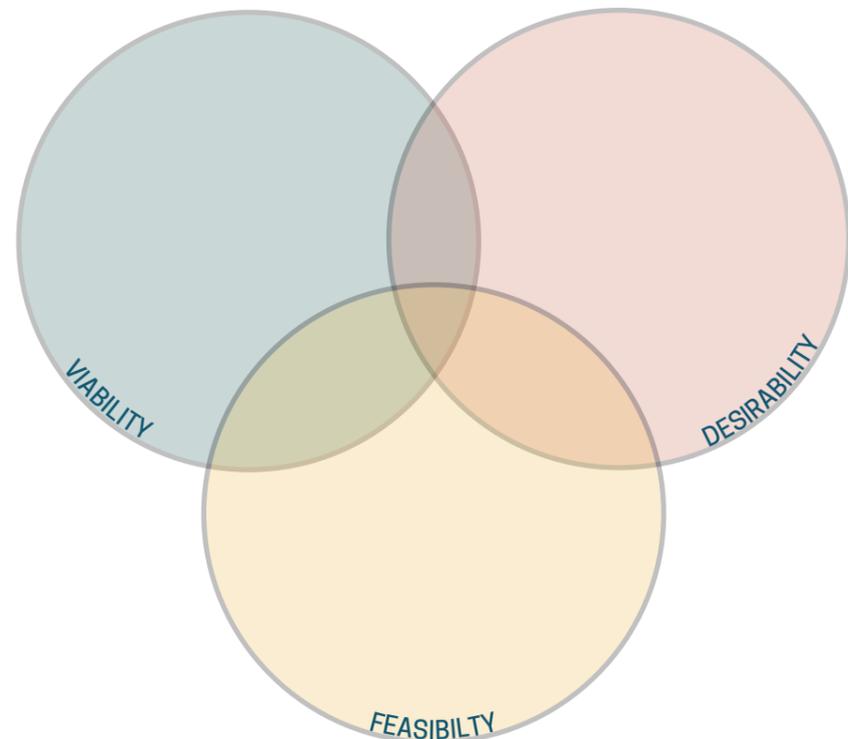


THE  
**KEEN**  
FRAMEWORK

A GUIDE FOR ENTREPRENEURIAL MINDSET

# WHAT'S MISSING FROM DESIGN?

➤ an emphasis on **opportunity** & **impact**



**You know the design process well.** It has been billed as the ultimate act within engineering. From developing requirements, to analyzing solutions, to creating models or prototypes, design is commonplace in engineering education. The KEEN Framework lists design skills featured in nearly every engineering design cycle.

By adding opportunity to design, students can refine concepts, think more broadly about the world around them, and understand the customer who they are designing for. The KEEN Framework outlines specific educational outcomes for opportunity skills, streamlining the process for faculty to include specific outcomes in courseware that reinforce the development of an entrepreneurial mindset.

**Impact is significance multiplied by scale.** Coupling impact skills to opportunity recognition and design implementation will equip students to have an eye for value creation. The KEEN Framework provides specific educational outcomes to develop students' impact skills. This includes communicating an engineering solution in economic terms, validating market interest, identifying supply chains distribution methods, and communicating an engineering solution in terms of societal benefits.

By adding opportunity and impact to your design skills, students will be able to apply creative thinking to ambiguous problems, convey engineering solutions in economic terms, evaluate technical feasibility, and understand the motivations and perspectives of team members and stakeholders.

# ENGINEERING SKILLSET

## OPPORTUNITY

## DESIGN

## IMPACT

**IDENTIFY**  
an opportunity

**DETERMINE**  
design requirements

**COMMUNICATE**  
an engineering solution  
in economic terms

**INVESTIGATE**  
the market

**PERFORM**  
technical design

**COMMUNICATE**  
an engineering solution  
in terms of societal benefits

**CREATE**  
a preliminary  
business model

**ANALYZE**  
solutions

**VALIDATE**  
market interest

**EVALUATE**  
technical feasibility  
customer value  
societal benefits  
economic viability

**DEVELOP**  
new technologies  
(optional)

**DEVELOP**  
partnerships and  
build a team

**TEST**  
concepts quickly via  
customer engagement

**CREATE**  
a model or prototype

**IDENTIFY**  
supply chains  
distribution methods

**ASSESS**  
policy and  
regulatory issues

**VALIDATE**  
functions

**PROTECT**  
intellectual property

THESE SPECIFIC **SKILLS** REINFORCE THE  
DEVELOPMENT OF AN ENTREPRENEURIAL MINDSET..

# ENTREPRENEURIAL MINDSET

## Engineers With an Entrepreneurial Mindset Transform the World

### THE 3C's



#### CURIOSITY

In a world of accelerating change, today's solutions are often obsolete tomorrow. Since discoveries are made by the curious, we must empower our students to investigate a rapidly changing world with an insatiable curiosity.



#### CONNECTIONS

Discoveries, however, are not enough. Information only yields insight when connected with other information. We must teach our students to habitually pursue knowledge and integrate it with their own discoveries to reveal innovative solutions.



#### CREATING VALUE

Innovative solutions are most meaningful when they create extraordinary value for others. Therefore, students must be champions of value creation. As educators, we must train students to persistently anticipate and meet the needs of a changing world.

**IT'S NOT JUST ABOUT SKILL.  
IT'S ABOUT A MINDSET.**

Engineers find success and personal fulfillment when they couple their skills with a mindset to create extraordinary value for others. The key is an entrepreneurial mindset.

Engineers equipped with this mindset understand the bigger picture, can recognize opportunities, evaluate markets, and learn from mistakes to create value for themselves and others.



#### The Curious

**Understand the broader world.  
Look toward the future.  
Explore multiple perspectives.**



#### Those Making Connections

**Think outside the box.  
Place old ideas in new contexts.  
Gain insights.**



#### Value Creators

**Seek opportunity.  
Understand stakeholders.  
Have an impact.**



**MINDSET + SKILLSET**  
A TANDEM DEVELOPMENT

# ENTREPRENEURIAL MINDSET + ENGINEERING SKILLSET = EDUCATIONAL OUTCOMES

## ENTREPRENEURIAL MINDSET

### CURIOSITY

**DEMONSTRATE** constant curiosity about our changing world

**EXPLORE** a contrarian view of accepted solutions

### CONNECTIONS

**INTEGRATE** information from many sources to gain insight

**ASSESS** and **MANAGE** risk

### CREATING VALUE

**IDENTIFY** unexpected opportunities to create extraordinary value

**PERSIST** through and learn from failure

COUPLED WITH

## ENGINEERING THOUGHT AND ACTION

**APPLY** creative thinking to ambiguous problems

**APPLY** systems thinking to complex problems

**EVALUATE** technical feasibility and economic drivers

**EXAMINE** societal and individual needs

EXPRESSED THROUGH

## COLLABORATION

**FORM** and **WORK** in teams

**UNDERSTAND** the motivations and perspectives of others

AND

## COMMUNICATION

**CONVEY** engineering solutions in economic terms

**SUBSTANTIATE** claims with data and facts

AND FOUNDED ON

## CHARACTER

**IDENTIFY** personal passions and a plan for professional development

**FULFILL** commitments in a timely manner

**DISCERN** and **PURSUE** ethical practices

**CONTRIBUTE** to society as an active citizen

THIS IS THE ENGINEER WE NEED.  
**MINDSET** ADDS TO A STRONG FOUNDATION.

**KEEN** STUDENT OUTCOMES CAN BE  
MEASURED THROUGH ACTION AND ACTIVITY.

# ENTREPRENEURIAL MINDSET



# ENGINEERING SKILLSET



# EDUCATIONAL OUTCOMES

## THE 3C's



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<b>INVESTIGATE</b> the market	<b>PERFORM</b> technical design	<b>COMMUNICATE</b> an engineering solution in terms of societal benefits
<b>CREATE</b> a preliminary business model	<b>ANALYZE</b> solutions	<b>VALIDATE</b> market interest
<b>EVALUATE</b> technical feasibility customer value societal benefits economic viability	<b>DEVELOP</b> new technologies (optional)	<b>DEVELOP</b> partnerships and build a team
<b>TEST</b> concepts quickly via customer engagement	<b>CREATE</b> a model or prototype	<b>IDENTIFY</b> supply chains distribution methods
<b>ASSESS</b> policy and regulatory issues	<b>VALIDATE</b> functions	<b>PROTECT</b> intellectual property

THESE SPECIFIC **SKILLS** REINFORCE THE DEVELOPMENT OF AN ENTREPRENEURIAL MINDSET..

**ENTREPRENEURIAL MINDSET**

COUPLED WITH

**ENGINEERING THOUGHT AND ACTION**

EXPRESSED THROUGH

**COLLABORATION**

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