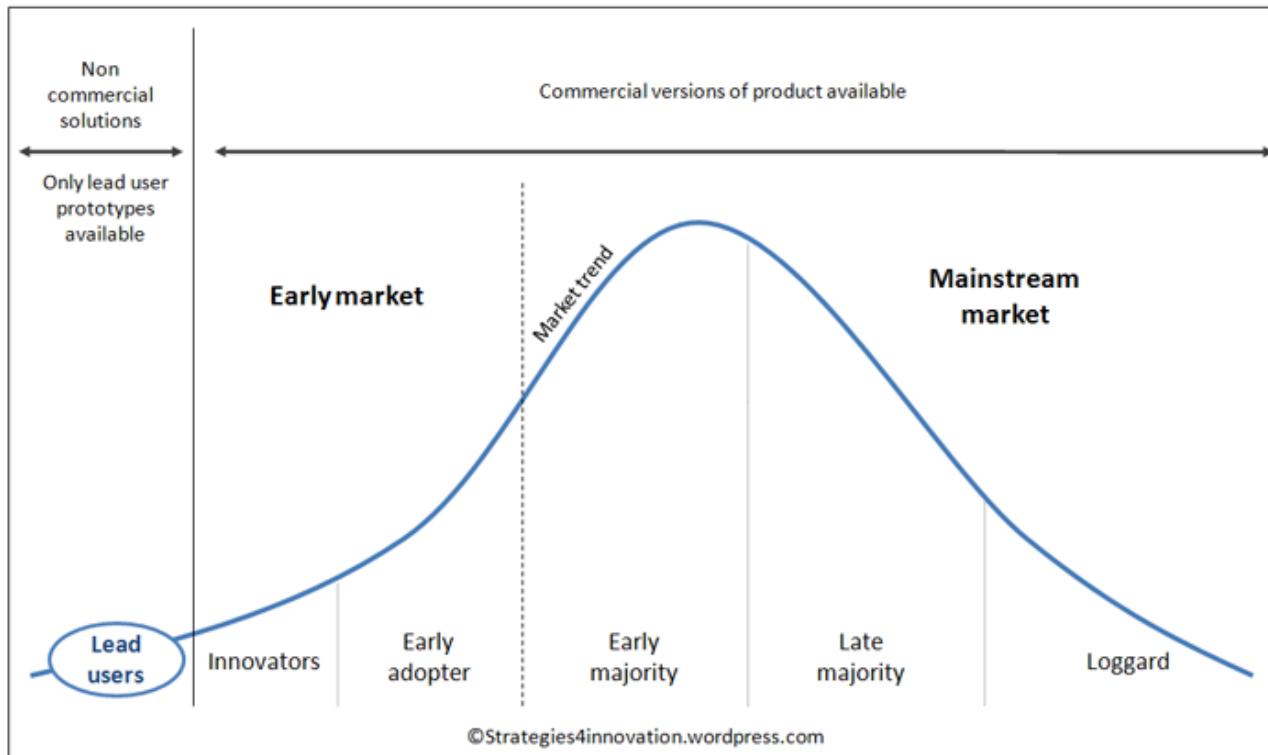


Lead users

- Users that are *experiencing needs that are ahead of the targeted market(s)*. Often, they *help develop* product or service prototypes to satisfy their leading edge needs which may become *commercially attractive* to firms
- The three types of lead users are:
 1. lead users of the *target application and market*
 2. lead users of *similar applications* in advanced “analog” markets
 3. lead users with respect to *important attributes* of problems faced by users in the target market



Lead users



Who Are the Lead Users in the EWB Case?

- First, you will need to **identify a specific problem**. The problem could be:

“cost of water storage devices”

- Then, you could identify:
 - Villagers who have **solved their water problem**
 - Other **villages in India** who have dealt with the issue
 - Someone who has developed **cheap containers** for storing something completely different than water

2. Interpreting the Data

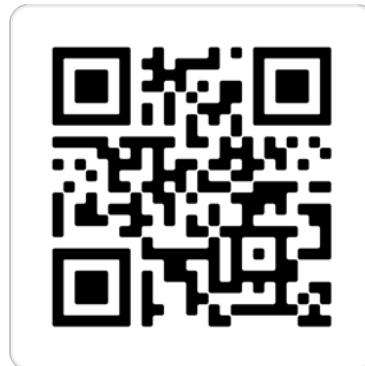
- Suggestions and constraints for expressing the data:
 - Write the needs in terms of **what the product has to do**, not how it might do it
 - Express the needs as **specifically** as the raw data implies
 - Use **positive** phrasing
 - Express the needs as an **attribute** of the product, use only **ONE** attribute per statement
 - Avoid the words **must** and **should** (*this can be done later in the product specification phase*)

3. Organize the Needs

- **Print** each need statement on a **card or Post-It note**
- **Eliminate redundant** statements
- **Group** the statements according to the **similarity** of needs they express
- **Choose** a **label** for each group
- **Consider** “**super groups**” of 2-5 groups
- **Review and edit** the organized needs statements

Course Attendance: Registration

- Use your smartphone or laptop to **register/notify** your attendance in this lecture
- Allow **geo location** in the attendance site
- Accept **cookies** from third parties applications
- Log in using only your **Uottawa** account at the link below
<https://attendance.azarm.ca/attendancerecord/gng1103f>
- Your attendance must be registered only **during the lecture** and at the **time specified by the professor**
- You can also use the **QR code** below, to register quickly



4. Establish Relative Importance

- Two basic approaches:
 - **Consensus** of the team
 - Further **customer surveys**
- A **numerical ranking** process is a common tool. For example:
 - 5 – Satisfying the need is **critical**
 - 4 – Satisfying the need is **highly desirable**
 - 3 – Satisfying the need would be **nice**, but is not necessary
 - 2 – Satisfying the need is **not important**
 - 1 – Satisfying the need is **undesirable**



5. Reflect On the Process

- Consider the statements that have been gathered and **study their interpretations**
- Try to evaluate how the process was executed:
 - Have **all types** of customers been interviewed?
 - Do any customers require **follow-up interviews**?
 - Are any of the needs **surprising**?
- Look for ways to **improve or refine** the Customer Needs Identification process:
 - Would **more** interviews help? **Less**?
 - How about **focus groups**?
 - Could the process have been done **faster**?
- Remember, as of now there are **no product specifications!** This entire process is about ***identifying needs, not designing solutions***. That comes later

SKI-HILL RESCUE DEVICE (CASE STUDY) WCDE 00395-01

DEVELOPED BY THE
UNIVERSITY OF WATERLOO



Rescue Toboggan Handling



<https://youtu.be/9aRXj4TeGf4>

genie.uOttawa.ca | engineering.uOttawa.ca

Example of Most Commonly Used Rescue Device



Case developed by the university of Waterloo (Module 01, Figure 2)

Who Are the Customers and Users?

- Injured persons
- Ski patrollers
- Ski hill owners



Gathering Raw Data: Customer Interviews

Question	Customer Statement	Interpreted Need
Typical Uses	I need a stretcher to transport injured people down the hill easily and safely	
	When I get a rescue call, I need to take it up the hill	
Likes – Current Tools	I like when it is cheap	
Dislikes – Current Tools	I don't like that it is hard to control	
	I don't like that it is heavy	
	When there is a patient, I sometimes lose control and the stretcher becomes hard to stop	
	If I lose control, there is no way to stop it	
Suggested Improvements	It is better if it is more compact to store	

Group Activity 1 (6min)

- Divide yourselves into groups of 3-5 people
- Interpret the customer need

2. Interpreting the Data

- Suggestions and constraints for expressing the data:
 - Write the needs in terms of **what the product has to do**, not how it might do it
 - Express the needs as **specifically** as the raw data implies
 - Use **positive** phrasing
 - Express the needs as an **attribute** of the product, use only **ONE** attribute per statement
 - Avoid the words **must** and **should** (*this can be done later in the product specification phase*)

Class Discussion: Interpreting the Data

Question	Customer Statement	Interpreted Need
Typical Uses	I need a stretcher to transport injured people down the hill easily and safely	The stretcher can be controlled
	When I get a rescue call, I need to take it up the hill	The stretcher is Compact in size when carried up the hill
Likes – Current Tools	I like when it is cheap	The stretcher is low cost
Dislikes – Current Tools	I don't like that it is hard to control	The stretcher can be controlled
	I don't like that it is heavy	The stretcher is light weight
	When there is a patient, I sometimes lose control and the stretcher becomes hard to stop	The stretcher is easy to stop
	If I lose control, there is no way to stop it	The stretcher is capable of stopping when out of control
Suggested Improvements	It is better if it is more compact to store	The stretcher is Compact in size when stored

Organize and Prioritize the Needs

Number	Need	Importance
1		
2		
3		
4		
5		
6		
7		

Group Activity 2 (3min)

- In the same groups, organize and prioritize the customer needs



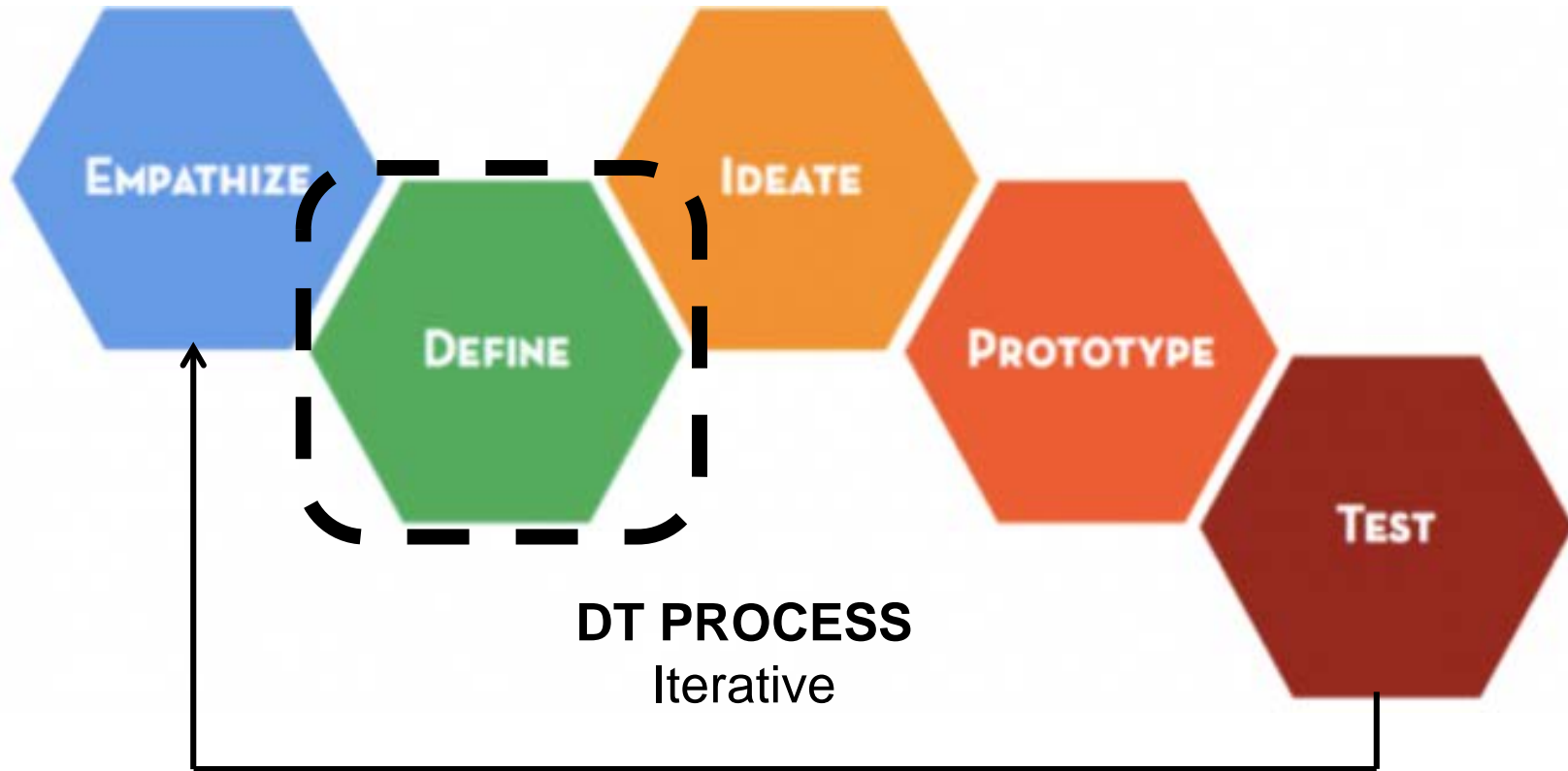
Class Discussion

Legend

- 5 – Critical
- 4 – Highly desirable
- 3 – Desirable, but not necessary
- 2 – Not important
- 1 – Undesirable

Number	Need	Importance
1	The stretcher can be controlled	5
2	The stretcher is easy to stop	4
3	The stretcher is capable of stopping when out of control	5
4	The stretcher is low cost	2
5	The stretcher is light weight	3
6	Compact in size when stored	2
7	Compact in size when carried up the hill	3

Turning Customer Needs Into a Problem Definition



What is a Problem definition?

A **problem definition** is a claim of *one or two* sentences in length that outlines the problem that will be *addressed by the design process* based on the *customer needs*.



What Does It Include?

- A **good** problem statement should answer these questions:
 1. **What** is the problem? This should explain **what needs** are being addressed
 2. **Who** has the problem or who is the client/customer/end-user? This should explain **who needs the solution** and who will decide if the problem has been solved (**solved really well**)
- Additionally, the statement can also include the following:
 3. **What form** can the solution be? **What is the scope** and limitations (e.g. in time, money, resources, technologies) that can be used to solve the problem?



Be Careful!

- The **primary purpose** of a problem statement is **to focus the attention** of the problem solving team
- However, if the focus of the problem is **too narrow** or the scope of the **solution too limited**, the **creativity and innovativeness** of the **solution can be stifled**
- Problem definition should be **short, specific** and **sexy**



Group Activity 3 (3min)

- In your same group, create a problem statement problem
- **Remember!** A problem statement should be **short**, **specific** and **sexy!**

Problem Definition

*“A need exists for **ski patrollers** to safely and easily transport injured persons down a ski-hill with a **portable device** that is easy to control, compact and cost effective for owners”*

Preparation For Lecture 6 – Design Criteria

- Read the engineering design case study entitled:
“Ski-Hill Rescue Device”
- It can be found in the folder of Lecture 4 on BrightSpace



Preparation for Lecture 5 – Client Meeting 1

- Next lecture, you will be **meeting your client**
- They will present their needs related to the class project
- As a class you will then have the opportunity to question the client in an **open discussion**
- To facilitate this process, we would like to **generate a list of questions in advance** regarding **uncertainties** or **knowledge gaps** related to the project
- Each student should provide **ONE** question for the client.
 - The due date of your question in PDF file in BrightSpace under the directory “**Question to Client**” is **January 18th**,