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EDD 104-51, Engineering Communications II
Project: Design Your Own Project: Wheelchair
Topic: Modifications for ability to maintain personal hygiene
Date: February 1, 2019
Design Statement: Create an electric wheelchair for those with mobility impairments of the lower extremities that allows them to perform typical morning and night time routines on their own.

Annotated Bibliography

Locatelli, Mancini, & Romano. (2014). Systems Engineering to improve the governance in complex project environments. *International Journal of Project Management, 32*(8), 1395-1410.

This article talks about Systems Engineering and project success. It describes Systems Engineering as "the discipline developed to deliver successful projects (and systems) in complex environments. The West Coast Route Modernization (WCRM) is a project that was positively affected by Systems Engineering. This was a project by the British government to modernize railway. The project's main goals were not on course for finishing as stated in the contracts, and because of poor management, the final cost was increase dramatically. Ultimately, new arrangements created by SE reduced the final cost by over 4 billion pounds, and the project turned out to be a success.

The article is from the International Journal of Project Management and is peer reviewed. The authors are Giorgio Locatelli, Mauro Mancini, and Erika Romano, they are from University of Lincoln's School of Engineering, Politecnico di Milano department of Management, and Deloitte Finance Process Solutions, respectively. Their respective fields provide enough credibility for this project. Through the process of Systems Engineering, we can develop clear goals and manage personnel effectively in our project to create an efficient wheelchair.

Hyun Ae Chung, Jemo Park, Jung Bo Hwang, Hee Dong Kim, & Hwa Shik Jung. (2016). Design of Ergonomic Front-Entry Sitting Toilet System for People using Wheelchairs. *대한인간공학회지, 35*(5), 425-437.

Our device is a wheelchair that will ease the pain of inconvenience during morning and night routines. One of the greatest obstacles to wheelchair users is the space in the bathrooms. Generally, personal bathrooms are wide enough for someone to extend their arms from a mirror to the opposite wall. This amount of space is further reduced by the sink and toilet, which leaves very little room for the wheelchair to rotate and move. Accessible public bathrooms have a large stall to solve this issue, but personal bathrooms do not. Another challenge is the design of toilets, sinks, and baths. Most sinks have cabinets underneath them, making them impossible for someone in a wheelchair to brush their teeth without dripping various liquids onto themselves. Toilets are sometimes much lower than the wheelchair, thus requiring a lot of upper body strength during the move between chair seat and toilet seat. Although bathing is almost impossible with a wheelchair, it can be solved with the help of another individual. But such solution would take away the privacy and make solutions to other problems obsolete since they

(solutions) are base on the condition that the wheelchair user is alone. This article talks about the design of a bathroom that can accommodate the needs of a wheelchair user. A bathroom with a certain modification is designed to solve the problem of space and privacy. Such modifications include toilet placement, hand rail placement, and orientation of the user. The wheelchair user enters the bathroom facing the sink, which the toilet is place in front of. The toilet is not a conventional toilet with a water tank-the user can move above the seat in all directions without any obstruction. The toilet is close enough to a sink that does not have anything underneath. Both the toilet and sink have hand rails to accommodate the user.

The article is peer reviewed and is from Journal of Ergonomics Society of Korea, which is a peer reviewed organization that releases bimonthly articles. There are many variations of the proposed solution, but they require rebuilding the bathroom in order to be accomplished while the wheelchair is still a conventional wheelchair. Our device achieves these solutions by wheelchair modifications rather than bathroom modifications: extendable hand rails, raiseable seats.

Goher, K., & Jin, Z. (2016). A reconfigurable wheelchair for mobility and rehabilitation: Design and development. *Cogent Engineering, 3*(1), .

Current modifications include “Sit-to-stand (STS) Transformation” and reclining seats. These features will help maintain health and “daily living activities”. It will allow for the user to change into different body positions throughout the day, reducing the risk of developing many health issues that results from prolonged sitting.

Through this assignment, I’ve learned that there are much more to designing a wheelchair than just physics and design. There are experiments for many things not just medical, some are even philosophical-ethics. Increasing features on a wheelchair will almost always be accompanied by size and price. I recommend my team to go in the direction of transferring from chair to bed, toilet, and other types of surfaces.