

Topic: Systems Thinking

Problem: Your chosen system has just rolled off the assembly line. Now what? In plain language, describe what happens to your system, step by step to get it to the owner, set up and ready for use. List the resources that are required each step along the way.

Pointers/Tips:

- If your system is an infrastructure system (e.g. hospital, powerplant), instead ask yourself what are the steps to get it from a set of blueprints to a fully constructed and operating facility. This may require watching a documentary or online research. If this is too difficult, try it using a house instead. What does it take to construct a house from a set of blueprints? What are the steps? What resources are required for each step?
- Try to think about as many details as you can. i.e. If someone requires special tools, try to include them. If you don't know the 'actual' process, that's okay. Try to figure it out for yourself. Put yourself in the shoes of the production facility workers or delivery driver.
- This exercise will get you to think about the 'bigger picture' of what is needed to transport, set up, train users and maintain the system after deployment. As you'll come to find out, there is a lot more to a 'system' than just the end item itself! Consider the organization needs to acquire, build, train and maintain these resources. This is also a part of systems engineering: we must consider the 'entire' system of interest, not just the mission system.
- I have attempted this exercise using the ATM as an example here:

The ATM just passed final quality checks in the production factory and has powered down. The ATM can now be delivered to a owner. Workers lift and place the ATM on a piece of wood, and then onto a pallet.

The ATM is brought over to a staging/packaging area by a forklift. Workers in the packaging area have pre-cut and formed packing materials made primarily out of cardboard and wood. The workers build pre-formed wood walls around the ATM pallet, using the wood base as a starting point. The workers place cardboard padding around the perimeter of the ATM to prevent the ATM from moving inside the pallet during shipment. The workers then place a pre-packaged set of materials into the pallet with the ATM. These items include setup tools, unpacking and setup instructions, user manual(s), maintenance manual(s), a shipping invoice, and desiccant to prevent moisture buildup during shipment and storage. The workers then place a lid on the top of the container and staple a shipping label to the container.

The forklift then takes the packaged ATM and moves it to a staging area for shipping. In the shipping area, a truck is backed into a loading dock, where there await multiple ATMs. A forklift operator takes each ATM to the edge of the dock, where workers then transfer each ATM into the trailer using a hand pulled pallet cart. Once loaded into the trailer, the set of ATMs are tied down using ratchet straps.

The truck driver then leaves the ATM factory and drives to a regional ATM retailer. The details for how a truck driver goes about their job driving safely is not required for this exercise. Upon arriving at the retailer, the truck driver backs into a loading dock or simply parks the truck near the retailer's receiving area if no loading dock is available. The truck driver then informs the retailer he/she is there to deliver the ATMs. After acknowledgement by the retailer, the truck

driver unstraps the ATMs, and uses the hand-driven pallet cart to unload each ATM into the retailer's receiving area. After unloading the ATMs, the retailer may inspect the ATMs to ensure they are in good physical condition before signing possession over from the factory to the retailer. The truck driver then secures the pallet cart and straps and leaves the premises.

Each ATM is placed in cool/dry storage at the retailer's facility until sale and delivery is scheduled by a owner. Once an order is placed to purchase an ATM, workers move the ATM to the loading area, where a truck awaits loading. Workers use crowbars, screwdrivers, and drills to partially disassemble the ATM container. The workers keep the packaging materials to re-package the ATM for delivery. The unpacked ATM is plugged in and powered on. The retailer loads the ATM with fake money, then performs functional checks on the ATM prior to delivery. After tests have passed, any fake money is removed, and the ATM is powered down. Workers re-package the ATM using the same packaging materials and then load the ATM (still on a pallet) onto a delivery truck using hand drawn pallet carts and a forklift. Once on the delivery truck, the ATM is strapped down.

A delivery driver and extra workers drive to the delivery location. Once at the delivery location, the delivery driver informs the owner they are there to deliver the ATM. The driver & workers perform a walk-through of the installation site to ensure the ATM can fit through doors and into the site. They ensure an internet LAN cable and power is available, providing the proper amperage. Once a location has been confirmed, workers mark the location of the security bolts. Workers then drill into the floor of the deployment site using impact drills. The workers then install security bolts into the drilled holes on the floor.

The workers unload the ATM from the delivery truck using the pallet hand cart, a hydraulic lift, or a forklift. Once on the ground, the workers completely unpackage the ATM, using crowbars, screwdrivers, and drills; leaving the ATM on the pallet. The workers place the packaging materials to be discarded back into the truck to disposal or storage at the retailer's facility.

The workers then use the pallet hand cart to position the ATM near the deployment area. If the hand cart cannot fit through the doorway(s), then workers will use lifting straps to lift and carry the ATM into the deployment area. They plug the ATM into the power and internet line and power the ATM on. The workers perform a final functional check of the ATM, testing out the ATM's functions and the network's functionality. When tests pass, the workers power the ATM back down and disconnect the power and internet cable. Workers then place the ATM into the deployment site over the security bolts. They open the ATM and secure the ATM to the security bolts using nuts, washers, wrenches, sockets, ratchets and perhaps a torque wrench.

Once secured, the workers plug the ATM back in and power it back on. They provide the owner with the manuals. If requested, one of the workers may provide training to the owner on how to operate, maintain, or replenish cash in the ATM. After the owner is satisfied with the installation of the ATM, they sign over possession from the retailer to the owner (invoice). The retailer workers and driver clean up the area, inside and outside, and leave the deployment site.

The owner (or representative) then fills the ATM with cash, unlocks the ATM features and end-user / customers may officially begin using the ATM!

- Submit your systems engineering activities to support@learnse.com if you'd like me to check it & provide feedback.