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Ladder Design Brainstorm

Consider the problem: Design a way for electricians or other maintenance and construction workers to reach and work at interior heights for conventional job sites in homes.

As a result of a [situation brainstorming](#) session, a team might end up with a list of statements and questions about the design intervention as shown below.

- Existing solutions include ladders, step-stools, and scaffolding.
- Users are trained in tool use and trades.
 - They know about conventional ladders, stools, and scaffolding.
 - Can we leverage affordances from existing products?
- Must be portable/movable between and within job sites.
 - Light enough to lift.
 - How much can target users lift?
 - How long will they have to carry it (from vehicle to job site)?
 - Will they have to maneuver it around corners?
 - How tight are typical corners?
 - Will they have to maneuver it up/down stairs?
 - What about stairs with corners or switchbacks?
 - Will it fit in a vehicle for transport between sites?
 - What vehicles matter? How much space do they have?
- If electricians use it, it should prevent electric shocks.
 - What about water? What if the product gets wet?
 - How do existing products prevent shocks/electrocution?
 - What kind of electric sources might cause shocks?
- Workers will need tools. Where will the tools stay?
 - Is it reasonable to expect all workers to have tool belts?
 - What dangers are there from putting a tool on the product rather than in a tool belt?
- Workers install stuff.
 - What will they install or work with?
 - Light fixtures and bulbs, electrical boxes, electrical wiring (how long?)
 - Pipes and tubing (how long? How heavy?)
 - Ductwork?
 - Drop-ceiling tiles?
 - Drywall? "Popcorn" ceilings?
 - Paint, paint brushes, paint cans, paint trays
 - How will they manipulate those parts at height?
 - Do they drop parts? What happens when they do?
- How high will they work?
 - Conventional North American homes typically have 8-10 ft ceilings. Getting above the ceiling might put the maximum height at 11 ft.
 - How high should a worker's arms be to ensure safe work and minimize chances of repetitive strain injuries?

- How does height influence stability of the intervention?
- Workers could fall.
 - The product has to be stable - no wiggling or movement when in use.
 - How rigid/strong ought it be to prevent movement that could cause falls?
 - What deflections are acceptable?
 - In a fall, might the product then fall on top of the worker?
 - How do users keep stable while using the intervention?
 - Support and stability of workers' feet is probably important for user stability. How big of a surface is needed for workers' feet?
- What other safety issues matter?
 - Does OSHA have any pertinent standards with which we must comply?
 - What about fires and combustion?
 - Would a welder ever be a user of this particular intervention?
- Must the floor be level?
 - How flat ought the floor be?
 - What kinds of angles might a floor be at?
 - Will workers need to access the ceiling above stairs?
- Do users care about how it looks?
 - Do aesthetics matter for these interventions? Is there a specific aesthetic for ladders?
- What should the intervention cost?
 - Who pays for it? (Worker? Worker's employer?)
 - What do existing solutions cost?

Notice that the brainstorming talks about the product as a whole, and not about any particular parts or sub-assemblies of the ladder. For example, nothing is said about the actual feet of the ladder; instead, functions that might relate to the feet appear in various statements and questions.

This is a very important point: you want to avoid, wherever possible, statements regarding the actual shape, material, and parts of a product (the *means* by which a product will achieve its required functionality) when you're first starting to explore a design problem. Instead, you want to try to focus on characteristics, functions, and constraints.

Notice also how many unanswered questions there are in our list. This is also important. You're not expected to know everything at the outset, but you are expected to be able to "ask the right questions." You cannot properly research something if you don't have a set of questions you intend to answer.

Of course, sometimes finding the answers just leads to more questions. This is normal and expected.

[analysis](#), [case](#), [critical thinking](#)

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