Ethical Implementation of Automation and Employment

Introduction

Automation – from robotics on factory floors to artificial intelligence (AI) in offices – is transforming the nature of work. This transformation brings both promise and peril. On one hand, automation can boost productivity and economic growth; on the other, it raises serious ethical questions about job displacement and the future of workers. Globally, the **World Economic Forum** predicts that around *85 million jobs may be displaced by 2025 due to automation*, even as about *97 million new roles emerge* to meet the changing economy. The challenge is ensuring that this technological progress benefits society broadly and **minimizes harm to workers**. For a developing country like Bangladesh – where industries like garments, agriculture, and services employ millions – the stakes are especially high. How can Bangladesh embrace the *Fourth Industrial Revolution* (4IR) while upholding ethical principles such as fairness, responsibility, and inclusive progress? This note explores these questions, focusing on job displacement, the duties of tech companies and engineers, the importance of retraining, and ensuring **no one is left behind** in the march of automation.

Automation and Employment: Opportunities and Challenges

Automation refers to machines and algorithms performing tasks that humans used to do. In Bangladesh and globally, this ranges from **industrial robots** assembling products to software automating routine office work. Automation can **create new kinds of jobs** – for example, demand for data analysts, robotics engineers, or machine maintenance technicians is rising. However, it can also **eliminate existing jobs**, especially those involving repetitive or routine work. In many industries, we are witnessing a *"digital disruption"* where certain roles are enhanced or created, but *many more traditional jobs may disappear*.

In Bangladesh, the impact of automation is already visible. The ready-made garments (**RMG**) sector, which is the country's largest manufacturing employer, provides a vivid example. Recent research (by Bangladesh Labour Foundation and BRAC University) found that *technological upgrades in garment factories led to a 30.58% reduction in overall employment*, mainly affecting entry-level positions like garment "helpers". In sweater-making factories, employment per production line fell by about 37%, and even in traditional woven garment units there was a ~27% workforce reduction as machines took over certain tasks. The **cutting department** – once

labor-intensive – saw the sharpest decline, with almost *48% fewer workers needed after automation*. These figures illustrate how efficiency gains can translate to significant job losses.

Other sectors face similar trends. In **agriculture**, mechanization (e.g. power tillers, harvesters) is gradually reducing the need for manual labor in planting or harvesting. In the **service industry**, automation appears in forms such as ATMs and mobile banking (reducing the need for bank tellers), or AI chatbots handling customer service queries. A multi-sector study in Bangladesh projected *alarming job losses due to automation across five major industries*: about **60%** of jobs could be lost in both the garments/textile and furniture sectors; around **40%** in agro-food processing; **35%** in the leather industry; and about **20%** in the tourism/hospitality sector. These predictions highlight that labor-intensive sectors are especially vulnerable if they do not adapt.

However, it's not all doom and gloom – *new opportunities are also arising*. The same study noted that automation is **creating new hybrid jobs** in manufacturing that blend technical and traditional skills. For example, apparel factories now seek professionals skilled in **computer-aided design (CAD)**, automated quality control, and robotics operation. Roles like *robot operators, industrial AI specialists, and maintenance technicians* are emerging, which were unheard of a decade ago. Even in agriculture, demand is growing for technicians who can manage automated farm equipment and analyze data from smart farming systems. This reflects a broader historical pattern: while technology can render older jobs obsolete, it often gives rise to new kinds of work. The overall outcome for employment will depend on how *workers can transition* to these new roles and how society manages the shift.

Job Displacement and Ethical Concerns

The most immediate ethical concern with automation is **job displacement** – workers losing livelihoods. This raises questions of **welfare, fairness, and social stability**. If a factory replaces hundreds of workers with machines, what happens to those workers and their families? In Bangladesh's garment industry, millions of **women** have traditionally relied on sewing and factory jobs. In fact, the RMG sector historically employed a majority of women (about 80% of its 4 million workers). As automation progresses, evidence suggests women are disproportionately affected: studies indicate that *female and less-educated workers are more likely to be severely impacted by automation*. In some factories, as low-skill jobs are automated, the share of female workers has dropped significantly, highlighting a gender fairness issue. **Older workers** face challenges too – they may find it harder to learn new skills or compete for the technical jobs that automation creates. Ethical implementation of automation must account for these *vulnerable groups* so that technological change does not worsen existing inequalities.

Another concern is the **speed of change**. If automation is introduced abruptly, whole communities can suffer economic shocks. In Bangladesh, many towns are centered around garment factories or agro-processing plants. A sudden wave of layoffs can lead to

unemployment, poverty, or social unrest. There is a principle in ethics called "*duty of care*" – employers and innovators should have a duty of care towards people impacted by their decisions. Rapid automation without support violates this principle by effectively abandoning loyal workers in the pursuit of efficiency.

Furthermore, **societal inequality** can increase if automation's benefits (like higher profits or productivity) accrue only to factory owners or tech companies, while the costs (unemployment, retrenchment) fall on workers. This scenario offends our sense of **justice and fairness**. Ethically, if robots and AI boost output, *who should enjoy the gains?* Fairness would suggest that some of those gains be used to compensate or uplift displaced workers – for instance, through better severance packages, funding retraining programs, or even profit-sharing mechanisms. An extreme ethical question arises: *Do people have a right to work in the age of automation?* While not a formal legal right, many philosophers argue that access to decent work is tied to human dignity. **International frameworks** like the ILO's Decent Work Agenda emphasize the right to livelihood and social protection. If automation undermines these without remedy, it may be viewed as ethically problematic, undermining human dignity and rights.

Ethical Frameworks: Utilitarian, Justice, and Rights-Based Views

Different ethical theories offer perspectives on how to approach automation and employment:

- **Utilitarian Perspective (Consequences and "Greatest Good")** – A utilitarian approach evaluates automation by weighing its overall benefits against its harms for society. It asks, *does automation produce more happiness (or utility) overall than pain?* From this view, the positive consequences (greater productivity, economic growth, cheaper goods, maybe new high-skill jobs) are balanced against negative consequences (job losses, income inequality, social disruption). If automation leads to a net increase in societal well-being, a utilitarian might support it – **but only if steps are taken to reduce the suffering of those who lose out**. For example, a utilitarian ethicist would **advocate for safety nets and retraining** to offset job losses. The Bangladesh government identifying that *"nearly two in five jobs face the risk of automation"* and planning mitigation is in line with this thinking. However, a purely utilitarian view has limits: it might justify sacrificing a minority (displaced workers) for a greater good, and *struggle to account for individual rights or the dignity of those who are harmed*. Thus, while utilitarianism highlights maximizing total benefit, it also compels us to minimize pain – e.g. by policies like **social welfare, universal basic income, or retraining programs** to ensure the greatest good for the greatest number.

- **Justice and Fairness Perspective** – This approach is about the *equitable distribution of benefits and burdens*. Philosophers like John Rawls would ask how we can arrange societal changes so that they are fair, especially to the least advantaged. In the context of automation, a fairness-oriented ethic would demand that the **gains from technology are shared** and that those who bear the brunt (often low-income workers) are protected. One notion is the *"difference principle"*, which suggests social and economic inequalities (like some benefiting from automation more than others) are only acceptable if they benefit the least advantaged members of society. Applying this to automation: it would be ethical only if it eventually makes even displaced workers better off (for instance, through new opportunities or compensation). If a factory gets richer by automating, **justice** might require it to invest in the community – perhaps funding training centers or creating alternative jobs – so that workers who lost jobs can still achieve a decent livelihood. In Bangladesh, policies call for *"inclusive, forward-looking"* skills development aligned with long-term goals. Ensuring inclusivity (e.g. training programs targeting **women, rural populations, and disadvantaged groups**) is explicitly identified as a key principle. This reflects a fairness-based ethic: giving *equal opportunities* to those who might otherwise be left behind. Fair process is also important – involving worker unions in decisions, giving advance notice of changes, and providing fair compensation all come under procedural justice.

- **Rights-Based (Deontological) Perspective** – A rights-based approach focuses on duties and the inviolable rights of individuals, rather than just aggregate outcomes. From this angle, workers are *not just means to an end* (profit or efficiency) but **ends in themselves**. Employers and tech developers have a moral duty to treat employees with respect, and workers have certain rights – e.g. the right to fair treatment, to pursue a livelihood, and to not be exploited. A deontologist would argue that even if automation brings efficiency, it's unethical to pursue it in ways that trample on people's rights or violate moral duties. This view would *emphasize companies' obligations*: for instance, to ensure a **living wage**, to **offer retraining opportunities**, and to avoid simply discarding workers. It's notable that Bangladesh's National Skills Development Policy (NSDP 2020) highlights *"shared responsibilities"* among government, employers, and others to provide re-skilling and up-skilling for workers. This aligns with the duty to help employees adapt. Unlike utilitarianism, a rights-based ethic might say **certain lines should not be crossed** – for example, it would view it as unethical if automation leads to exploitation (like making remaining workers do the job of three people or denying them benefits) even if profits increase. It insists on treating workers with dignity during transitions – meaning consultation, respect, and support, rather than treating them as expendable resources.

These frameworks collectively suggest that *ethical implementation of automation* requires looking beyond just profit or output. We must consider **consequences**, ensure **fair distribution**,

and respect **fundamental rights**. In practice, a balanced approach drawing on all these perspectives is needed.

Responsibilities of Tech Developers and Companies

Who is responsible for ensuring automation is implemented ethically? The answer is **shared** – tech developers, business leaders, and policymakers all have roles to play. First, **technology companies and engineers** (including CSE graduates who design software or robots) must recognize their professional ethical obligations. Codes of ethics in computing (like the ACM Code of Ethics) urge professionals to *"contribute to society and to human well-being"*. This implies that when designing an automated system, an engineer should consider its impact on people's lives – including whether it might displace workers or otherwise harm communities. The principle of *"avoiding harm"* means developers should **not build technology in a moral vacuum**. For example, if you are programming an AI to optimize a factory, an ethical approach would be to also provide features that *assist human workers* (perhaps making the AI a tool that augments human labor rather than outright replacing it). Where replacement is inevitable, developers and companies should at least **foresee the impact** and advise mitigation (for instance, providing a long lead time for deployment to allow workforce adjustment).

Companies that adopt automation have a direct responsibility to their employees. Leading thinkers call for *"socially responsible automation"* – a commitment by businesses to adopt new tech in ways that foster not just economic gain but also **social cohesion**. Practically, what might this entail? Some ethical responsibilities of companies and tech leaders include:

- **Advance Planning and Transparency:** Companies should not surprise workers with sudden layoffs due to automation. Instead, they should plan changes in advance and **communicate honestly** with employees. Involving workers (through unions or representatives) in discussions about technological changes is a mark of respect and fairness. In Bangladesh, experts have stressed involving *"workers, trade unions, employers, and civil society"* when navigating 4IR challenges.

- **Retraining and Upskilling Programs:** Perhaps the clearest responsibility is to help displaced workers land on their feet. It is widely encouraged that employers who introduce automation also **invest in retraining** those workers for other roles. This could mean training an assembly line worker to become a machine operator or maintenance technician, or providing digital literacy courses so that administrative staff can shift to higher-skilled office jobs. Offering such programs (or partnering with government initiatives) is an ethical way to *"usher the workforce through digital disruption"* rather than simply cutting jobs. For example, some garment factories might retrain sewing machine operators to run computerized embroidery machines, thereby *augmenting* their

skill set instead of eliminating their livelihood.

- **Fair Transition Support:** If jobs must be eliminated, companies have a duty to provide **fair severance benefits and job placement assistance**. Ethically, a company that has benefited from employees' service owes them support in transition. This could include financial packages, counseling, and connecting workers with new opportunities (perhaps in the newly created tech-oriented roles). The concept of a *"just transition"* is relevant here – it means ensuring that workers are not made to bear all the costs of a societal shift. The recent apparel sector study in Bangladesh underscored the need for *"Just Transition strategies"* so that technological progress does not come at the expense of fair treatment for displaced workers.

- **Human-Centric Design:** Tech developers can aim to design automation systems that **work alongside humans** rather than replace them outright. The idea is to use machines to take over dull, dangerous, or physically taxing aspects of jobs, while still relying on human judgment, creativity, and oversight. Research presented at MIT emphasizes that *"humans should remain critical and central to the workplace of the future, controlling, complementing, and augmenting technological solutions"*. In this view, automation and AI are *tools to enrich human lives and livelihoods*, not to render humans obsolete. A concrete example could be a decision by a software firm to create AI that *assists* doctors in diagnosis (improving accuracy) rather than an AI that fully replaces the doctor-patient interaction. In manufacturing, instead of a fully automated factory with no workers, a **cobotics** approach (collaborative robots) might be used, where robots handle heavy lifting and precision tasks under the guidance of human workers. Such approaches keep humans in the loop and uphold the notion that technology should serve humanity.

- **Ethical Compliance and Standards:** Companies deploying AI should also adhere to emerging ethical standards – for instance, ensuring AI does not violate privacy or labor rights. In Bangladesh, officials have noted the need to *"establish ethical standards for the use of artificial intelligence"* as automation expands. This could mean internal company policies that say, for example, *we will not use AI to unfairly monitor or punish workers* (surveillance ethics), or *we will not base layoffs solely on an algorithm's recommendation without human review*. Adopting **Corporate Social Responsibility (CSR)** guidelines for technology use can help align business practices with societal values.

In summary, **tech companies and developers carry significant ethical responsibility**: they are effectively the architects of the future of work. Ethical implementation requires them to prioritize people over pure profit – building systems that *drive economic growth **and** social well-being together*. As one conference of experts concluded, leaders must *"commit to building systems that drive ... social cohesion"* even as they innovate technologically. In practical terms, if a new

automated system is introduced, an ethical leader asks: *Have we ensured our employees are taken care of? Are we contributing to society, not just our bottom line?* These questions should guide decision-making.

Retraining, Education, and Inclusive Progress

A core strategy for ethical automation is **education and retraining** – equipping the workforce with skills to thrive alongside machines. Bangladesh's context highlights this need. The government's Access to Information program (a2i) has found that *"nearly two in five jobs"* in key manufacturing and service sectors are at risk from automation. To address this, the nation must invest heavily in **human capital development**. The good news is that this is recognized at high levels: Bangladesh's National Skills Development Policy (2020) sets out a vision for *"demand-driven, flexible and responsive training provisions"* and emphasizes aligning skills training with the evolving needs of industry. The policy explicitly calls for **equal opportunities** in training for all segments of society – including women, rural communities, and disadvantaged groups – so that technological progress does not exclude anyone. This commitment to inclusivity is ethically important: it aims to ensure that those who *need upskilling the most (e.g. low-skill workers, women in vulnerable jobs)* get access to it.

Re-skilling programs can take many forms. The government, perhaps in partnership with industry and NGOs, can set up vocational training centers focusing on *4IR skills* (such as robotics operation, programming, equipment maintenance, or digital literacy). In the RMG sector, for example, there are initiatives to train workers in operating advanced machinery or transitioning into other growing sectors like footwear or light engineering. **On-the-job training** is also valuable: factories introducing new tech might phase it in by first running it parallel to human workers and training them to operate or supervise it. Bangladesh has begun such efforts; for instance, experts have urged strategic planning for skill development and even the Bangladesh Institute of Labour Studies (BILS) together with the ILO have organised dialogues on upskilling workers for the 4IR.

Aside from technical skills, education in *STEM fields* and basic computer literacy for youth becomes crucial so that the next generation can fill the new types of jobs created by automation. Professional ethics education (like the course for which this note is intended) also plays a role: tomorrow's engineers and managers should graduate with an understanding of their ethical duties in a tech-driven world.

Inclusive technological progress means that the benefits of automation should reach all groups in society, not just urban elites or company owners. In Bangladesh's context, that means policies should address rural areas and sectors like agriculture and small enterprises. For example, if agricultural automation (like automatic irrigation systems or drones for crop monitoring) is introduced, inclusive progress would entail training *farm workers* to operate these new tools, or

helping them transition to other roles in the agricultural value chain (such as equipment maintenance or agribusiness services). The government and NGOs can also provide **micro-credit and entrepreneurship training** to displaced workers, enabling them to start small businesses (perhaps leveraging technology themselves – e.g. an e-commerce venture or a food processing micro-enterprise). Such steps ensure that people can find *new livelihoods instead of permanent unemployment*.

From a policy angle, **safety nets** are a key part of inclusive progress. Automation may cause frictions – periods of unemployment or lower income for workers in transition. Strengthening social safety nets (unemployment benefits, public works programs, or conditional cash transfers) can cushion the blow and uphold a basic standard of living as people retrain. The International Labour Organization advocates for extending social protection and promoting *"decent work"* in tandem with technological change, so that development remains **people-centered**. Bangladesh's government, for instance, could consider expanding programs like skill development funds, subsidized retraining courses, or even exploring future-oriented ideas like a *universal basic income (UBI)* pilot in heavily automated sectors, to ensure **no citizen is left destitute by tech progress**. While UBI is a debated topic, its mention in ethics discussions underscores the moral imperative to share the fruits of automation with those impacted.

Another aspect of inclusive progress is **regional and sectoral balance**. The government must identify which regions and industries are most at risk and focus attention there. A study by the IMF on Bangladesh suggested that boosting skills and education is *complementary to policies responding to automation* – essentially, that as automation proceeds, constant *upgrading of the labor force's skills* is needed to avoid stagnation. This might mean, for example, offering special training programs in cities like **Chittagong or Gazipur**, which have high concentrations of garment factories, so that those communities can evolve toward more advanced manufacturing or service jobs over time.

Finally, ethical implementation in the Bangladeshi context involves **multi-stakeholder governance**. A combination of government policy, industry initiative, and labor representation is required. The formation of task forces or committees on the Future of Work (with representatives from ministries, business associations like BGMEA, and worker unions) can help steer policies. Already, voices in government have highlighted the need to *"make timely policy decisions to mitigate risks to workers' employment"* from 4IR. This proactive stance – planning **now** for the changes that are coming – is the essence of an ethical, prepared approach. It is much better to implement automation gradually and mindfully, rather than be forced into it suddenly by global competition without safeguards.

Case Study Spotlight: Bangladesh's RMG Sector and "Just Transition"

To ground these ideas, consider Bangladesh's **RMG sector** as a short case study in ethical automation. The garment industry is the lifeblood of Bangladesh's export economy, employing millions of mostly young, often rural-origin workers (predominantly women). It faces intense pressure from international markets to improve efficiency, quality, and compliance with labor and safety standards. Automation is one way factories have started to respond – for example, some larger factories have installed **automatic cutting machines**, **computer-controlled knitting machines**, and even experimented with robotic sewing units. These investments can boost output and reduce waste. But they also directly impact employment: one report warned that *up to 60% of garment jobs in Bangladesh may be lost by 2040 due to automation* if no actions are taken.

Ethical implementation in this scenario has several facets. **Firstly**, there is a need for a *"just transition" plan* for garment workers. The 2025 study by BLF/BRAC University strongly emphasizes focusing on just transition strategies that ensure workers displaced by technology are treated fairly and given new opportunities. This could involve the government and industry providing **vocational training in other sectors** (e.g. teaching sewing operators to become certified electricians, since infrastructure and construction jobs are growing). It could also include commitments by major apparel buyers (the international brands) to contribute to transition funds – since they are part of the value chain demanding higher productivity, an ethical supply chain approach would have them share responsibility for the workforce well-being.

Secondly, the RMG case underlines gender implications. As noted, women are losing jobs faster in automation-affected roles; this threatens to roll back the social progress made by women's mass entry into formal employment. To ethically manage this, programs specifically targeting **women workers** are needed – e.g. scholarships or stipends for women to enroll in technical courses, or entrepreneurship programs for women to start small businesses (such as tailoring shops that do custom work machines can't do, or other service ventures). The **Ministry of Labour** and donor agencies have indeed started some initiatives for training female workers in new skills (for instance, training in ICT or in higher value apparel design). Such gender-focused support is crucial for fairness.

Thirdly, open social dialogue is being used to address ethical concerns. In late 2024, the Bangladesh Institute of Labour Studies and the ILO hosted discussions in Dhaka on how to protect and upskill workers amid 4IR, urging involvement from all stakeholders. This kind of forum embodies an ethical approach – it treats workers as **stakeholders with a voice**, not passive subjects of technology. It also pushes the government to define policies (like clarifying the definition of "worker" in the age of AI, and setting ethical AI standards as mentioned by

officials). By bringing everyone to the table, Bangladesh increases the likelihood of consensus-driven, humane solutions rather than conflict.

Conclusion: Towards an Ethical and Inclusive Future of Work

Automation is often likened to a double-edged sword – it can cut new pathways to prosperity, but it can also cause harm if wielded carelessly. For undergraduate CSE students and future technology leaders, the key lesson is that **technology is not neutral** in its impact on society; it carries the values (or lack thereof) of those who implement it. The rise of automation in Bangladesh and around the world presents an urgent call for ethical action. *Job displacement, while real, does not have to mean permanent unemployment and misery* – if managed properly, workers can be transitioned to safer, perhaps more fulfilling roles, and society as a whole can benefit from increased productivity. The **ethical responsibilities** lie with all of us: engineers must design with humanity in mind, companies must adopt *responsible automation practices* rather than "ruthless automation," and governments must create frameworks that ensure progress is **inclusive**.

In the context of Bangladesh, ethical implementation of automation means blending the country's ambitious vision for development with its commitments to social justice. It involves investing in people as much as in machines – turning a potentially threatening situation into an opportunity for upskilling the workforce and improving job quality. It means using ethical frameworks as guides: the *utilitarian need to maximize overall welfare* (hence leveraging automation for economic growth **and** using some of that wealth to support displaced workers), the *justice imperative to protect the vulnerable and distribute gains fairly*, and the *rights-based duty* to treat every worker with dignity and respect through the transition.

To truly achieve **"Digital Bangladesh"** or a prosperous Bangladesh by 2041, the country must harness technology in a way that uplifts all its citizens. As one set of researchers noted, *humans should remain central in the future workplace, with technology enriching human lives rather than displacing them*. This vision is aspirational but attainable – through conscious ethical choices, stakeholder collaboration, and proactive policy. In practical terms, it means a garment factory worker in 2030 Bangladesh might work alongside automated machines, in a safer and more productive environment, while having the skills and support to secure her livelihood. It means a young CSE graduate might create the next AI application that boosts agriculture output, but also works with policymakers to ensure farm laborers are trained for new roles that AI creates.

Ethical automation is about balance: embracing innovation while caring for those who fuel that innovation with their labor. By preparing now – educating ourselves, our colleagues, and our policymakers about these ethical considerations – we can strive for a future where automation benefits *everyone*. In that future, technological advancement and employment need not be at

odds; instead, through ethical implementation, they can go hand in hand towards a more equitable and prosperous society.

Sources: The insights and data in this note are drawn from a range of credible sources, including academic and policy studies. Key references include government research (e.g. the a2i report on automation risk which found two in five jobs at risk), industry studies (e.g. the BLF/BRAC University study showing a 30% job cut from automation in garments), international analyses (e.g. World Economic Forum's job projections), and ethical analyses (e.g. MIT's framework for socially responsible automation). These sources, listed in the reference list, provide a foundation for understanding both the local context in Bangladesh and the broader ethical discourse on automation and employment.