



CS 77 11 – Creative and
Innovative Project Laboratory

VII Semester (Group I)

Prepared by Ms.V.Suganya

CS 7711 - Creative and Innovative Project Laboratory

The laboratory course 'Creative and Innovative Project' would an opportunity for you to explore an interesting problem of your choice in the context of a real-world data set. You can either choose one of the suggested projects we provided or pick your own topic. Do not hesitate to discuss your project with the instructors to get feedback on your ideas.

Course Objectives

- To identify the problem based on societal needs
- To interview people on societal problems that require computerization
- To suggest creative solutions to societal problems
- To explore possible alternative solutions
- To estimate risk and develop a prototype

The aim of this course is to encourage the students to identify projects that help in exploring variables that promote creativity and innovation. Each student is expected to choose a real life or socially relevant problem. At the end of the project, students should be familiar with the state of art in their respective fields. They would be able to apply the concepts learnt to relevant research problems or practical applications. This course is to motivate them to learn concepts, models, frameworks, and tools that engineering graduate need in a world where creativity and innovation is fast becoming a pre-condition for competitive advantage.

Course Outcomes

Upon completion of this course, the students will be able to

- Convert user requirements to a software architecture diagram
- Identify and specify the pre-processing necessary to solve a problem
- Suggest optimum solutions by comparing the different solutions from an algorithmic perspective
- Discover the research implications in any societal problem
- Design and use performance metrics to evaluate a designed system
- Perform SWOT and PESTEL Analysis

General Guidelines

The CIP Laboratory would follow a typical SDLC approach. Review I would cover **Analysis and Initial level of Design**. Review II concentrates on selection of appropriate (!) algorithm for the project and getting started with Implementation. Review III coerce **100% implementation and Initial Testing** activities. Lastly, after Test Analysis, the project would be presented before a panel for Evaluation.

The project shall be done as a **Team of size n, where n not exceeding two**. You are appreciated to do Individually without consideration of team size while complexity is considered during evaluation. Choose your partner (Project !) wisely, you may not change later.

The assignments should be submitted (both Online & Offline) before the deadline. If submission is delayed penalties apply as follows:

- up to 24h - 10% penalty
- up to 7x24h - 50% penalty
- more than 7x24h - 100% penalty

Important Dates

S.No	Type	Date	Deliverables
1.	Review I	27.07.2018 #	Domain / Tentative Title Problem Statement (creative & Innovative !!) Architecture Preliminary Experiment set-up
2.	Review II	31.08.2018 #	Algorithm and Methodologies 60 % Implementation
3.	Review III	28.09.2018 #	100% Implementation Test Plan
4.	Viva-Voce	26.10.2018 #	Metrics & Test Analysis Performance Evaluation Power Point Presentation

Mail your submissions to creativeazzign@gmail.com on or before 12.00 PM on the mentioned date (Two hours before the contact laboratory)

Schedule

#	Date	Activity	Deliverables
1.	06.07.2018	Idea Generation Scenario Modelling Requirement Validation Dataset Identification	
2.	13.07.2018	Stakeholders (Use Cases) Module Segregation Block Diagram with Input and Output	Title Technique & Dataset Significance Report
3.	20.07.2018	Feasibility Study Tools and Techniques Platform for Experimentation	SWOT & PESTEL analysis Detailed design (Frameworks/ Models / Concepts) Literature Survey
4.	27.07.2018	Review I	Experiment Set-up Presentation
5.	03.08.2018	Identifying Existing approaches to the Problem Proposed/ Modified solution Identify relevant Algorithm to solve the problem	Suggestion of Review I to be included under relevant topics
6.	10.08.2018	Implementation	Justification for the selected algorithm(s)
7.	17.08.2018	Implementation	20% Completion
8.	24.08.2018	Implementation	40% Completion
9.	31.08.2018	Review II	60% Completion Presentation & Demo
10.	07.09.2018	Implementation, Testing	80% Completion
11.	14.09.2018	Testing	100% Completion Test Plan
12.	21.09.2018	Holiday (Muharram)	
13.	28.09.2018	Review III	Integration of modules Preliminary Demo
14.	07.10.2018	Performance Evaluation & Metrics	Test Analysis /Demo
15.	14.10.2018	Holiday (Vijaya Dasami)	
16.	21.10.2018	Viva Voce	Presentation

4 golden rules of Ideation



RULE #1 / THERE ARE NO BAD IDEAS

Indeed, often times, initial ideas just sound absurd - and "this can't work" is the first thing you may have in mind. However, great business concepts are an unusual combination of (not-so) crazy ideas that become meaningful when combined together.

RULE #2 / CAPTURE EVERYTHING

In the heat of the action, brilliant ideas might get lost ("it is such a good idea, tomorrow we'll remember it for sure". You won't). There is only one way to solve this: capture every idea on your note.



RULE #3 / GO FOR HYBRID BRAINSTORMING

In the heat of the action, brilliant ideas might get lost ("it is such a good idea, tomorrow we'll remember it for sure". You won't). There is only one way to solve this: capture every idea on a note.

RULE #4 / QUANTITY OVER QUALITY

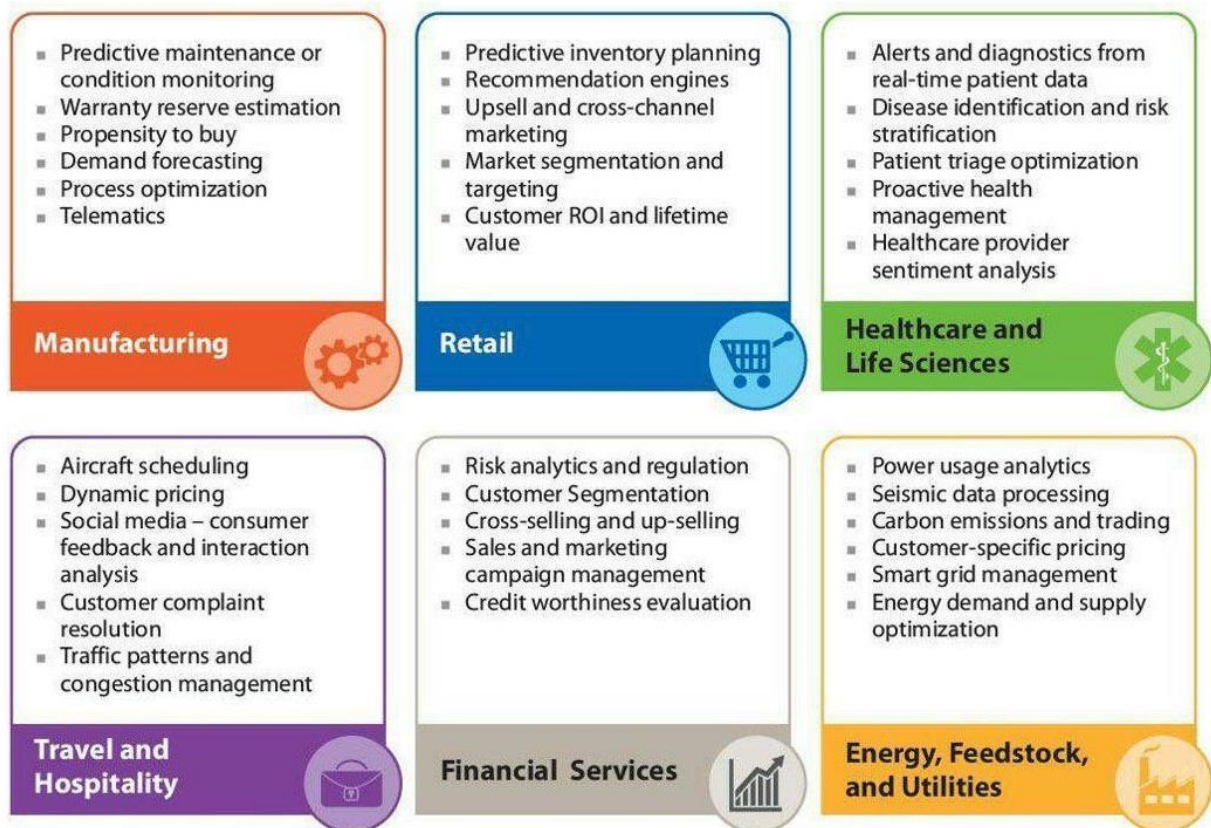
The old adage "Quality over Quantity" doesn't hold during ideation exercises. There is nothing like thinking about the quality or feasibility of ideas to stop the creative juice from flowing.



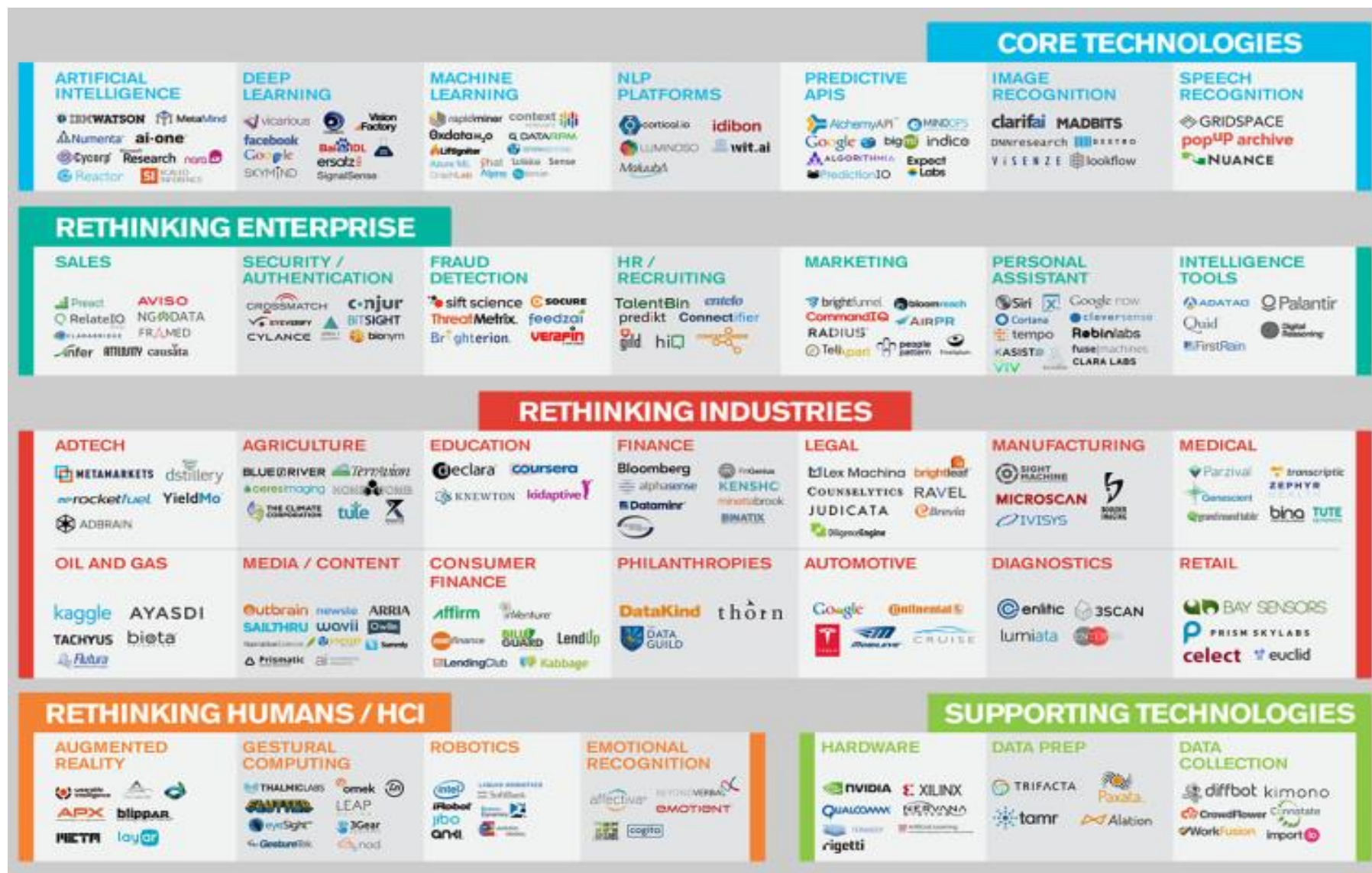
Choosing a Problem

Select a project such that it is Socially Relevant! The framework/ model or tool developed as a product after the course should be useful to public or a specific focus group. You may choose your project relatively close to the following domain listed below -

- Healthcare
- Education
- Transport & logistics
- Public Services
- Finance
- Retail
- Energy



Thanks to <https://www.pinterest.co.uk/pin/805792558301340394/>



Thanks to <http://airesearch.com/ai-blog/ai-startups-companies-in-the-landscape-of-machine-intelligence/>

MACHINE LEARNING IN EMOJI

● SUPERVISED
 ● UNSUPERVISED
 ● REINFORCEMENT

● SUPERVISED	human builds model based on input / output
● UNSUPERVISED	human input, machine output human utilizes if satisfactory
● REINFORCEMENT	human input, machine output human reward/punish, cycle continues

BASIC REGRESSION

● LINEAR	<code>linear_model.LinearRegression()</code> Lots of numerical data	💰 🚄 💵
● LOGISTIC	<code>linear_model.LogisticRegression()</code> Target variable is categorical	🍕 or 🍔

CLASSIFICATION

● ● ● NEURAL NET	<code>neural_network.MLPClassifier()</code> Complex relationships. Prone to overfitting Basically magic.	🔮
● K-NN	<code>neighbors.KNeighborsClassifier()</code> Group membership based on proximity	🏠
● DECISION TREE	<code>tree.DecisionTreeClassifier()</code> If/then/else. Non-contiguous data Can also be regression	👤 👤
● ● RANDOM FOREST	<code>ensemble.RandomForestClassifier()</code> Find best split randomly Can also be regression	🌲 🌲 🌲 🌲
● ● SVM	<code>svm.SVC()</code> <code>svm.LinearSVC()</code> Maximum margin classifier. Fundamental Data Science algorithm	🦄
● NAIVE BAYES	<code>GaussianNB()</code> <code>MultinomialNB()</code> <code>BernoulliNB()</code> Updating knowledge step by step with new info	🎲

CLUSTER ANALYSIS

● ● K-MEANS	<code>cluster.KMeans()</code> Similar datum into groups based on centroids	☀️
● ● ANOMALY DETECTION	<code>covariance.EllipticalEnvelope()</code> Finding outliers through grouping	🐼 🐼 🐻 🐼

FEATURE REDUCTION

T-DISTRIBUTED STOCHASTIC NEIB EMBEDDING	<code>manifold.TSNE()</code> Visualize high dimensional data. Convert similarity to joint probabilities	🎨
PRINCIPLE COMPONENT ANALYSIS	<code>decomposition.PCA()</code> Distill feature space into components that describe greatest variance	🦄
CANONICAL CORRELATION ANALYSIS	<code>decomposition.CCA()</code> Making sense of cross-correlation matrices	😬 😬
LINEAR DISCRIMINANT ANALYSIS	<code>lda.LDA()</code> Linear combination of features that separates classes	💧 🔥

OTHER IMPORTANT CONCEPTS

BIAS VARIANCE TRADEOFF		☁️ ☁️
UNDERFITTING / OVERFITTING		☁️ ☁️
INERTIA		🌈
ACCURACY FUNCTION	$(TP + TN) / (P + N)$	☁️ ⚡️
PRECISION FUNCTION	$TP / (TP + FP)$	☁️
SPECIFICITY FUNCTION	$TN / (FP + TN)$	❄️
SENSITIVITY FUNCTION	$TP / (TP + FN)$	🌪️

@emilyinamillion made this

Thanks to <https://www.pinterest.com/pin/24066179239071368/>

How to Read a Paper?

Research papers tend to follow a certain form; for the uninitiated, this may take getting used to. There are two types of research papers that we will look at:

- conference papers – shorter papers (typically 6-8 pages) generally subject to peer review, written and presented in conjunction with a conference.
- journal papers – longer and more complete papers, subject to a more thorough peer review, and published in an (archival) journal

You need not read a research paper sequentially from beginning to end. Here's one possible sequence:

- Read the title. (What is the paper about?)
- Read the abstract. (Should give you a concise overview of the paper.)
- Read the introduction. (Look for motivations, relation to other work, and a more detailed overview.)
- Look at the structure of the paper. (What do the remaining sections address? How do they fit together?)
- (Read the previous/related work section. (How does this work relate? What is new or different about this work?))
- Read the conclusions. (What were their results?)
- Read the body of the paper. You may want to skip over all the equations the first time through.

Questions to ask while reading a research paper

It is important that you learn to read research papers critically, so here are some questions to ask yourself as you read and some tips on reading.

- What problem(s) are they solving? Why are these problems important?
- What did they really do? (as opposed to what the authors say or imply they did)
- What is the contribution of the work? (i.e. what is interesting or new?)
- What methods are they using?
- Would you have solved the problem differently?
- Do all the pieces of their work fit together logically?
- What were the results? Did they do what they set out to do?

Documentation Guidelines



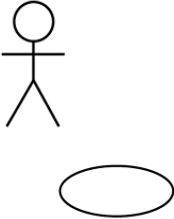

The following are general format elements to which the report should conform. Any deliverable not conforming to the below requirements will be considered void and claim a resubmission.

- The report should be typed using a word processor and printed on A4 paper with a 3 cm margin at the left-hand side and 2.5 cm margin at the top, bottom and the right-hand side.
- The font should be Arial, The text must be in 11-point type and the headings in 14-point type with 1.5 line spacing.
- The headings are numbered according to the decimal system. Each main heading is a whole number and the sub-heading is numbered as a decimal of that.
- Each page of the report should be numbered in the bottom right-hand corner.
- The title page must include the title of the project, the authors' name, date and place.
- All graphs should be produced using graphics software. All figures must have a caption and labels.
- Each table must have a title, and all columns and rows should have appropriate headings.
- All figures and tables must be cited in the text.
- The computations or solution procedures should be done or outlined in orderly steps with all assumptions clearly stated and their source given.
- All experiments and calculations should be reproducible.
- All units should be clearly indicated.
- The reference list should be explicit with the author's name, title, publisher and date following the IEEE Style.
- Acknowledgments should be duly conferred, and copied material should be duly credited.

The grading of the reports is based on the format, the content, the originality, and the professional appearance. Major points of interest:

- Structure & Format: Grammar, Syntax, table of contents & References
- Background Material: Introduction, Significance, and Literature Survey
- Methodology: Accuracy and Completeness
- Analysis & Discussion including Conclusions
- Presentation & Aesthetic: Figures, Tables and Overall Appearance

Project Roadmap

(Title)		NAME IN UPPERCASE	
		NAME IN UPPERCASE	
(Short Description)			
			
	(Scope & Purpose)		
(Tools & Technologies)			
			
	(Actors & Use cases)		
(Functional Requirements)		(Non-functional Requirements)	
(Deliverables, Reports)			

Grading Rubric (Project objective, formulation, methodology to be followed, background)

S.No	Type	Marks (10)
1.	The objectives are well defined and prioritized. All relevant information and constraints are obtained and accurately analysed. Decision and design recommendation are well supported by the information.	7.5 - 10
2.	All major objectives are identified. Sufficient information is obtained. Appropriate analyses are selected. Decision and design recommendation are reasonable and mostly supported by the information	6 - 7.5
3.	Most major objectives are identified but one or two minor ones are missing or priorities are not established. Most constraints are identified; some are not adequately addressed or accurately analyzed. Decision and design recommendation is reasonable.	3 - 5
4.	Many major objectives are not identified. Information is collected but without any analysis. Only one solution is considered or other solutions were ignored or incompletely analyzed. Many constraints and criteria were ignored.	< 3

Further Learning

1. <https://archive.nytimes.com/www.nytimes.com/interactive/2012/06/03/magazine/innovations-issue.html>
2. <https://www.inf.ethz.ch/research.html>

Objectives:

- Perform SWOT analysis to assess your project
- Identify the Stakeholders of the project. (Provide appropriate Use Cases)
- Segregate the project to manageable segments.
- Formulate a Block Diagram with associated Input and Output parameters

SWOT Analysis

A SWOT analysis is a planning tool used to understand the Strengths, Weaknesses, Opportunities, and Threats involved in a project. It involves specifying the objective of the project and identifying the internal and external factors that are supportive or unfavourable to achieving that objective.

S: Play to Your *Strengths* | **W:** Address *Weaknesses*
O: Exploit *Opportunities* | **T:** Hedge Against *Threats*

Strengths What do you do well? What unique resources can you draw on? What do others see as your strengths?	Weaknesses What could you improve? Where do you have fewer resources than others? What are others likely to see as weaknesses?
Opportunities What opportunities are open to you? What trends could you take advantage of? How can you turn your strengths into opportunities?	Threats What threats could harm you? What is your competition doing? What threats do your weaknesses expose you to?

Thanks to Mind Tools Ltd.

TOWS Strategy

As we saw, SWOT Analysis starts with an internal analysis, the TOWS Matrix starts the other way around, with an external environment analysis; the threats and opportunities are examined first. From that standpoint, an organisation gets a clear picture of its environment and the opportunity to think about strategy and what direction the company will go in. Next the company's strengths and weaknesses are considered; what it's good at internally and what it's not so good at.

The external analysis is linked to the analysis and the resulting TOWS Matrix can help an organisation to make decisions better, seize opportunities and protect itself better against threats.

- **Internal Strengths and External Opportunities (S-O)** - how can they use the strengths to benefit from existing external opportunities?
- **Internal Strengths and External Threats (S-T)** - how can they benefit from their strengths to avoid or lessen (potential) external threats?
- **Internal Weaknesses and External Opportunities (W-O)** - how can they use opportunities to overcome the organisation's internal weaknesses?
- **Internal Weaknesses and External Threats (W-T)** - how can they minimise weaknesses and thus avoid potential threats?

		External Opportunities (O)	External Threats (T)
		1.	1.
		2.	2.
		3.	3.
		4.	4.
Internal Strengths (S)	1.	SO Maxi-Maxi Strategy	ST Maxi-Mini Strategy
	2.		
	3.		
	4.		
Internal Weaknesses (W)	1.	WO Mini-Maxi Strategy	WT Mini-Mini Strategy
	2.		
	3.		
	4.		

Thanks to Mind Tools Ltd.

Identifying Stakeholders

The stakeholder identification process is one of the most important processes in project management because projects are undertaken to fulfil the requirements of stakeholders. To satisfy and fulfil the requirements of your stakeholders, you will have to identify them, involve them, and keep them engaged with your project.

A **stakeholder** is an individual, group, or organization who may affect, be affected by or perceive itself to be **affected by a decision, activity, or outcome of a project**

Stakeholders are classified to three types; internal, connected and external. **Internal stakeholders** are intimately connected to the organisation, and their objectives are likely to have a strong influence on how it is run. **Connected stakeholders** can be viewed as having a contractual relationship with the organisation. **External stakeholders** include the government, local authority etc. This group will have quite diverse objectives and have varying ability to ensure that the organisation meets their objectives

Type	Need / Expectation	Example
Employee	Pay, working conditions and job security	If workers are given more responsibility they expect increase in pay
Manager / Director	Status, Pay, bonus and job security	Profit and bonus on completion
Shareholder	Steady flow of income, increase growth capital, value for money	Increased capital growth would lead expectation of rise in dividend stream
Customer	Value for money	Decrease in quality, Increase in price leads to dissatisfaction
Supplier	Paid promptly	Cease cash flow to suppliers may cause cease of supply by supplier
Community	Public affected by organization's decisions	Pollution, Use of property held by public
Environmental Pressure Groups	Affecting the environment	

Stakeholder Need Analysis Matrix

After identifying the stakeholders, understand their needs and requirements from them. As a first step list the various categories of stakeholders and their influence in making the organization's decision using Table 2.1. Using Table 2.2 the needs of each stakeholder shall be obtained. From

the list of needs specified by the stakeholder the project may address specific set of needs taking necessity and stakeholder's priority into consideration.

Table 2.1: Stakeholder Identification

	Power	Influence	Interest	Involvement
Stakeholder 01				
Stakeholder 02				
Stakeholder 03				
...				
Stakeholder m				

* Indicate High/Medium/Low based on the aspects

Table 2.2: Stakeholder Need Matrix

	Need 01	Need 02	Need 03 . . .	Need n
Stakeholder 01	✓			✓
Stakeholder 02		✓		
Stakeholder 03	✓	✓	✓	
...			✓	✓
Stakeholder m		✓		

* Tick wherever applicable

Salient question to identify "Who are your Stakeholders?"

- Who is directly involved with the project?
- Who is indirectly involved with the project?
- Who may be affected by the project?
- Who may be affected by the project's outcome?
- Who gains or losses from the project's success?
- Who wants to complete the project successfully and who doesn't?
- Who are the suppliers?
- Who is the user of the end result of the project?
- Who are the competitors?
- Who are the shareholders?
- Is any local community impacted by the project or its outcome?
- Who has the authority to influence the project or its outcome?
- Who has the authority to make the project succeed?
- Who can make your project fail?

Modularization

Software applications include many different tasks and processes that cohesively serve all paradigms within a complete business solution. A module is a software component or part of a program that contains one or more routines. One or more independently developed modules make up a program. Modules make a programmer's job easy by allowing the programmer to focus on only one area of the functionality of the software application. Modules are typically incorporated into the program (software) through interfaces.

Table 2.3 Software Components

Module Name			
Technique			
Input		Output	
Dependent Modules			
Reference/ Resources			
Risk factors			
Expected No. of days to complete (Tentative)			

System Flow Identification

With the knowledge of the methods, identify the various paths in the system based on the input, output, resource availability, dependency from other module, human resource etc. Identify the critical modules based on the schedule and time availability using tools like CPM / PERT.

Further Reading

1. <https://www.quickbase.com/blog/fine-tune-your-project-with-a-swot-analysis>
2. <https://www.toolshero.com/strategy/tows-matrix/>
3. https://www.mindtools.com/pages/article/newPPM_07.htm
4. http://www.math.upatras.gr/~tsantas/DownloadFiles/hil61217_ch22.pdf

Grading Rubric (Week 02)

Task	Proficient 7.5 - 10	Good 6 - 7.5	Intermediate 3 - 5	Need Improvement < 3
SWOT	Comprehensive and realistic list that states strength, weakness, opportunities and threats	Realistic list that states strength, weakness, opportunities and threats	Clearly lacks effort in the development of the criteria	Non-Realistic list that states strength, weakness, opportunities and threats
Stakeholder - Need Analysis	All possible stakeholders are identified. Prioritized the stakeholders Proper Stakeholder-need analysis Selection of 'Needs' to be addressed	Major stakeholders identified Needs of stakeholders are recorded Needs are Prioritized	Some Stakeholders are identified Needs of stakeholders are recorded Needs are just selected without appropriate decision.	Minimal stakeholders are identified Needs of stakeholders are recorded
Module Description & Architecture	Comprehensive module list Methodology with input/output Dependency across resources	Clear definition of modules Techniques are identified and proper	Clear definition of modules Techniques are identified	Modules are identified.
Documentation	Documentation is clear and well written, and clearly explains the techniques. It includes how to configure the system and how to use it correctly	Documentation is reasonably clear and mostly complete, and is useful in understanding the system and how to configure and use it correctly	Documentation is adequate, but not well written or thorough; configuration and user information is minimal	Documentation is does not explain the purpose or methods well, and does not help the reader understand the program or system; configuration and user documentation are inadequate