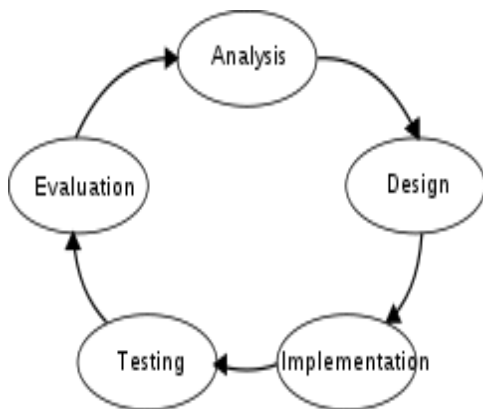
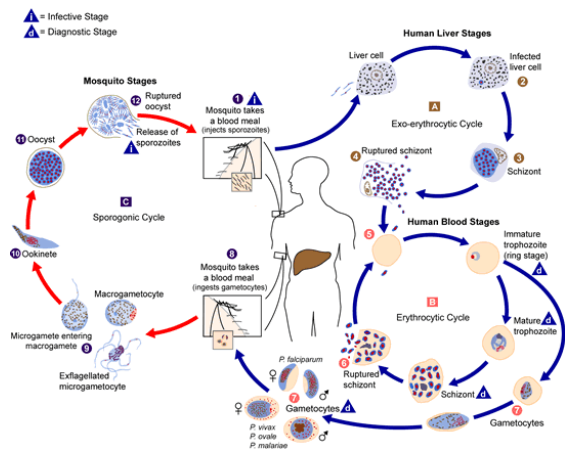
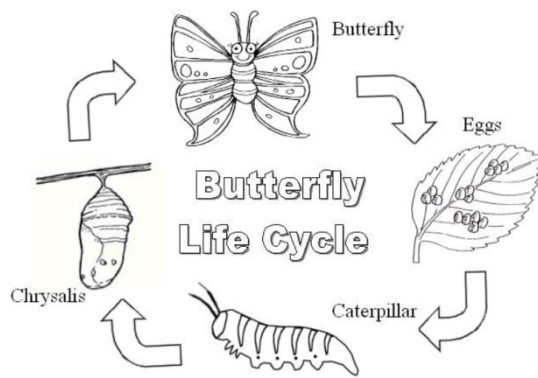


HANDOUT: WHAT IS SYSTEMS ENGINEERING?

SYSTEMS ENGINEERING IS AN INTERDISCIPLINARY ENGINEERING FIELD THAT LOOKS AT COMPLEX SYSTEMS AND DESIGNS AND DEVELOPS SOLUTIONS TO PROBLEMS, ISSUES AND CONCERNS.

WHAT DO ALL THESE GRAPHICS HAVE IN COMMON?

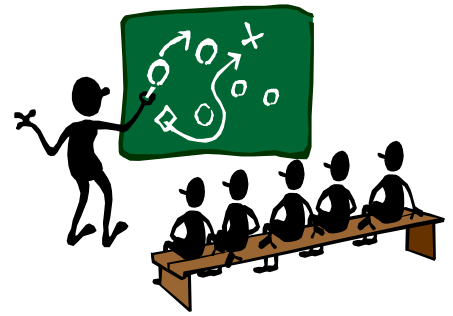


All three graphics represent a type of life cycle, with each having a defined beginning and end, but that can be repeated over and over.

Image Sources: Creative Commons

A **Systems Engineer** uses an interdisciplinary approach and means to bring about the successful development of a system, product or activity.

They focus on defining the customer's needs and wants in developing a new software, computer, iPhone, toy or any other gadget you can think of. They help brainstorm what functions and requirements are needed, as well as help come up with different design options. Then they document the requirements, oversee the implementation process and validate the solution. All the while they are thinking about cost, schedule, and support options.



You might say, *Hey, that sounds like what my mom and dad do.* And in fact the process is very similar. A coach also uses similar processes.



Let's pretend Sally's family is trying to decide how to throw a birthday party for Sally's grandmother. In this case, Sally's mom is going to serve as the *Family Systems Engineer*. The first thing Sally's mom has to think about is ideas about what the family wants to do and more importantly about what Sally's grandmother would enjoy.

Would her grandmother enjoy going horseback riding, mountain climbing, or just relaxing with the family and friends? Well, there are probably some grandmothers out there that would enjoy a variety of activities, but for this example we are going to share that Sally's grandmother just got out of the hospital, so probably wants something more relaxing.

For something relaxing, do they plan something in the morning, in the afternoon, in the evening, or some combination? What are some of the things Sally's grandmother likes to do? Who should they invite? What does Sally's grandmother like to eat? Sally's mom also has to think about Sally's brother who has food allergies. Sally's grandmother LOVES prune juice, but that might not excite the rest of the family members. All these are details that would have to be worked out. She also has to know how much to buy? What if she buys too much and it snows and no one can get there?

Sally's grandmother has often reminded the family that she would really like to see the old home videos. The family decides to convert their old videos to a new format so they can share them at the birthday party celebration. Sally's mom and dad have to check into various ways to do the conversion and pick the one they feel will do the best job at the most reasonable price, and do it in time for the party. This is all part of the design process. After they get the video back, they test it out on their own computer and TV monitor at home.

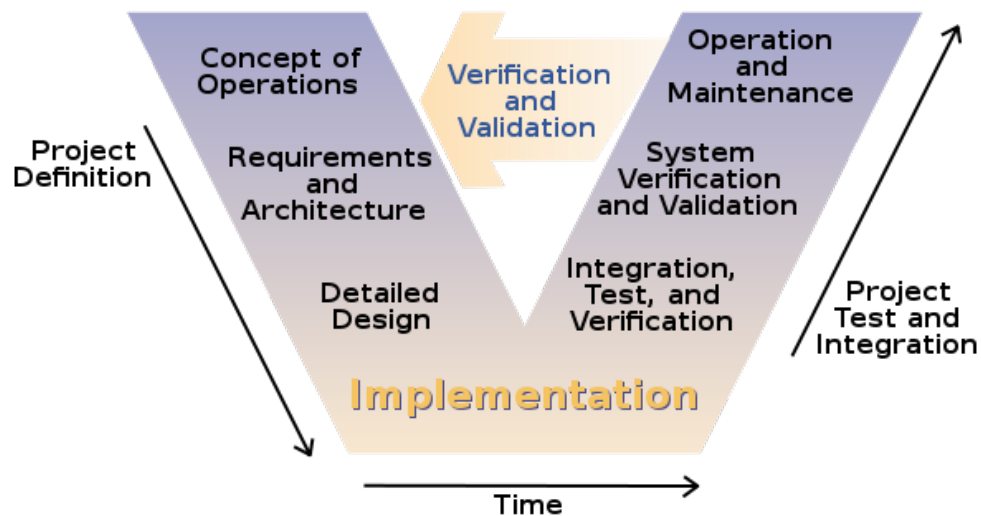
It's finally time for the party! During the party, Sally's mom is constantly checking back to make sure Sally's grandmother is OK and having fun. She also checks on the rest of the family members. When food runs out, she runs back to the kitchen to refill the bowls and get more drinks. And finally, at the end she listens to figure out if the family, including Sally's grandmother enjoyed themselves.

Do you think Sally's grandmother had a good time?

All the processes Sally's mom went through in the above story are similar to what a Systems Engineer does in their work. The V-model (shown below) is a graphical representation of the systems development lifecycle used to help Systems Engineers think through the planning of their product or idea.

The V represents the sequence of steps, describes the activities to be performed and shows the results that have to be produced during product development.

For each of the steps, what things did Sally's mom have to consider?



For the story you just read, answer the following questions	
Who could be considered the client?	
What was the concept?	
What were some of the requirements?	
What were some of the things that had to be planned out in detail?	
What had to be tested?	
What did Sally's mom validate at the party?	
What did Sally's mom do to maintain the party and party atmosphere?	

Graphic Source: Creative Commons

HANDOUT: SYSTEMS ENGINEER

Biological

Biological systems engineering focuses on creating useful products out of natural materials, sustainable production and storage.

Communication

Communication systems engineers monitor all types of communication but usually specialize in information security, information technology, computer networks or telephone systems.

Introduction to Systems Engineering

Systems Engineering integrates several disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. *Systems Engineering* considers both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs.

Learn more at INCOSE

<http://www.incose.org/practice/whatisystemseng.aspx>

Engineering Your Future

Video Snippets about Systems Engineering ThinkTVPBS

http://www.youtube.com/watch?v=68gPf7g_670

Another cool place to find video snippets about these type of careers

GoCracker: Careers & Pathways

<http://www.gocracker.com/careers-and-pathways/>

Systems Engineers work behind the scenes to keep biological, communication, manufacturing, environmental and other systems operating. What makes systems engineering unique is that it follows its objectives from start to end. Systems engineering is interested in processes as a whole, especially how each part of the process can be improved to meet specific goals.

Manufacturing

Manufacturing systems engineers work in teams responsible for the manufacturing cycle of a product.

"The smart grid is going to be reliant upon systems engineering," says Christos G. Cassandras, recipient of a IEEE Control Systems *Technology Award*. "The grid is a dynamic system, with many pieces connecting, that needs to be optimized and with uncertainties that need to be understood. It's a very good example of why these systems engineering skills are necessary."

Environmental

Environmental systems engineers study environmental consequences of industrial activities.

TO SHARE WITH YOUR PARENTS

SYSTEMS ENGINEER

A **Systems Engineer** uses an interdisciplinary approach and means to bring about the successful development of a system, product or activity. If you were trying to design a new type of wheelchair, the systems engineering process would begin with establishing a customer's needs and defining the problems that need to be overcome. It then moves to investigating alternatives, testing the system, combining various components (often made by multiple teams or suppliers), and launching the system. But the launch is not the end of the job: the systems engineer must then keep testing the performance of the product or system and re-evaluate to make sure the system will continue to operate properly.



EDUCATION

Most Systems Engineers have at least a bachelor's degree in math, engineering, computer science or some other technology related program. They usually continue to take additional courses and training, often business related classes. They also need communication and leadership skills and enjoy working as a team.

WHERE THEY WORK

Most large companies have computer and information systems managers/engineers. The largest concentration of Systems Engineers work for computer systems design, telecommunications companies, consulting firms, science and engineering firms, and all levels of government.

FUN FACTOIDS

In 2009, *Money* magazine called Systems Engineering the best career in America based on numbers from the Bureau of Labor Statistics which not only showed a high median salary for the profession, but also predicted a high growth in systems engineering employment over the first half of this decade. In 2010, *Focus.com* concluded the same; that the best job in the US is a tech job: systems engineer.

WHERE TO FIND OUT MORE

US Department of Labor: <http://www.bls.gov/ooh/occupation-finder.htm>
IEEE: <http://www.todaysengineer.org/2011/Nov/career-focus.asp>
INCOSE: <http://www.incose.org/practice/whatissystemseng.aspx>

WHAT'S THE SALARY?

Median Salary: \$115,780/yr
As of May 2010

JOB OUTLOOK?

Employment projected to grow 18 % from 2010 to 2020. Growth will be driven by organizations upgrading their IT systems and switching to newer, faster, and more mobile networks.

WHAT COURSES DO I TAKE?

Computer Science
Engineering
Math
Business