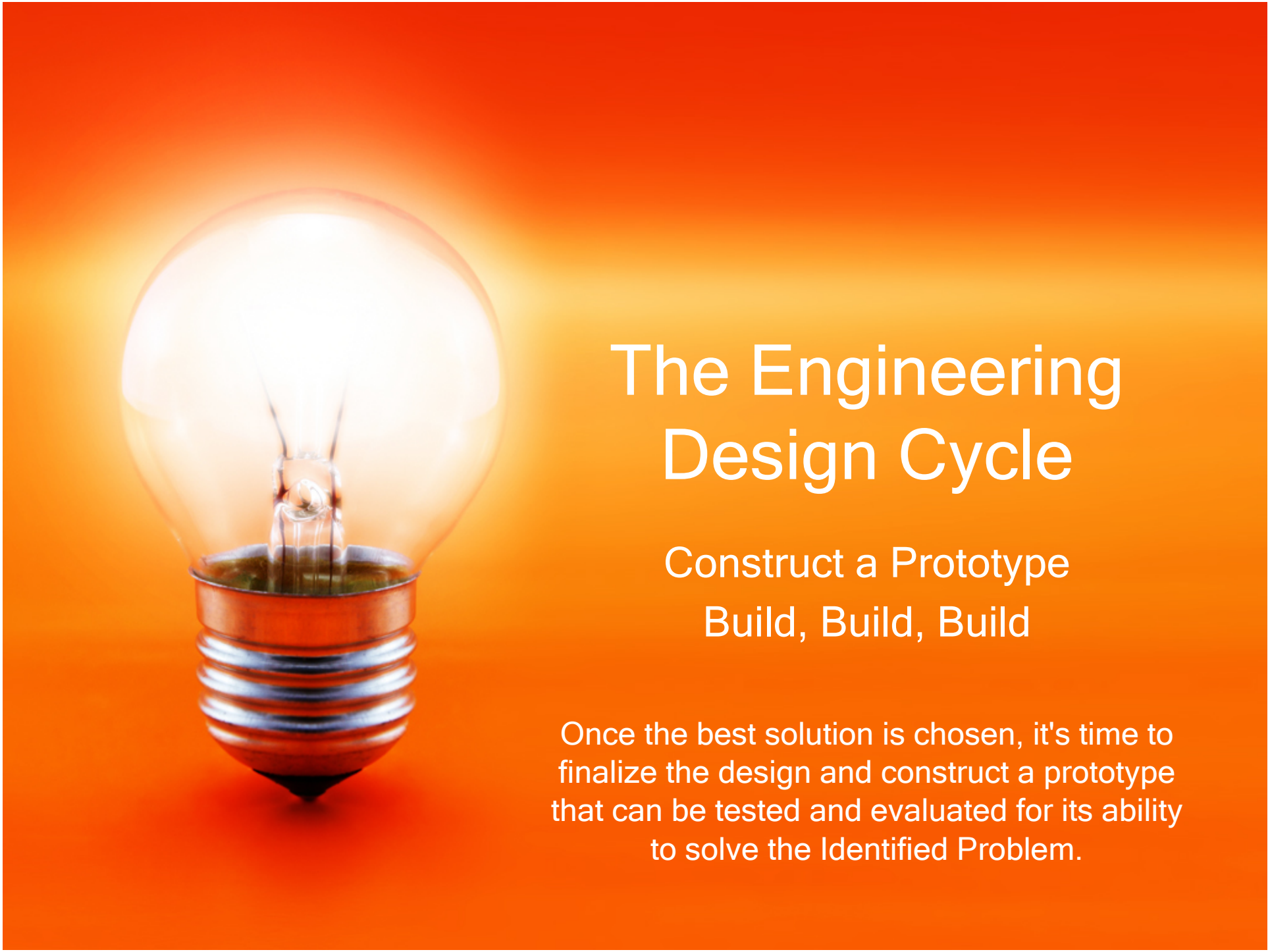
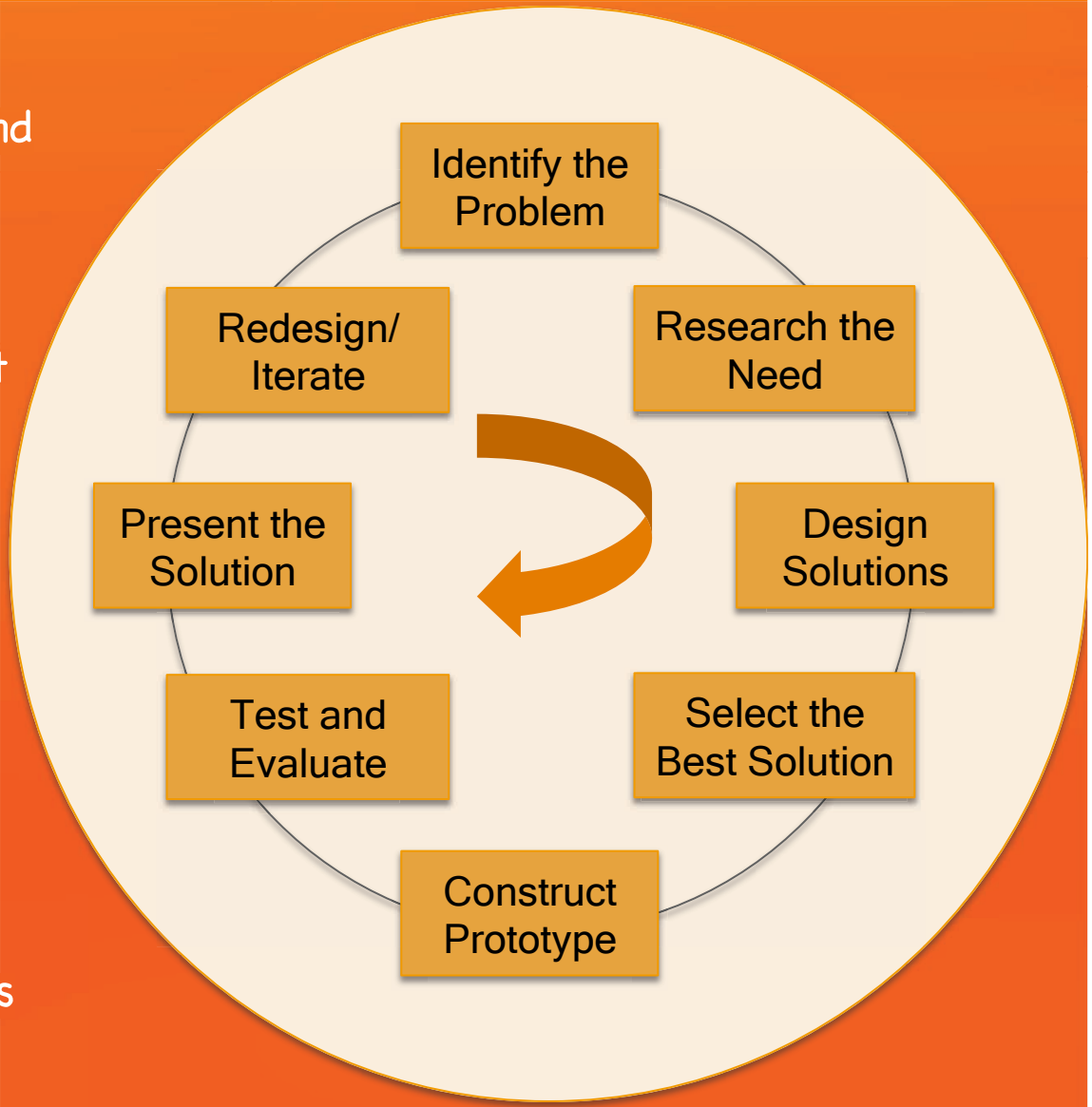

The Engineering Design Cycle
Construct a Prototype
Build, Build, Build
Once the best solution is chosen, it's time to finalize the design and construct a prototype that can be tested and evaluated for its ability to solve the Identified Problem.

The Engineering Design Cycle

A problem has been identified and researched. The need to solve it has been proven with credible sources. A range of solutions have been identified and the best of the bunch has been selected. Now it's time to construct a prototype!

A prototype can be a physical model of a system, a functional model, or both. Often, it is made with different materials than intended for the final design and is not as polished. A prototype is used to convey the meaning and purpose of the design.



Construct a Prototype

during

the Engineering Design Cycle

Physical Prototypes

Often a working prototype is more convincing if it looks like the final product (even though the materials to create this "look" may be entirely different from materials used in the final design).

Using Everyday Materials

Cardboard, paper, poster board, foam-core, balsa wood, and similar materials are very useful in constructing prototypes that emulate the form of a design, but require simple tools (e.g. knife, scissors) and adhesives (e.g. tape, blue) to construct. Everyday "found" objects such as straws, plastic bottles, cans, and other items can also be used to supplement these basic but inexpensive prototypes of design form.

Construct a Prototype

during

the Engineering Design Cycle

Physical Prototypes

Often a working prototype is more convincing if it looks like the final product (even though the materials to create this "look" may be entirely different from materials used in the final design).

Using Construction Kits

Legos (basic kits, mindstorms, technic) are valuable in readily constructing different shapes, forms, and sizes of prototypes. Fishertechnik is similar to Legos and is less likely to fall apart.

Construction Kits can also be used to create simulation "spaces" for demonstrating a design. For example, a model of a city or park might be constructed to identify the full range of environments in which an environmental monitoring sensor will be tested and expected to perform to specifications.

Construct a Prototype

during

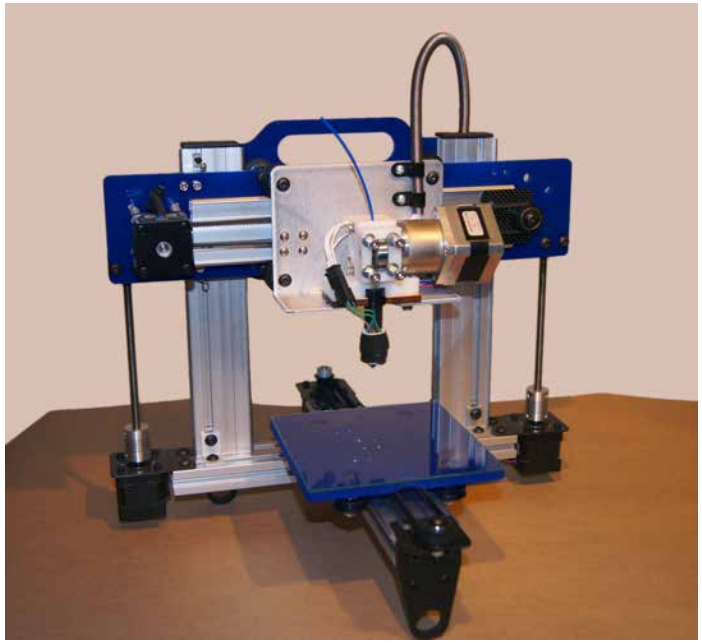
the Engineering Design Cycle

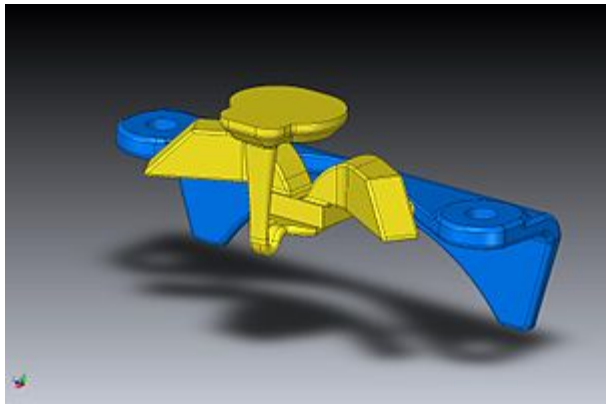
Physical Prototypes

Often a working prototype is more convincing if it looks like the final product (even though the materials to create this "look" may be entirely different from materials used in the final design).

Using 3D Printing (Additive Manufacturing)

3D printing, a computer that allows successive layers of various materials to be deposited into a 3-D space using a type of industrial robot machine. Almost any shape and geometry can be constructed using 3D printing, making it an excellent choice for constructing prototypes (after the design is selected) or models (before the design is selected).





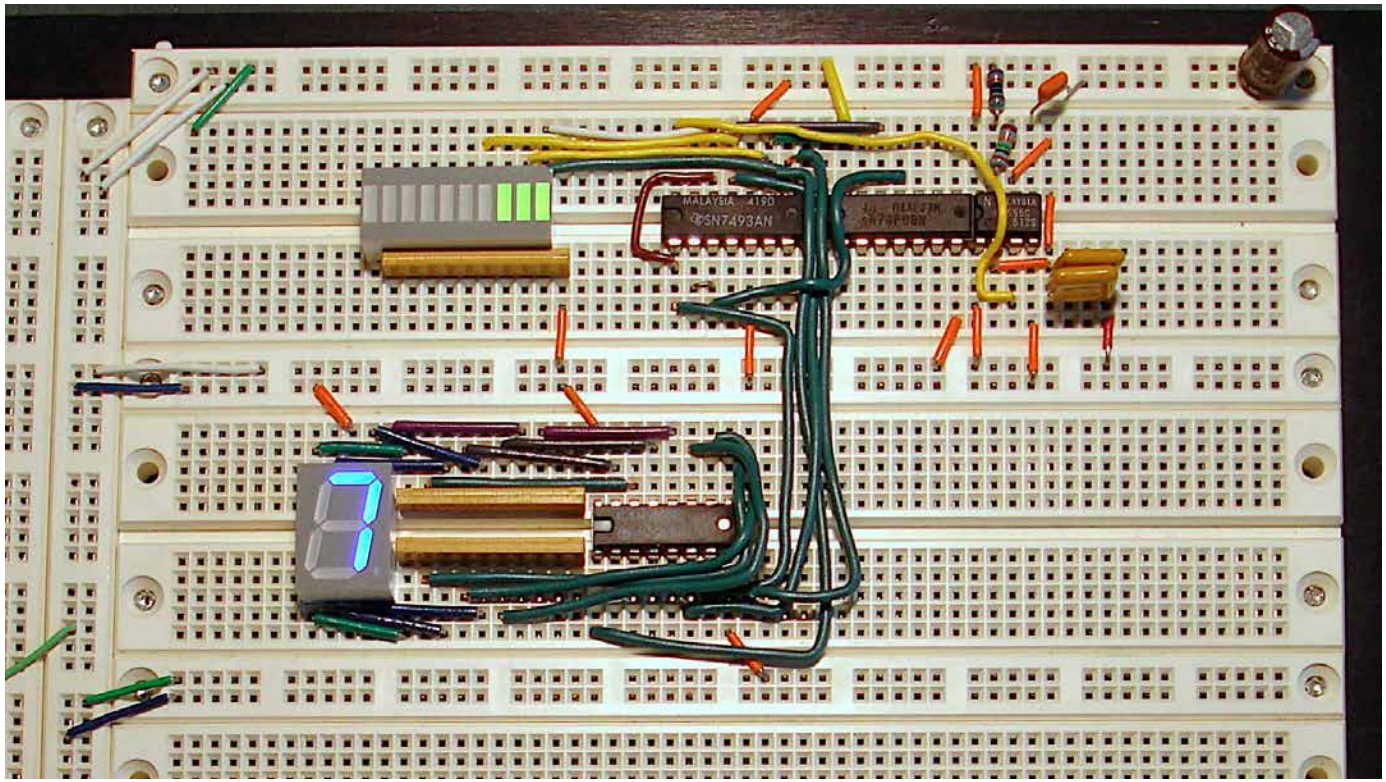
Construct a Prototype

during

the Engineering Design Cycle

Electronic Prototypes

Breadboarding
Solderless breadboards are a good, first step in prototyping circuits, allowing circuit component values and small design changes to be made quickly and easily. However, breadboards tend to have high parasitic values of resistance and capacitance and may also be noisy, thus causing interference with the measurement of small signals, errors in high frequency measurements, or similar problems.



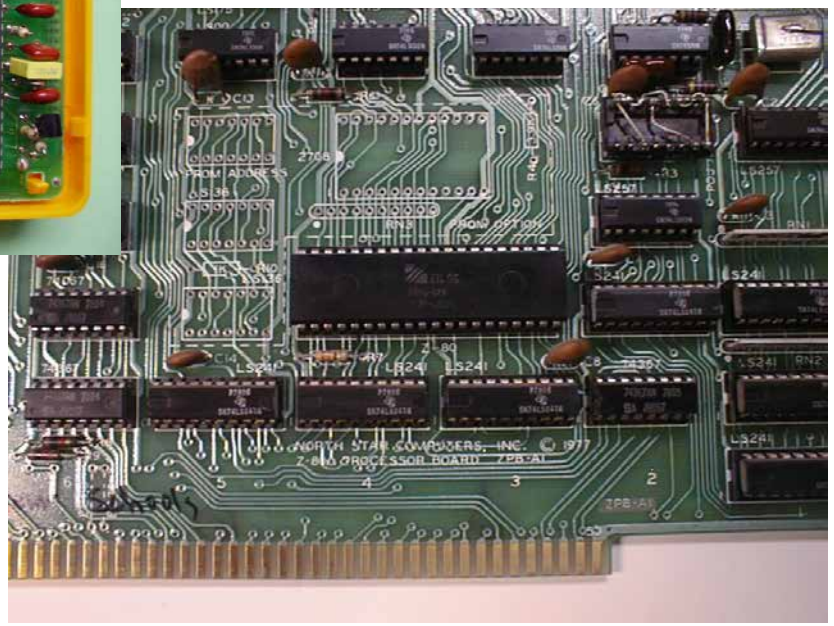
Construct a Prototype

during

the Engineering Design Cycle

Electronic Prototypes

Advanced Prototyping
To create a more convincing prototype or to eliminate noise and parasitic problems with breadboards, use prototyping boards or professionally printed and assembled PCBs (printed circuit boards) .



Construct a Prototype

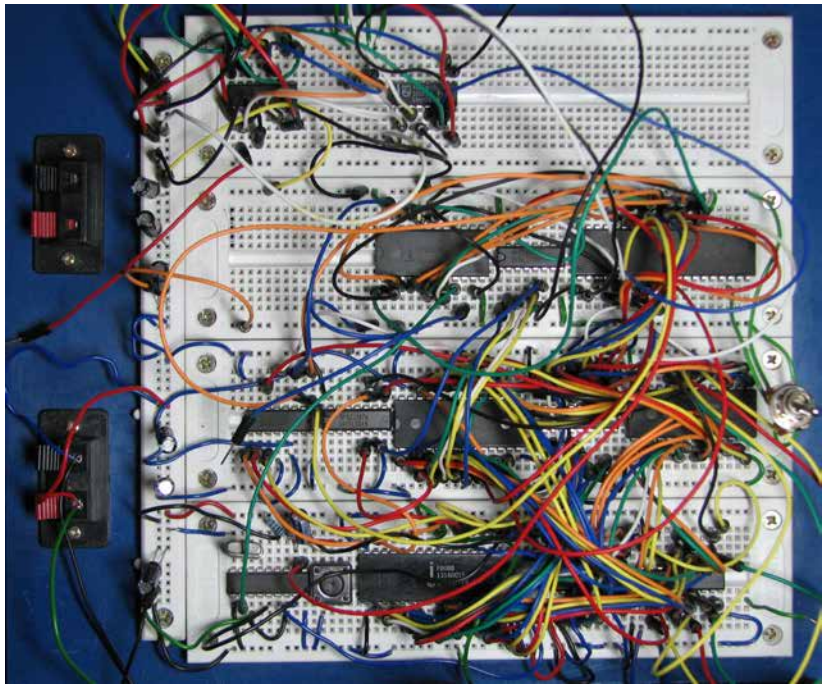
during

the Engineering Design Cycle

Electronic Prototypes

Often a final product is intended to operate wirelessly with no tether between the point of use and the point of data collection or analysis. For purposes of testing and evaluation, a wired prototype is perfectly reasonable; but for purposes of demonstration, wireless functionality is more convincing of the "goodness" of design.

Remember:
The presentation of your design is a sales pitch to convince your audience that the design works and should be pursued to product development!



Wired prototypes, although functional, often give the impression that the design is unfinished, bulky, or will include a mess of wires in the final product. It is difficult to see beyond wire "spaghetti".

Construct a Prototype

Physical Prototypes

1. Can be constructed using:
   - Everyday Materials
   - Construction Kits
   - 3-D Printing
   - A combination of the above
2. Focus on conveying
   - Form and Shape of the design
   - Meaning and context of the design
3. May or may not be functional models