Leveraging Modern Technology: Empowering Women through Reduction of Unpaid Labour in Nairobi City County, Kenya.

Abigael Mwende Malelu-Gitau

Abstract.

Women's economic empowerment has become a major theme in Gender Equality and Sustainable Development. At the same time, women have long been burdened with the majority of unpaid household labour, limiting their participation in various economic activities. Scholars have linked the adoption of modern technology to alleviating the burden of care work and enhancing women's economic opportunities. This abstract explores the intersection between women's adoption of modern technology in addressing unpaid labour and its impact on their economic empowerment in Nairobi City County, Kenya. The study utilised an exploratory multiple-case design with snowball sampling and social media analysis to gain insights into how women in Nairobi leverage modern technology to reduce unpaid labour, consequently enhancing their economic empowerment. The study revealed that mobile technologies are the most utilised form of technology. Mobile technologies connect women to the marketplace and individuals who can deliver products. The installation of CCTV allows women to monitor and manage their households remotely, allowing them peace of mind to concentrate on income-generating activities. Social media provides a platform to share information on obtaining a work-life balance. Other technologies included washing machines and refrigerators, and modern forms of energy were used in cooking. This study supports the potential of technology in alleviating the burden of care work on women, enhancing their economic empowerment. Future studies are required to improve accessibility to affordable technologies and internet connectivity for women and enhance digital literacy. This should happen in spite of the overarching hegemonic masculinity, which has a direct influence on the socio-cultural view of ideal femininities, and the resultant guilt-driven push to meet these imposed standards of femininity.

Keywords: Economic empowerment, technology, hegemonic masculinity, ideal femininity, gender bias.

Introduction

Gender Equality and Women's Economic Empowerment are interlinked and are essential to achieving the 2030 Agenda for Sustainable Development, as endorsed by countries in 2015. Reducing gender inequality has been linked to accelerating women's economic empowerment. However, such endeavours are undermined by glaring gender gaps (Department & Dept, 2018). According to Sahay (1998), the social construction of gender disempowers women, positioning them in a disadvantaged position in production and primarily assigning them reproduction responsibilities. This discrimination continues in how women and men access and control

resources within the community. Gender inequalities are perpetuated and reproduced through various institutions, such as the family, where women bear a disproportionate burden of household work at the expense of their participation in paid labour activities. This has led to the concept of the "double shift", describing women's increasing participation in paid labour in addition to domestic chores. This phenomenon is widespread globally and among rural and urban societies, continuing unabated as men's concept of shared housework faces social acceptability challenges ((Sahay, 1998).

The United Nations Women (2024) defines women's economic empowerment as a situation where women can equally participate in and benefit from decent work and social protection; access markets and have control over resources, their own time, lives, and bodies; and increased voice, agency, and meaningful participation in economic decision making at all levels from the household to international institutions (Un Women, n.d.). UN Women estimates that gender equality could give the global economy a USD 7 trillion boost (*UN Women. (*n.d.)

The increased interest in unpaid domestic work and its economic and social impact on society necessitates its inclusion within budget planning and national policy agendas (Redistribute Unpaid Work, n.d.). The ILO report notes that on a daily basis, 16 billion hours are devoted to unpaid domestic and care work globally, with a disproportionate impact on women and girls. Consequently, this leads to labour- underutilisation, employment trends and gender-based inequalities. The ILO's 19th International Conference of Labour Statistics expanded its definition to include previously omitted types of unpaid work alongside paid employment and existing categories of unpaid work. This has necessitated the provision of statistics on the proportion of time spent on unpaid domestic and care work (UDCW) by sex, age and location. This has seen initiatives like Beyond GDP compile macro-economic indicators such as GDPs with evaluations of UDCW and other well-being measures in order to produce and disseminate evidence-based solutions. The end result is fostering equal opportunity, inclusion and social justice on an international scale.

Additionally, UN Women, n.d suggests that unpaid care and domestic care work is valued at 10 and 39 per cent of the gross domestic product, contributing greatly to the economic development of countries globally. Noteworthy, women and girls carry out at least two and half times more

unpaid household and care work than men. Consequently, this negatively impacts women's labour participation. The UN calls for the adoption of policies that redistribute unpaid labour between men and women and create more paid jobs in the care economy as a strategy to accelerate women's economic empowerment ((UN Women, n.d.). The paper explores women's resilience in the face of the traditional gendered division of labour, particularly in relation to leveraging technology.

Literature Review

Human activities are classified into three categories: paid work, unpaid and no work (Antonopoulos, 2008). Paid labour refers to work for which an individual receives financial compensation, typically in the form of wages, salaries, or other monetary benefits. This type of labour is usually formalized through employment contracts and is regulated by labour laws and policies. Unpaid labour, on the other hand, includes work that is not financially compensated, such as household chores, caregiving, volunteering, and other forms of non-market work. Unpaid work is often undervalued despite its significant contribution to the economy and society, and it disproportionately affects women due to traditional gender roles (ILO, 2018).

Odeku (2014) posits that unpaid work can be classified as either economic or non-economic, with the latter referring to the production of fixed assets for household use, subsistence production, collection of basic necessities and raw materials for income-generating activities and unpaid family work for crop production that reaches the market. Non-economic activities include household maintenance, cleaning, washing, shopping, providing care, and all volunteer work for community services. Regrettably, Berg (2017) notes that despite the critical role played by unpaid care in supporting human health and development, the burden is borne mostly by women and girls. Hence, the adverse effects of unpaid labour start from the adolescent stage and continue to limit women's participation in the labour force (Berg, 2017).

There are various terms that are used to refer to unpaid labour, each highlighting different aspects of its nature and importance. Unpaid domestic and care work refers to household tasks such as cleaning, cooking, childcare, and caregiving activities like eldercare and care for the sick, underscoring the essential yet uncompensated nature (Odeku, 2014). Other terms include reproductive labour, which likens these activities to the sustenance and reproduction of the labour

force (Duffy, 2007) and invisible work, which emphasises the lack of recognition and valuation of such labour (Hatton, 2017). Household labour and domestic work are also used to describe similar unpaid activities within the home (Seedat & Rondon, 2021). Collectively, these terms highlight the critical but often undervalued contributions of unpaid labour to the economy and society.

Gender scholars and feminists agree that unpaid care work is a universal issue affecting women globally, regardless of their level of education and income or the level of development in their countries (WHO, 2018). Picchio (2017) argues that despite many historical changes in economic contexts, technologies, and fertility rates, the quantity of unpaid socially reproductive labour and its distribution based on sex and age have been too slow. Yet, it is its flexibility that brings stability to the household and the productive system.

Technology, broadly defined, encompasses applying scientific knowledge for practical purposes, particularly in industry. It includes developing and using tools, machines, techniques, and systems to solve problems and enhance human capabilities (Arthur, 2023). Key aspects of technology involve its ability to automate processes, facilitate communication, and increase efficiency in various sectors (Brynjolfsson & McAfee, 2022). As technology continues to evolve, its impact on society, the economy, and labour dynamics remains profound and multifaceted.

Technology has significantly reshaped various aspects of daily life, including the realm of unpaid labour. Innovations such as smart home devices, automated appliances, and online platforms for grocery shopping and meal plans have transformed, potentially reducing the time and effort required for these tasks (Schneider, 2017). However, the distribution of benefits from these technologies often reflects and reinforces existing gender inequalities, as women still predominantly shoulder the burden of unpaid labour despite technological advancements (Perrons, 2019). Moreover, while technology can streamline certain activities, it does not fully alleviate the need for human caregiving, highlighting the persistent undervaluation of unpaid domestic and care work in the digital age.

According to Horton (2023), the use of household service robots, such as vacuum cleaners and floor mops- a category of the use of smart and AI technologies has reduced 50-60% of the total time spent on unpaid labour by women in Japan and the United Kingdom. Additionally, women

use other new labour-saving innovations such as grocery shopping, food delivery platforms, and children's learning apps. This automation of unpaid labour was seen to have both economic and social gains since it could free up to 9.3 % of women in Japan and the UK to take up full-time or part-time employment. However, despite the automation of unpaid work, women with young children still face challenges in freeing up time to participate in the labour market. Additionally, cultural values and gendered social norms influence the adoption of technologies (Herton, 2023).

In Africa, social norms and lack of infrastructure (household infrastructure and childcare facilities) impede women's participation in labour to market. As such, the shift in outsourcing household tasks such as cooking, producing clothing and household goods, and providing childcare and elderly care has positively impacted women's time, the creation of jobs, and gender equality. However, women are confounded by social norms, legal barriers and time constraints that negatively impact the division of labour at home and in the workplace. In conclusion, technological change produces mixed results in relation to women's participation in the labour force. For example, access to clean water reduces time spent on household work but fails to translate into more female market work in African countries. The same applies to electrification programs as seen in randomized trials in Morocco and Kenya (Dinkelman, 2022).

In South Africa, the use of the refrigerators and the washing machines is directly related to women's employment and access to upper non-farming positions. The study calls for social policies that support the ownership of such appliances in South Africa (Dueso-Barroso, n.d). In Nigeria, as women make use of modern household appliances, they participate less in informal activities and more in formal employment (Omotoso, K.O, 2017).

In Kenya, as in other contexts, care work plays a pivotal role in society, contributing significantly to the nation's well-being and its socio-economic development. However, unpaid labour encompassing care work, household responsibilities, and maintenance remains largely invisible. Socio-cultural norms disproportionately assign these tasks to women and girls, thereby undermining and excluding approximately 42% of females globally from opportunities to engage in decent work. This gendered division of unpaid care work is deeply rooted in societal norms and is exacerbated by intersectional factors such as income, education, age, race, ethnicity and geography. Economic models, particularly those focused on Gross Domestic product (GDP), tend

to prioritize corporate profit over societal wellbeing, resulting in the exclusion of unpaid and domestic work from both national and county social and economic development plans. The austerity measures adopted by the government, particularly in relation to the provision of public services such as childcare, healthcare, and education, have compelled women to compensate for the shortfall through their unpaid labour.

According to the International Centre for Research on Women (2023), Studies indicate that women spend approximately five (5) hours a daily on care activities, compared to just one hour for men. When multitasking care activities (such as supervising children while cooking) are considered, women spend an estimated eleven hours per day on care roles within their households and communities – triple the time that men spend. Women are more often expected to be primary caregivers and are likely to spend 20% of their time caring for children. While men spend almost double the time women spend on paid work, women's working days are considerably longer due to their extensive unpaid care work. Technical brief argues that care work is time- consuming and physically taxing, particularly where infrastructure is inadequate and publicly provided services are limited or absent. Women in the rural areas, single-headed households, and ageing societies are more burdened by care work. In urban settings, childcare presents a significant challenge due to the lack of extended family support in cities. The brief recommends the International Labor Organization (ILO) 5R Framework for decent care work, which supports the reduction of unpaid care by investing in services and infrastructure that alleviate the time and burden on care providers. The 5Rs include Redistributing unpaid care tasks between men and women; Recognizing the burden of unpaid care work in decision-making, budgeting and data collection; Rewarding care work with decent, attractive, and equal pay and working conditions; Representing care providers in political, economic, and public decision-making. Systematic and structural shifts are essential for challenging the entrenched social norms that equate care work with women's work (ICRW, 2023).

Policies on Water, Sanitation and Hygiene (WASH), energy, transport, and time and labour-saving equipment (TLSE) infrastructure are crucial in alleviating the burden of unpaid labour on women. These technologies significantly reduce the time women spend on daily tasks, such as fuel collection, which averages 374 hours per year, and cooking and meal preparation where women spend four times as much time compared to men (Rosenberg, 2013). This study is anchored on the

philosophy of recognising, reducing, and redistributing unpaid care work as a strategy for achieving gender equality in both unpaid and paid labour.

However, Bittman (2023) highlights the paradoxical nature of domestic technologies in reducing the burden of unpaid labour, stating that these technologies often increase the time spent on tasks. Furthermore, domestic appliances fail to challenge the traditional gendered division of labour, benefiting men more than women. Women continue to perform these tasks as a measure of their socialized femininities identities. Bittman examined the use of appliances such as microwave ovens, deep freezers and dishwashers, clothes dryers, lawn mowers or trimmers. Silva (2002) supports Bittman's sentiments, asserting that technological developments have not reduced women's time on housework, due to patriarchal ideologies that reinforces the association of these tasks with feminine identity.

Ferrant et al. (2014) posit that gender inequality in the form of unpaid labour is a missing link in gender analysis studies on labour outcomes. They argue that the time spent on unpaid labour could be utilized for paid labour, education and vocational skills development. Therefore, redistributing the care burden through investing in time-saving technologies and infrastructure, and improving access to public and care services, is essential. However, the study postulates that the adoption of such technologies may not necessarily translate into easing the burden of care on women. Consequently, this study seeks to examine how women in Nairobi City County leverage technology in line with the ILO 5R Framework.

According to the Economic Policy Research Centre, (2021), Leveraging technology is crucial for alleviating the burden of domestic care work and promoting gender equality. Purpose-specific, labour-saving devices, such as water-gathering solutions, piped water systems, energy-efficient cook stoves, food processors, and low-wattage solar-powered appliances, can significantly reduce the time and effort required for household tasks. Additionally, affordable technologies like mobile money and digital payment systems enable women to conduct business remotely and manage simple errands, such as paying school fees, without the need to queue at banks or schools. By integrating these technologies into daily life, they argue that we can support a more equitable distribution of domestic responsibilities and enhance women's economic empowerment (ibid).

This study aimed to examine the various forms of technology supporting unpaid care work in Kenya, explored how women in Nairobi utilize these technologies, and evaluated the impact of these technologies on women's economic empowerment. Specifically, the research assessed technologies related to WASH (water, sanitation, and hygiene), energy, transport, and time- and labour-saving equipment (TLSE) infrastructure. The literature review is anchored on existing social media platforms, particularly WhatsApp, Facebook, and Instagram, which were selected due to their widespread use and high engagement rates among Kenyan women. Analysing these platforms provides insights into how technologies are shared, discussed, and utilised, highlighting the role of social networks in facilitating access to resources and enhancing knowledge-sharing related to unpaid labour technologies.

Theoretical Framework

A comprehensive theoretical framework for understanding how women leverage technology to reduce the burden of unpaid labour can combine the Technology Acceptance Model (TAM) with the Feminist Standpoint Theory. TAM, developed by Davis (1989) and further refined by Venkatesh and Bala (2008), posits that perceived ease of use and perceived usefulness are critical factors determining whether individuals will adopt and effectively utilize new technologies. In the context of unpaid lab, TAM can be used to assess how women perceive technologies such as smart home devices, online shopping platforms, and digital health tools in terms of their ability to simplify and streamline household tasks and caregiving responsibilities. By focusing on these perceptions, TAM helps to identify the key motivators and barriers that influence the adoption of these technologies among women, providing valuable insights into how technological solutions can be designed and promoted to better support unpaid labour.

Complementing TAM, Feminist Standpoint Theory (Harding, 2004) offers a critical lens through which to examine the gendered nature of unpaid labour and the structural inequalities that shape women's experiences. This theory emphasises the importance of women's unique perspectives and lived experiences in understanding social phenomena, arguing that marginalized groups can provide more complete and insightful analyses of power dynamics. Applying Feminist Standpoint

Theory to the study of unpaid labour and technology adoption highlights how societal norms, gender roles, and economic inequalities influence women's responsibilities and their interactions with technology. By acknowledging these broader social contexts, researchers can better understand the systemic factors that contribute to the unequal distribution of unpaid labour and how technology might challenge and reinforce these inequalities.

Integrating TAM with Feminist Standpoint Theory allows for a more nuanced and comprehensive analysis of how technology can empower women and alleviate the burden of unpaid labour. This combined approach recognizes that while technological innovations have the potential to reduce the time and effort required for domestic and care work, their adoption and effectiveness are influenced by broader social and gender dynamics. For instance, even as smart home devices might make household tasks more efficient, the persistent undervaluation of unpaid labour and entrenched gender roles can limit the extent to which these technologies truly alleviate women's burdens. By considering both the individual-level factors identified by TAM and the structural factors highlighted by Feminist Standpoint Theory, researchers and policymakers can develop more targeted and effective strategies to promote gender equality and support women's use of technology in managing unpaid labour.

This study employed an exploratory multiple-case study design to investigate how women in Nairobi leverage modern technologies to reduce labour and enhance their well-being. This design was chosen for its ability to provide in-depth, contextual insights into complex phenomena (Yin, 2018). Snowball sampling was utilised to identify and recruit participants, starting with initial contacts that then referred additional women using relevant technologies. This sampling method effectively reached a diverse group of women who might not be easily accessible through conventional sampling techniques (Noy, 2008). Data collection involved social media analysis to capture real-time, user-generated content and interactions, providing a rich source of information on technology use in daily life (Kaplan & Haenlein, 2010).

Research Methodology

Data for the study was collected using a mixed-methods approach, integrating exploratory multiple case study design and snowball sampling techniques. First, social media analysis was conducted

to explore discussions and trends related to unpaid care work and women's experiences. This involved following relevant threads, groups, and hashtags to gather qualitative insights contextualising the study. Additionally, I developed and distributed questionnaires to women in my personal and professional contacts. These questionnaires were designed to capture quantitative data on their experiences with unpaid care work, technology usage, and perceptions of gender roles. Participants were encouraged to share the questionnaire with others in their networks, facilitating a snowball sampling method that broadened the reach and diversity of responses. The combination of social media analysis and survey distribution allowed for a comprehensive understanding of the challenges and perceptions surrounding unpaid care work, enriching the dataset for analysis.

The data gathered was analysed using thematic analysis, focusing on key themes related to Water, Sanitation, and Hygiene (WASH), Energy, Transport, and Time Labour Saving Equipment Infrastructure (TLSE). These themes were selected due to their critical role in reducing the burden of unpaid labour and their significant impact on women's daily lives (Rosenberg, 2013). By categorising data within these themes, the study aimed to systematically explore how specific technologies are utilised and their effectiveness in improving efficiency and reducing labour.

Additionally, the technologies were assessed using the 5Rs framework developed by the International Labour Organization (ILO), which includes Reducing, Recognizing, Rewarding, Representing, and Rebalancing unpaid labour (ILO, 2018). This framework provided a comprehensive lens to evaluate the broader implications of technology adoption, ensuring that the analysis considered the practical benefits of technology and its impact on social and economic recognition and representation. By integrating these analytical frameworks, the study offers a holistic understanding of the intersection between technology, unpaid labour, and women's well-being in Nairobi.

Key Findings

Through social media analysis, insights were gathered into adopting and utilising technologies related to Water, Sanitation, and Hygiene (WASH), Energy, Transport, and Time Labour Saving Equipment Infrastructure (TLSE). The thematic analysis revealed several key findings:

Types of Unpaid Labour

In Nairobi City County, unpaid labour extends beyond cooking, cleaning, and childcare and includes a variety of other responsibilities. Women often participate in church and welfare groups, which involve organising events, fundraising and providing community support, all of which require significant time and effort. Child and elderly care are also critical components of unpaid labour. While elderly care predominantly occurs in rural areas, many women in the city still manage these responsibilities by hiring someone to assist. Additionally, grocery shopping is a routine yet time-consuming task that women frequently undertake. These diverse forms of unpaid care work highlight the extensive range of activities that women manage daily, often alongside their professional duties. However, it's noted that the level of involvement varies significantly among different women. Women with infants and Younger children were likely to be more involved than those with teenagers and adult children.

Women in Nairobi City County manage their unpaid labour in various ways. Most employ stay–at–home nannies to assist with household chores and childcare. Others rely on older children and day burg (housemaids) to share their workload. However, many women handle these tasks alone, with only 13.3% reporting that their husbands assist with household duties. This minimal involvement of husbands in unpaid labour underscored the gender imbalance in domestic responsibilities. Hiring of help depended on factors like income, household size, and personal preferences. Spousal support was also dependent on individual family dynamics.

Childcare is majorly borne by women and heavily impacts their participation in paid labour. In a Facebook conversation, women narrated their experiences after maternity leave, with several women indicating taking career breaks to focus on raising the child. The majority called for flexible working arrangements like online jobs, working from home, and a supportive work environment as key roles in supporting women to maintain the work-family balance. It is worth noting that women's experiences of post-maternity were different and unique, depending mostly on spousal, family support, socio-economic, and professional background.

Online discussions reveal that women are finding innovative ways to empower house managers and ease their workload. Empowering house managers to take on more responsibilities, such as

grocery shopping and caregiving, is a common strategy. This delegation helps distribute the workload more evenly. However, the practice of empowering house managers is more accessible for households with sufficient financial means. The study noted that women from low-income households employed nannies from upcountry that may be primary or secondary school drop-outs, lacking professional training and paid low wages. The security risk in Nairobi associated with tricking nannies also made most afraid to delegate certain roles. Some house managers have also been linked to stealing from their employers, and thus, trust issues have hindered women from empowering them.

Additionally, women are increasingly utilizing local bike riders to pick up and deliver items from markets and shops. This practice not only eases the burden of grocery shopping but also supports local businesses and provides employment opportunities within the community. The cost implications of using bikes to run errands are a trend mostly among high-income neighbourhoods and, as such, may not be prevalent in low-income households.

Social media discussions reveal that while women appreciate any form of assistance, they often feel societal pressure and guilt for delegating household tasks. This highlights the need for broader support systems and progressive workplace policies. Additionally, there is a growing movement towards more efficient collaborative approaches to managing unpaid labour in Nairobi City County.

Form of technology;

WASH and Energy Technologies: Technologies related to WASH and energy management play a crucial role in improving living conditions and reducing the burden of the manual labour associated with fetching water, cooking, and maintaining household cleanliness. Participants highlighted the convenience and time-saving benefits of water purification systems, energy-efficient appliances, and automated cleaning tools.

The following were commonly used among women in Nairobi City County: water purifiers, dispensers, running tap water in the house, water tanks for storage, and the adoption of rain harvesting techniques in their houses.

The transition from rural settings, where fetching water from distant sources was a daily necessity, to modern homes equipped with running water has significantly impacted unpaid labour, particularly for women and children who traditionally bore the brunt of this task. This shift has drastically reduced the time and physical effort required for water collection, allowing individuals to redirect their energy towards education, employment, and other productive activities. It has also enhanced overall health and hygiene by providing easier access to clean water, further alleviating the burden of water-borne diseases (in a home set-up, due to the gendered division of labour, a mother has to forfeit work to take care of sick family members). Consequently, this change has contributed to improved gender equality and economic development, as the reduction in unpaid labour allows for greater participation in formal economic activities.

Modern houses with in-built flush toilets, dishwashing stations, and advanced sanitation infrastructure were noted to significantly reduce the burden of unpaid labour, particularly for women in Nairobi. These efforts are required for daily chores such as water collection, manual dishwashing, and maintaining hygiene, which traditionally fall on women. These facilities enhance convenience and efficiency and improve health outcomes by reducing exposure to the spread of diseases such as cholera, dysentery, and typhoid. Moreover, this transition allows women to allocate more time to paid employment. However, the benefits of such modern infrastructure were not uniformly accessible; socioeconomic status, residential location and availability of reliable utilities intersect to determine who can afford and maintain these conveniences, thereby influencing the extent to which unpaid labour is alleviated. Poor sanitation exacerbates the vulnerability of communities, particularly impacting children and the elderly, who are more susceptible to severe outcomes.

Energy:

Adopting modern energy sources for cooking and lighting, such as electricity, natural gas, and solar power, has significantly revolutionised unpaid labour, particularly benefiting women in Nairobi. Using electricity for lighting extends productive hours and enables safer, more efficient completion of household tasks. Electric and gas stoves reduce the time and health risks associated with traditional wood or charcoal stoves, minimising exposure to harmful smoke and reducing the labour of gathering fuel. Using KOKO, a clean ethanol cooking fuel, and solar energy offers an

affordable and sustainable alternative, especially in areas with unreliable electricity supply, further alleviating the burden of unpaid labour. These advancements free up time for women to engage in educational pursuits, formal employment, and entrepreneurial activities, thereby supporting women's economic empowerment(WEE) and contributing to broader societal development.

However, water challenges remain a big issue in Nairobi, disproportionately increasing women unpaid labour who are primarily responsible for securing and managing household water supplies, thereby exacerbating gender inequalities in access to education, employment and leisure activities. Additionally, socioeconomic status, availability of reliable infrastructure, and even property ownership influence the degree to which WASH and Energy technologies are accessible and impactful in Nairobi. Women in informal settlements within Nairobi may face challenges due to limited access to these tools, exacerbating their unpaid labour burden. The high cost of electricity in Kenya limits its usage within most homes opting for cheaper energy sources.

Transport Logistics and Supply Engineering:

The development of transportation, logistics and supply chain engineering (TLSE) infrastructure, along with the proliferation of personal car ownership, ride-hailing services like UBER and Bolt, and organized public transport systems, has significantly alleviated unpaid labour, particularly for women in Nairobi. Owning a personal car offers the convenience of flexible, efficient travel, reducing the time and physical strain associated with commuting long distances for daily tasks such as grocery shopping, school runs, and healthcare visits. This flexibility is crucial in managing household responsibilities more effectively and freeing up time for other productive activities.

Ride-hailing services like Uber and Bolt provide an accessible alternative for those who do not own cars, offering on-demand transportation that can save substantial time and effort compared to traditional public transport. These services reduce the uncertainty and physical exertion of navigating complex and often unreliable public transport, particularly during peak hours. Additionally, organised school bus services further ease the burden of unpaid labour. School buses ensure safe and reliable transportation for children, alleviating parents from daily school runs and allowing them to focus on other tasks or engage in paid employment. Improved public systems

make commuting more predictable and less consuming, reducing stress and unpaid labour associated with long commutes.

Using motorbikes in Nairobi has significantly supported women in managing household logistics by providing fast, affordable and flexible transportation options. They enable quick trips to markets, schools and healthcare facilities, reducing the time and effort required for these essential tasks. This accessibility is particularly valuable in navigating the city's traffic, allowing women to balance multiple responsibilities efficiently. Additionally, motorbike riders, commonly known as "boda boda", offer a convenient alternative for those who don't own personal vehicles, further easing the burden of unpaid labour and enhancing women's ability to participate in economic and social activities.

The intersection of these transportation options with socioeconomic factors is critical. While personal car ownership and frequent use of ride-hailing services may be more accessible to higher-income households, enhancements in public transport infrastructure can broadly benefit all socioeconomic groups, promoting greater equity. Public transportation and motorbike taxis are more common in low-to-middle-income areas and may vary significantly in availability and reliability. Boda Boda rides have also been linked to insecurity issues and may expose women to further risks of Gender-Based Violence and Sexual Harassment. Ultimately, developing diverse and efficient transportation options reduces unpaid labour, supports women's economic empowerment, and fosters greater gender equality by enabling more balanced participation in economic and social activities.

Time and labour-saving equipment.

Time and labour-saving equipment, such as refrigerators, microwave ovens, pressure cookers, gas/electric cookers, and washing machines, are crucial in reducing household unpaid labour. These domestic appliances streamline daily chores, allowing women to complete tasks more efficiently and freeing up time for other activities, including starting side businesses. For example, a refrigerator enables bulk shopping and food preservation, while a washing machine significantly reduces the time and effort spent on laundry and enables multitasking by allowing women to attend to other tasks or even pursue work-from-home opportunities while the machines run. Pressure

cookers and gas/electric cookers significantly reduce cooking time and effort, allowing for quicker meal preparation and freeing up time for other tasks. However, the availability of such appliances is often determined by household income and dynamics; as such, not all households can afford them. The unsteady supply of electricity and water, coupled with the low-skill level of nannies/house managers and related costs, makes their use impractical and limits their usefulness

Mobile technology and internet connectivity further enhance household management. With tools like CCTV cameras, messaging apps, and WhatsApp, women can remotely coordinate and monitor household activities, ensuring safety and efficiency. Online platforms also provide valuable resources for managing unpaid labour. Websites and social media channels such as "Lets Cook Kenyan Meals" offer life hacks and challenging traditional gender roles in domestic work. Influencers like Khamadi Murila with "ICOOKUEAT" and Dennis Ombachi, "the Roaming Chef", promote shared responsibilities and culinary skills among men. Additionally, platforms like Nyarai, Pigiame, Glovo and Jumia, among others, offer services for cleaning, cooking and repairs, further alleviating household burdens. These tools and household resources reduce unpaid labour and empower women to participate more fully in economic and social activities.

The study noted the existence of a digital divide whereby there are disparities in access to and use of digital technologies. This was seen to impact on unpaid labour and WEE activities negatively. Women in many parts of Nairobi have limited access to the internet and digital tools due to its high cost. In these regions, women often face greater challenges in managing unpaid labour effectively. Without access to online platforms, resources, and networks, they may find it harder to access time-saving information, tips, and support for household management. This has perpetuated gender roles, where women bear the disproportionate burden of unpaid labour, limiting their opportunities for education and paid and entrepreneurial activities.

A Facebook analysis revealed that women used kitchen appliances to start income-generating projects as side hustles, as commonly referred to us, while others developed full-time self-employment from such appliances. Social media discussions also reveal that women engage in online education and professional development courses, allowing them to develop skills and seek employment opportunities without compromising their responsibilities at home. Women also use YouTube and other online resources to learn skills that make household work easier, such as

efficient cooking techniques, DIY cleaning hacks, and home organisation tips. These insights demonstrate the transformative impact of mobile technology on women's lives, providing them with tools to balance their numerous roles more effectively and gain greater control over their time and activities. However, limitations associated with diverse digital literacy skills, entrepreneurial skills and self-belief among women hindered such advancements.

The impact of technology on Women's Economic Empowerment

The study noted that only 18 % of users are completely satisfied, while the largest segment, 37.5%, rated their satisfaction at 2, indicating moderate dissatisfaction. A quarter of the users, 25%, rated their satisfaction at 3, suggesting significant dissatisfaction. Meanwhile, 6.3 % rated their experiences at 5, showing high dissatisfaction and 12.5 % rated them at 5, the highest level of dissatisfaction. This distribution suggests that although some users find technologies beneficial, a substantial portion experiences varying degrees of dissatisfaction, highlighting areas for improvement in these technologies' effectiveness and accessibility.

The data on user dissatisfaction with technologies designed to reduce unpaid labour highlights several barriers that impede their effectiveness. Key obstacles include the high cost of appliances, limited availability, and lack of skills to operate them. Cultural norms and gender roles also play significant roles, often restricting women's access to these technologies. Limited infrastructure, particularly unreliable electricity and water supply, further complicate their use. Additionally, there is a lack of knowledge and awareness about the benefits and usage of these technologies. Discussions on social media reveal other barriers, such as inadequate customer support, maintenance challenges, and the digital divide, which restricts access to online resources and training. Addressing these barriers requires a multifaceted approach, including making appliances more affordable, enhancing infrastructure, providing skill training, and challenging cultural norms to ensure broader adoption and effective utilisation of technologies that can alleviate the labour burden.

The effectiveness of the technologies in reducing unpaid labour, rated on a scale from 0 (very satisfied) to 5 (Not satisfied), reveals mixed outcomes. Only 18.8% of the respondents are very satisfied with these technologies, indicating that small portions find them highly effective. The

largest group, 37%, rated their satisfaction at 2, showing moderate effectiveness but still room for improvement. A quarter of the respondents, 25 %, rated the effectiveness' at 3, indicating significant dissatisfaction. Higher levels of dissatisfaction are seen in the 6.3% who rated the effectiveness at 4 and the 12.5% who rated it at 5. This distribution suggests that while some users benefit from these technologies, a substantial portion finds them insufficiently effective in reducing unpaid labour, highlighting the need for enhanced functionality, better accessibility, and targeted user education. The satisfaction level can vary widely based on individual household needs, personal expectations, and prior familiarity with such technologies.

On technology that could significantly reduce the burden of unpaid labour, Mobile applications and online platforms were rated highly, each garnering 31.3% of the preference. These tools offer convenience and accessibility, enabling women to manage household tasks, access services, and gain valuable information more efficiently. Child care services, favoured by 18.8%, are also seen as crucial in alleviating unpaid labour by freeing up time for other activities. Appliances for the house (12%) and educational resources for children (12.5%) are also important but less prioritised. Social media discussions suggest additional valuable technologies and community support networks for sharing childcare and domestic responsibilities. These insights emphasise the importance of integrated digital solutions and supportive services in effectively reducing unpaid labour for women.

Barriers to the Effective Utilization of Technology

The high cost of data and calling rates significantly impede the effectiveness of digital technologies in reducing unpaid labour. Despite the potential benefits of mobile applications, online platforms, and telecommunication services, these expenses can limit access for many women, particularly in lower-income households. This financial burden restricts their ability to fully utilise these technologies to manage household tasks, access educational resources, and participate in online support networks.

Addressing the high cost of data is crucial to ensuring that digital solutions can reach and benefit a broader population. This would enhance their role in alleviating unpaid labour and supporting women's economic empowerment. Reducing these costs would enable more women to harness the

full potential of digital technologies, making household management more efficient and creating opportunities for economic participation.

The study also identifies various sociocultural norms that significantly hinder women's access to and use of technology. Assigned gender roles as women's primary roles restricting their time and opportunities were supported by 56.3% of respondents. Cultural beliefs that discourage women from using technology affect 50% of the respondents, further limiting their engagement with beneficial digital tools. Additionally, 31.3% cite limited access to education and training, which impedes their ability to utilise available technologies effectively. Financial constraints are a major barrier, with 62.5% highlighting restrictions on women's financial capacity and autonomy. Stereotypes about women's technological abilities also persist, impacting 31.3 % of women. Furthermore, 50% of women feel quilt delegating their traditional roles to nannies and machines, illustrating deep-seated cultural pressures. These combined factors create significant obstacles to leveraging technology to reduce unpaid labour, emphasising the need for comprehensive strategies to address these barriers.

Discussion

The data clearly shows that a significant majority of women (62.5%) believe that technology can empower them, compared to the 18.8% who do not share this belief. This demonstrates a strong consensus on the potential of technology to transform women's lives by reducing unpaid labour. The benefits of such empowerment include increased time for paid work, enabling women to take on more responsibilities and pursue higher positions. This also opens up more opportunities for education, allowing women to enhance their skills and qualifications. The study findings agree with Guney-Frahm (2023), who acknowledges that technology can potentially alleviate the burden of unpaid labour. However, to achieve gender equality, it is essential to redistribute this work and ensure equal participation of men in reproductive tasks. She recommends a cultural revolution and a change in mindset, emphasising that women must first possess the necessary skills and free themselves from stereotypes associating masculinity with technology. Additionally, equal male participation in household and care work is crucial. To challenge gender stereotypes, collaboration among civil society, the private sector, and the government is necessary through educational campaigns, training, and advertisements. Without these changes, she notes that the unequal

division of labour in the household will remain a significant barrier to gender equality and hinder women's economic empowerment in the technological era

Despite the many gains in the use of technology, the socialisation of women into gendered roles has led to feelings of guilt when leaving young children under the care of hired help or utilising technology to ease household work. This is because they feel they do not fit the ideal image of a wife or mother. Huws (2019) supports this notion, suggesting that new strategies are needed to address the underlying social relations perpetuating the unequal division of labour in contemporary capitalism. In line with the study findings, governments must invest in infrastructure and public services such as water, electricity, security, and digital connectivity to ease the burden of unpaid labour.

Conclusion

Technology has transformed how women in Nairobi City County manage and reduce the burden of unpaid labour. Mobile technology and internet connectivity enable remote home monitoring, efficient communication, and access to online services for grocery shopping, delivery services, and household management. These advancements save time and effort and give women more control over their daily activities, allowing them to balance professional and personal responsibilities more effectively. Social media platforms facilitate sharing strategies and tips, advocating for supportive work environments and empowering house managers. Utilising local bike riders for deliveries further eases the workload. These technological solutions foster a more equitable distribution of domestic duties, supporting women in their multifaceted roles and enhancing their economic development.

In conclusion, leveraging technology can improve mental and physical health by alleviating unpaid labour's stress and physical burden. It also provides more leisure time, which women can use to build talents and develop other skills. Enhanced family relationships are another positive outcome, as technology allows for more efficient household management and better work-life balance. Women can also undertake more activities for career advancement, networking, sharing and collaboration, thus broadening their professional and social horizons.

Recommendation

The study recommendations for leveraging technology to reduce unpaid labour and enhance women's economic empowerment align with the 5R framework: recognise, Reduce, Redistribute, Represent, and Reward.

Promote flexible work arrangements: Employers should leverage modern technologies to adopt flexible work options, such as remote work and flexible hours, to support women in balancing unpaid and paid labour. Flexible policies, for example, will help mothers during the early childhood years manage childcare and household responsibilities without compromising their career growth.

Improve access to affordable and sustainable household technologies: Increasing the availability of affordable household appliances such as energy-efficient cookers, washing machines, and refrigeration, would reduce time spent on domestic chores. Government and Non-governmental organisations can partner to subsidise or provide financing options to help women in lower-income households access these tools.

Enhance digital literacy and technology skills for women: Training programs should be established to equip women with skills in using mobile applications, internet services, and technological tools that simplify household management and access to services. Digital literacy can also open avenues for online learning, side business, and gig work, contributing to women's economic empowerment.

Advocate for gender-equitable domestic policies; Encourage initiatives and policies that promote shared household responsibilities between men and women. Campaigns and educational programs should challenge traditional gender roles by promoting a culture of equality in household duties, encouraging men to actively participate in childcare and housework to lessen the disproportionate burden on women.

Delegate and utilize resources and technologies to lighten the domestic load: Women should be sensitized to embrace delegation and use available resources- such as nannies, caretakers, and support networks—to share domestic responsibilities. This approach prioritises smart planning and efficiency, challenging the traditional expectation that women should single-handedly manage all household tasks.

Challenge and overcome guilt associated with delegation: Women should reframe and address the internalised guilt often felt when delegating household tasks. Society often socialises women to feel responsible for managing the home entirely, creating an unnecessary burden of guilt when tasks are shared. By recognising that delegation enhances family well-being and personal fulfilment, women can gradually let go of this guilt, embracing the idea that a balanced approach to home management benefits everyone.

These recommendations, informed by the intersection of social, economic, and technological factors, empower women to rethink unpaid labour and foster a more balanced and guilt-free approach that challenges the deeply rooted traditional gender roles while supporting women's active participation in both household and economic spheres.

Recognise: Acknowledge the importance of unpaid labour and integrate it into economic and policy frameworks. The study highlights the benefits of technology in alleviating the burden through public awareness campaigns and data integration.

Reduce: Minimise the barriers to technology by addressing affordability and accessibility issues, such as reducing data costs and expanding infrastructure for reliable services. Provide targeted education and training to equip women with the skills needed to utilize technology effectively.

Redistribute: Challenge cultural norms and stereotypes around gender roles to promote a more equitable division of unpaid labour. Encourage men's involvement in household responsibilities and support initiatives that promote care shared caregiving.

Represent: Increase women's representation in decision-making processes related to technology and infrastructure development. Ensure their voices are heard in designing and implementing policies that affect their access to and use of technology.

Reward: Recognise and reward women's paid and unpaid contributions through incentives and policies that support their economic empowerment. Celebrate achievements and promote positive role models to inspire others.

By presenting these key findings within the employed methodology framework, this study provides valuable insights into the transformative role of technology in enhancing women's well-being and reducing the burden of unpaid labour in urban settings like Nairobi.

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