ROBOTICS AND ITS IMPACT ON HOUSEHOLD ACTIVITIES

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Abstract

The study examined robotics and its impact on household activities. The study reviewed the concepts of robotics, types of robotics and household activities,general benefits of robots in daily life and their specific benefits in household activities. The study reviewed the positive and negative impacts of robotics on household activities. Robotics according to the study is the science and technology behind the design, manufacturing and application of robots. Robots are of various forms such as medical robots, educational robots, and domestic robots amongst others. Domestic robots, also known as personal service robots or companion robots are designed to help with household tasks. Robots are used for carrying out various activities among which are household activities. Household activities are those duties/jobs which are performed by family members such as father, mother and children. The study also identified some of the negative effects of robotics to include increase in the rate of unemployment since robots can now take over tasks originally performed by human beings, high cost of purchase and lack of electricity to power or to charge the robots.This study recommended among others that individuals and families should purchase some of the domestic robots for house chores such as mopping of floors, lifting of heavy equipment and attending to the elderly in the home.

Keywords: Robotics, Household Activities, Domestic Robots.

Introduction

The emergence of technology has bridged the gaps between machine and human. Technology has reduced the stresses which people undergo in carrying out household activities. The smart home technology has been increasing for the past decade. As the smart home technologies are increasing, so also the development of the social and tele-presence robotics is increasing to better lives and care for the people where needed (Isabet, Pino, Lewis, Benveniste&Rigaud, 2021). Robotics is the intersection of science, engineering and technology that produces machines, called robots that can replicate or substitute for human actions (Sam, 2022).

The technological advancement on the globe is evolving rapidly, one of which is the use of robots. Robots are used for different activities to alleviate the stress humans experience on a daily basis including domestic activities. According to the Institute of America as cited by Lutfi, 2018, a robot is a programmable multifunctional manipulator designed to move materials, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks. Domestic robots technologies have improved over the past decade and are fast integrated into daily lives. Use of robots has come to stay, and it is massively evolving. Different institutions in the society must embrace robots to make activities easier to perform. The families should not be left out. They should

utilize these technologies in carrying out the domestic activities like house mopping, vacuum cleaning, dish washing, toasting bread, flour mixer, clothes washer amongst others.

The impact of robotics on household activities among families has been remarkable in the recent time. Household is full of different activities.For a person to minimize the use of time and energy spent on activities, technology may have to play an important role. This paper is aimed at reviewing the impact of robotics on household activities.

Concept of Robotics

Robotics refers to the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing (Muhamad, 2020). Robotics is the intersection of science, engineering and technology that produces machines, called robots that replicate or substitute for human actions (Sam, 2022). The most commonly used robot definition was stated in 1979 by the Robot Institute of America; which says it is *a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through various programmed motions for the performance of variety of tasks* (Lutfi, 2018*)*. In the advent of advanced digital technologies, especially artificial intelligence (AI) and Internet of Things (IOT), and the pandemic situation, smart robots are increasingly replacing employees to provide contactless services due to worldwide pandemic (Wirtz, Patterson, Kunz, Gruber, NhatLuV, Paluch and Martins, 2018). Smarter robots have been employed in some places like hotels (Palvia andVemuri, 2016), meal delivery (Lee, Forlizzi, Rybski, Crabble, Chung, Finkle, Lee, Lee and Glaser. 2019) airport (Frick, 2015), retail stores (Grewal, Motyka and Levy. 2018).

Robotics is the automation of system or machine for a specific purpose, which can be used to perform tasks that are done conventionally by human beings. Robots are generally used in industries, such as automobile manufacture to accomplish simple recurring tasks, also in industries where some work have to be carried out in hazardous environments to humans.In general, Robots have been used in the industrial field for some centuries now and the advancement is rapidly growing with help of Artificial Intelligence (AI) technologies. This AI is the ability of a machine or a system to perceive, interact with humans and the environment with natural language processing, speech recognition and machine vision to learn and solve problems. Machine with AI system is built for supporting daily life's activities, such as plate washing machine, food preparing and also for the disabled, bizarre and aging people to self-sufficiently live *(*Winterstein, Keller, Huffstadt and Muller. 2021*)*. Moreover, to specify what a robot is by the 1940's, the Russian writer Isaac Asimou made an important contribution in the history of robots by introducing the word "robotics" which now defines the field of robots and also initiated the three laws of robotics and later added the Zeroth law.

Law 0: A robot may not injure human or through inaction, allow human to come to harm.

Law 1: A robot may not injure human being or through inaction allow a human being to come to harm, unless this would violate a higher order law.

Law 2: A robot must obey orders given to it by human beings, except where such orders would conflict with a higher order law.

Law 3: A robot must protect its own existence as long as such protection does not conflict with a higher order law.

Robots have become very useful in many ways especially in carrying out household activities.However, this study focused mainly on the effects of domestic (personal) robotics in carrying out household activities. Domestic robot is an autonomous or semi-autonomous robot that communicates and interacts with humans by following the behavioral rules expected by the user with whom the robot is intended to interact(Sam, 2022).

Concept of Household Activities

Household activities are those duties done by the people to maintain their household and these include washing of plates, cleaning of house, cooking, yard care, pet care, cloths washing, vehicle maintenance and repair, home maintenance, repair, decoration, and renovation amongst others. They

are done by households to maintain their family. A clear household chore list is important to keep the household running smoothly and to keep everything tidy. A master list is usually drawn up and subsequently broken down into individual lists for each member of the family. In this way, all the chores are divided evenly and no one has an unfair amount of work to do to keep the home in shape (Robert, 2015). Conclusively, household activities can be grouped as follows according to The Daily Telegraph, 2014; Ewherido, 2020: Weekly cleaning, daily cleaning, vacuuming, cleaning kitchen/bathroom, heavy duty kitchen cleaning (oven/fridge), tidying up, washing of cloths, washing of beddings, changing of bed sheets and ironing amongst others. It is clear that some of these duties can be carried out by different types of robotics.

Types and Typical Examples of Robots in Everyday Life
Typical examples of robots in everyday life include:

- **Collaborative Robots (Cobots):** Most robots are designed to work autonomously, a number of companies have started developing collaborative robots. Collaborative robots can be controlled by a human operator, making them safer for use in factories and other workplaces where humans are present. Since cobots collaborate with humans to accomplish tasks, they are also called robotic staff augmentation. This allows people to perform more complex tasks without having to work alongside an autonomous robot (Trung, 2022). Collaborative robots are typically used in industrial settings, factories, warehouses, or households. However, they can also be found in other workplaces, such as shopping centers or airports. Collaborative robots have the potential to boost productivity while reducing workplace accidents. Many experts believe that collaborative robots will be critical for business success in the years ahead (Trung, 2022).

- **Domestic Robots:** Domestic robots, also known as personal service robots or companion robots, are designed to help with household tasks. Domestic robots can be found in people's homes and workplaces. They perform a variety of tasks, such as cleaning, laundry, and providing care for elderly or disabled people. One example of a domestic robot is the Roomba vacuum cleaner robot. It is a small, autonomous cleaning robot that can be programmed to clean floors, carpets, and rugs (Trung, 2022). A good example of domestic robot is Roomba. Roomba is a rational integrated of vacuum technology and artificial intelligent technology; it is capable of sweeping up dirt as it is moving about in the house (Tom, 2022).

Figure 1: Roomba Vacuum (Booth, 2022)
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- **Medical Robots:** Medical robots are developed to perform a variety of tasks in healthcare settings. They can be found in hospitals, doctors' surgeries, and ambulances. They range from essential robotic tools that assist surgeons during operations to autonomous surgical systems that conduct entire procedures on their own. In 2007, a great number of robot-assisted minimally invasive surgeries were performed worldwide (Trung, 2022). Medical robots are designed to make medical

procedures easier, faster, and more accurate. They can be used for a variety of surgical tasks, including the removal of tumors, needle biopsies, and endoscopic operations. Medical robots can also perform routine tests that human doctors find repetitive or difficult to complete. Examples include blood cell analysis, eye exams, and mammograms (Trung, 2022).

- **Industrial Robots:**Industrial robots are used in the manufacturing industry, particularly for tasks that require great speed, precision, and endurance. They can be found on assembly lines across all types of industries, handling jobs that range from loading materials to welding parts. Their main advantage over humans is their precision; they do not get worn out or make mistakes, even when they perform repetitive tasks (Trung, 2022). Industrial robots' speed and precision make them particularly useful for tasks that require repetitive work and high levels of control (Trung, 2022).
- **Entertainment Robots:** These robots are designed to be entertaining for audiences. They can take many forms, including animatronic toys, clowns, and automated creatures that appear in science fiction films and rides. People use such robots for various reasons: they can help people relax and unwind; they can keep children entertained, and some believe that humanoid robotics makes people more likely to trust them (Trung, 2022). AIBO is another personal robot which was designed in dog like form for an entertainment and also used as pet dog (Tim, 2018).
- **Educational Robots:** Educational robots are designed to be used in schools and other educational institutions. They can help teachers to deliver lessons or allow students to investigate topics that interest them without the risk of injury. These robots are made particularly for children because they are much smaller than industrial models, have numerous safety features built-in, are less likely to cause damage if they malfunction, and are generally less expensive than larger robots (Trung, 2022).

General Benefits of Robots in Daily Life
Here are some typical benefits of robots in daily life:
- **Safety:** Robots are able to carry out tasks in hazardous environments such as the inside of a nuclear power plant or deep underwater. They can also shield humans from dangerous situations by working alongside them, such as flying planes or driving cars (Trung, 2022).
- **Time Saving:** Many repetitive and arduous tasks can be carried out by robots, which mean human do not have to do such tasks. This can increase productivity and free up time for more critical activities (Trung, 2022).
- **Accessibility:** Robots offer people access to things that they would not otherwise be able to do. For example, a robot could carry heavy objects or assist someone in moving from one place to another as a wheelchair does for those who need assistance walking (Trung, 2022).
- **Surveillance:** Robots can be equipped with cameras to give a view of places that would otherwise be inaccessible or too dangerous for humans. This includes bomb disposal robots that enter hazardous situations and gather information before experts decide how to proceed (Trung, 2022).
- **Reduces Loneliness:** Artificial intelligence (AI) robotic companions can keep people company when they are alone, providing social interaction and making those who feel lonely less likely to become depressed. Whether it is a robot that performs tasks with the person or one that simply provides companionship, robotic friends can make life more fulfilling for people of all ages (Trung, 2022).
- **Productivity:** Robots reduce human efforts and increase productivity within the workplace by taking on dangerous jobs that humans do not want to do. This could be mundane activities such as vacuuming or more complex jobs like assembling components in a factory-type environment (Trung, 2022).
- **Improved Operation:** Robots can also improve the operation of systems such as computer networks and electrical grids. They can solve problems without people having to step in, which mean greater productivity and faster response times if there is a need to fix an issue (Trung, 2022).

- **Less Human Errors:** Robots can ensure better accuracy within the workplace, which reduces the likelihood of human error. When robots work alongside humans, they can help reduce mistakes by carrying out critical tasks without humans having to risk their lives (Trung, 2022). Apart from the general benefits of robots, they can also be helpful in carrying out household activities.

Benefits of Robotics in Household Activities

The following are the robots that can be used and their benefits on household activities:

- **ROKUBOT Sanitizer Robot:**ROKUBOT is a device that helps to eliminate 99.9 percent of bacteria and mites in home environment. This device is also used in cleaning the bed-on and the under the sheets, pillows and mattresses. This device comes with a Bluetooth speaker and so enables user to stream favorite music while working with it (Schlage, 2022).
- **iRobotBravva Jet 240 Mop:** This device is a vacuuming device that makes chores to be easier over several years now. It is use to tackle or remove dirt of different types from the floor especially spaces that are hard to reach such as around toilets. This device keeps the floor sparkling clean and shining. It squirts a jet of water before it sweeps over an area sensor, allows it to judge whether any wire or furniture are in spraying distances before it begins (Schlage, 2022).

- **Gladwell Gecko Robot Window Cleaner:** This device is used to clean windows especially storey building windows where the hands cannot get to easily. The device uses suction to cling onto the glass surface before wiping away any dirt and grime (Schlage, 2022).
- **Grillbot/Roomba:** This is one of the cleaning robots that is produced by IROBOT. Though it has been around since 2002, it has improved over the past years. The latest version can be controlled via wifi or through Amazon Alexa or Google voice-activated assistor. It moves freely around a home, cleaning floors, it has the ability to remember dirty places that need extra attention and it can also plug itself into its charging station and go back to where it left off when the battery is recharged (Schlage, 2022).
- **WorxLandroid Robotic Lawnmower:** This lawnmower trims the grasses perfectly well. The WorxLandroid has rain sensor that will send it back to the docking station when the weather turns, as well as security features like a pin number to start operation and alerts if it strays from the owners yard (Schlage, 2022).
- **Pool Cleaner Robots:** These robots are specially designed to work in water pool by cleaning it. An example of it is 'Dolphin', it is designed to carry out vacuuming and scrubbing elements and also smart enough to choose which one to use. Dolphin comes with special survival cables that will never get tangled and GPS to ensure that the entire pool is cleaned. One can sit by pool side and read newspaper or magazine while Dolphin does all the work (John, 2021).
- *Avatar III Security Robot: The Avatar III Security Robot by RoboteX is a home security robot that can patrol the home and send back video of what it sees. It can be programmed to patrol specific routes throughout a home, and can even climb up and down most standard sets of stairs. It can also allow one to communicate with people that it comes across through a two-way audio system, which could be useful if one likes to screen people that come to the front door (John, 2021).*
- **Cook Robots:** These robot offers assistance in cooking, children are mostly motivated by robots giving step by step instructions for recipe. The robots are allowed to recommend recipes based on the available ingredients at home and also to consider dietary regulations of family members.

Robots mostly are good in providing recipes and instructions. They could get in the way in the kitchen if allowed to move freely which could amount to disaster (Bengisu, Hui-Ru, Joseph & Bilge, 2020).

- **Child Tutor Robots:** Due to the busy work schedule of most parents, time for tutoring their wards is not always there. Their absence leaves a vacuum in their ward's life which they try as much as possible to fill. It is at the pre-school age that robots teaches children words. This tutor robot helps children in the advanced countries to do their assignment/homework's at home (Henny& Brain, n.d.).

- **Reading Companion Robots:** These robots are developed with focus on speech, intonation, expression, pronunciation and vocabulary support features while reading robots is expected to provide definitions to different words. The robot is programmed with a teaching of books so that it could express appropriate emotions such as "surprising", "non surprising", "happy", "sad". Robots are programmed to suggest books, give comments after reading a part of a book and engage in interactive reading and guessing games (Bengisu, Hui-Ru, Joseph & Bilge, 2020).

- **Conversational Companion Robots:** Conversational companion robots are built in such a way that they converse about hobbies, movies, daily events, among others. Conversational companion robots helps one when the person is all alone and has no one to talk to, they simply conserve with the robot. These robots are also confidents- trusting companions (Bengisu, Hui-Ru, Joseph & Bilge, 2020).

- **EDWard – The Intelligent Wardrobe:** EDWard knows about every piece of clothing which is stored in it. This includes shoes, as well as hats and ties. This clothes awareness is implemented by means of a database and a tracking system, which notices whenever an item is taken out of or put into EDWard. The database contains an entry for every piece of clothing stored in EDWard. It also contains information on how pieces of clothing can be combined to form an attractive outfit or for which temperatures or weather conditions they are suitable for (Shweta, 2017).

- **Intelligent Refrigerator:** The share of robotic technology involved in an intelligent fridge is negligible. For this reason we only briefly discuss one representative of this class of smart appliances, namely the Electrolux Screen Fridge, which is one of the latest developments. Screen Fridge has a wireless connection to the Internet and to the TV. Its user interface is a 15-inch touch screen and pop-up keyboard. In addition to Internet, email, phone, radio, and MP3 player Screen Fridge also offers an advanced calendar and video messaging system (Shweta, 2017).

- **Dressman, Siemens (Germany):** The Siemens Dressman ironing robot complies with the definition of a robot only in the wider sense. It is a machine which automatizes a certain service, which is disliked by many people: ironing. More specifically, Dressman is designed to iron shirts. It does so by means of an inflatable torso made of parachute silk material. Once the shirt is stripped over the torso it is inflated with hot air in its interior. This hot air presses and dries the shirt. Creases are removed during this process (John, 2021). It is believed that these robots have affected humanity and the society positively.

Impacts of Robots on Household Activities
Robots are reported to have positive and negative impacts on household activities. The following are the impacts:
Positive Effects/Advantages of Robotics
Robots according to Wijeokoon, (2017),the following have been highlighted as the positive impacts of robotics:
1. The availability of robots has helped in the avoidance of hazardous and accidents by more precise and much focused direction in dangerous and repeated task. These tasks have become of ease and over-all result on working environment has improved. During the COVID-19 lockdown, the developed countries sent robots to deliver foods to their citizens because of the restriction of movement.

2. Robots can handle lifting of heavy loads, toxic substances and repetitive tasks. This has helped organizations, families and companies to prevent many accidents, also saving time and money.
3. Robotics helps the handicapped maneuver and serves as companions for the elderly.
4. Robotics can provide personal security at home by the use of the automated camera inside of the robots.
5. Robots serve as vacuum cleaning devices in home environment such as windows, floors and water pools.
6. Robots trims the grasses in the flower gardens using WorxLandroid lawnmowers.
7. Robots offer assistance in cooking by providing step by step recipe on how to prepare food dishes.
8. Robotics helps in carrying out children's assignment or home work.
9. Edward robot contains information on how pieces of clothing stored can be combined to form an attractive outfit.
10. They also serve as an automated ironing device (John, 2021).

Negative Effects/Disadvantages of Robotics
It is very remarkable that there are many negative influences in human society brought about by robots. These negative effects of robots include:
1. The use of robots probably increases the unemployment rate. The acquisition of robots food delivery services will make organizations and companies to hire a few workers (Wijeokoon, 2017).
2. Robots work by following some designated instructions. In some urgent and dangerous situations, robots cannot adjust automatically to fit the change and lead to serious consequences (Wijeokoon, 2017).
3. The widespread use of robots decreases the independence of humans on machines and weakens the creativity ability of human indirectly. Malevolent robots, designed by criminals are also out there. Many websites had been infiltrated by these criminal robots posing as real people and manipulating people into using Web Camera or disclosing their credit card information (Wijeokoon, 2017).
4. The production and purchasing of robots is very expensive.
5. Lack of electricity to power some of the robotics and to charge them as well.

Conclusion
Robotics is becoming more prevalent in our daily lives as we see them everywhere, from the factory floor to the grocery store checkout line. This article has gone through some typical examples of robots in everyday life. Domestic robots that are products of affecting design may entertain human and also offer rational activities like companionship, socializing or physical therapy, baby care, general house cleaning and cooking.
However, the growing of the smart home is really making ways for domestic robots now, but many existing challenges about robotics need to be sorted. The focus of human computer interaction on the principles in design is a great move. Also, the idea in law to design for regulation means there is a similar drive to consider end user interests and rights within the design process. If roboticists who create home robots ensure that they engage with the interests of end users, there is a chance that they can emerge in a more responsible manner.

Recommendations
The following recommendations were made:
1. The Government of each country should endeavor to purchase some of the robots like medical robots to help the medical officers in the discharge of their duties.
2. Federal and state Ministries of Education should use the educational robots in the school to help the teachers during explanations in the class.

3. Individuals should purchase some of the domestic robots for house chores such as mopping and gardening.

References

Bartneck, C., &Forlizzi, J. (2004). A design-centered framework for social human-robot interaction. *Proceedings of the Ro-man*, 591-594.

Bengisu, C., Hui-Ru, H., Joseph, E. M. & Bilge, M. (2020). Investigating family perceptions and design preferences for an in home robot. Retrieved from https://doi.org/10.1145/3392063.3394411

Booth, B. (2022). Roomba robot vacuums. Everything you need to know before you buy. Retrieved from https://nbcnew.com/select/shopping/best-roomba-robot-vacuum-ncna1242644.

Ewherido, F. (2020). Duties of a mother to her children. Retrieved from https://www.vanguardngr.com/2020/11/duties-of-a-mother-to-her-children

Frick, W. (2015). When your boss wears metal pants. Harvard Business Review, 93(6):84–89.

Grewal, D., Motyka, S. & Levy, M. (2018). The evolution and future of retailing and retailing education. *Journal of Marketing Education,* 40(1):85–93.

Henny, A. & Brain, S. (n.d.). Roles of Robots in Socially Assistive Applications. Department of Computer Science, Yale University New Haven, Connecticut 06520 USA.

Isabet, B., Pino, M., Lewis, M., Benveniste, S. &Rigaud, A. S. (2021). Social Telepresence Robots: A Narrative Review of Experiments Involving Older Adults before and during the COVID-19 Pandemic*. International Journal of Environmental Research and Public Health*, 30;18(7):3597. doi: 10.3390/ijerph18073597. PMID: 33808457; PMCID: PMC8037050.

John, C. (2021). 10 Robots that can help you at home. Retrieved from Https://www.turbofuture.com/consumer-electronics/Robots-That-Can-Help-You-At-Your-Home

Lee, S. & Lee, D. (2020). Untact: a new customer service strategy in the digital age. *Service Business* ,14(5):1–22.

Lutfi, S. (2018). Will domestic robotics enter our houses? A study of implicit and explicit associations and attitudes towards domestic robotics.

Muhamad, M. (2020). Robotics as good machineries outside the factory in changing lives over the coming decades. (*International Digital Organization for Scientific) IDOS Research Journal of Scientific Research,* 5(1): 21-26.

Palvia, S. &Vemuri, V. (2016). Forecasts of jobless growth: facts and myths. *Journal of Information Technology Case and Application Research, 18(1):4–10.*

Robert, K. (2015).Household chore list. Retrieved from http://www.cleaning.lovetoknow.com/household_chore_list.

Sam, D. (2022). Robotics: What are robots? Robotics Definition and Uses. Retrieved from https://builtin.com/robotics

Schlage, (2022). 15 robots you'll want to bring home in 2022. Retrieved from Https://www.schlage.com/blog/categories/2022/01/robots-for-home.html

Shweta, A.S. (2017). Intelligent Refrigerator using Artificial. Retrieved from https://researchgate.net/publication/3138804173_intelligent_rwfrigerator_using_ARTIFICIAL_INTELLIGENCE

The Daily Telegraph. (2014, 7 October). 36 Chores men don't bother to do. Retrieved from https://timeslive.co.za/news/south-africa/2014-10-17-36-chores-men-dont-bother-to-do/

Tim, H. (2018). Sony's new robot dog AIBO barks, does tricks and charms animal lovers. Retrieved from https://cbcn.com/2018/04/09/sonys-new-dog-aibo-barks-does-tricks-and-charms-animal-lovers.html.

Tom, C. (2022). More work for Roomba? Domestic robots housework and production of privacy. Retrieved from https://researchgate.net/publication/361145840_more_work_for_Roomba_Domestics_robots_housework_and_the_production_of _privacy

Trung, T. (2022). 6 Typical Examples of Robots in Everyday life. Retrieved from https://orientsoftware.com/blog/robtos-in-everyday-life/

Wijeokoon, W. A. S. (2017). The influence of robots on the human society. *International Journal of Humanities and Social Science,* 3(3*)*: 79-81.

Winterstein, K., Keller, L., Huffstadt, K. & Müller, N. H. (2021). Acceptance of Social and Telepresence Robot Assistance in German Households. In International Conference on Human-Computer Interaction HCII 2021: Learning and Collaboration Technologies: Games and Virtual Environments for Learning, 326-339.

Wirtz, J., Patterson P., Kunz, W., Gruber, T., NhatLuV, P. S. & Martins, A. (2018). Service robots in the front line: will it be a brave new world? *In Journal of Service Management* 29(5):907–931