AIUB Journal of Business and Economics [AJBE]

Volume 19, Issue 2, December 2022 Pages 65-80

Research Article

ISSN: 1683-8742 (PRINT) 2706-7076 (ONLINE) Homepage: https://ajbe.aiub.edu

Managerial Perspectives on Automation and Human Factors: Evidence from the Bangladeshi Garment Industry

Pinky Akter [1]

[1]Department of Economy and Business, Kyushu University, Japan; mahmudpinky@gmail.com

*****Correspondence: mahmudpinky@gmail.com

Abstract

Purpose of the study: The aim of this paper is to understand the perception of the human resource managers of the Bangladeshi RMG sectors regarding automation-related displacement and management of related human factors. Overall views regarding automation, related training and compliance issues are investigated too.

Methodology: Data is mustered by face-to-face interviews using a semi-structured questionnaire, which is analyzed through manual interpretive content analysis. A convenience sampling method is pursued; nonetheless, a proper mix of varied levels of garment factories is assured.

Findings: Low-skilled workers are mostly displaced due to automation; however, in aggregate it does not decrease jobs. Management is mostly driven by international buyers and compliance requirements while catering to human factors; even if training is considered a vital factor for automation success, the majority of the sampled factories do not have (effective) in-house training facilities.

Implications (practical): These findings will be beneficial to the academic, HR managers of the Bangladeshi RMG industry, regulatory bodies, and related business associations.

Limitations and Future direction: This study has considered a few samples from the model, above average and average garment factories; hence, generalizations of the conclusion might be questionable.

Article History:
Received: 08 October 2022
Accepted: 16 November 2022
Online: 12 December 2022

Keywords:
Automation; Displacement; Human Factors; Ready-made Garment (RMG); Compliance.

1. Introduction

Since the invention of the machine humankind is experiencing an ever-dynamic dependency on it. Machines and advanced technologies have brought effectiveness and efficiency in various activities and made our life easier (Parasuraman, 1997); it is especially true from the commercial aspects. Business entities are skewed toward the idea of making a profit and maximizing their firm value (Watts and Zimmerman, 1986). This perspective has brought about the concept of accelerated production process keeping in mind the notion of cost saving; 'automation' plays an important role here. Automation has been interpreted in different degrees and the range of its understanding starts from simple mechanization to complete control through artificial intelligence; some of its aftermaths reduce human employment and others abolish it completely (Sheridan and Parasuraman, 2005). Consequently, automation gives rise to various human factors, such as unemployment, de-skilling, desocialization, technological illiteracy, abandonment of responsibility and so on; all these have dire economic and social consequences too (Hofstede, 1994; Moray, 2000; Sheridan, 1980). The Bangladeshi Ready-made Garment (RMG) sector is not beyond this context.

Since its inception, within a short span of time, the Bangladeshi RMG industry has reached the apex of the global export arena; holding the second global position this industry earns almost 85% of the country's total export revenue. The major strength of this industry is the supply of low-cost labor; about 4 million employees work here and 80% of them are women (Akter, 2020). It is assumed that a majority of these employees are going to be impacted by automation which will displace and impact them with different human factors; unemployment being the vital one. Understanding this catastrophic impact of automation on the labor force and mitigating the same have motivated the persuasion of this study. Some of the Bangladeshi RMG factories—it has several top green (model) garments—have embraced automation and implemented it focusing on the idea of sustainability and some are not fond of automation at all. Intriguingly, there are different levels of automation installment in varied classes—garments vary based on order types, order amount, standardization of product, investment tenure, technological alignment, and compliance pursuance—of garments factories and the perception towards managing automation along with the associated human factors diverges according to it. The contribution of this study comes from this angle of deviation, i.e., understanding varied perceptions towards managing human factors that are arising as an aftermath of embracing automation.

The aim of this paper is to understand the managerial perspectives on automation and related human factors. Logically, the research questions are: how the Bangladeshi RMG managers view the idea of factory-automation-related displacement and how do they manage human factors arising from the adoption of automation? The specific areas that are being investigated are: a) automation-related job displacement, b) the category of workers that are being mostly displaced, c) implementation of training to facilitate automation and mitigate the related displacement and d) human factor management based on compliance.

The rest of the paper is structured as follows: section 2 covers a literature review with related background, section 3 offers the evidence of hypotheses development, section 4 depicts the methodology covering sampling, data collection and questionnaire factors, section 5 holds findings and discussion, and the paper ends with concluding comments accepting or rejecting the hypotheses.

2. Literature Review

Automation is traditionally understood as the execution by a machine agent of a function that used to be carried out by a human. The idea of automation is a dynamic one; when a function is completely reallocated from human to machine, it is simply interpreted as a mechanized tool, not automation. Hence, the automation of today can be termed as machines in the future (Parasuraman, 1997). Comprehensively, automation encapsulates the ideas of mechanization, environmental sensing, data processing, computerized decision-making, mechanical action and information action (Sheridan and Parasuraman, 2005).

Contemporary definitions of automation are aligned with interesting conceptualizations. According to Groover (2018) automation refers to a self-governing system of machines and it is beyond the simple replacement of human labor by technologies. Stone et al. (2016) integrated the notion of a computer-aided system with automation and postulated that even in highly automated technologies humans will be there as necessary drivers.

Automated technologies perform a given task more efficiently, accurately, cost-effectively, and reliably than human operators and are expected to replace them—at least most of them—in the long run. In some systems, automation replaced the human part completely and in others mostly. However, overall, the idea of a clean sweeping replacement of human operators is challenged in various levels of automation and value addition in factories (Parasuraman, 1997).

Automation might impact vulnerable workers from multiple dynamics; one of the aftermaths that vibrates them intensely is 'alienation'. This idea covers varied social and political issues related to the workers; an alienated worker is removed not only spatially but also temporally, functionally and cognitively (Sheridan and Parasuraman, 2005). Additionally, various authors have noted distinguishable human factors sourced to the idea of alienation (Hofstede, 1994; Moray, 2000; Sheridan, 1980), which are enumerated below.

When automation happens, fewer people become able to operate more machines and automated technologies can detect problems and (occasionally) troubleshoot on their own. This causes unemployment, especially for unskilled and technology-illiterate individuals. Automation makes the pace of work fluctuate extremely; it fabricates erratic workloads and dissatisfaction among the workers. Again, due to advanced technology management can monitor workers invisibly; consequently, the workers become anxious, and the private data becomes susceptible to unauthorized access. In an advanced technology-supported work environment virtual interactions replace physical ones and desocialization takes place; to add, operators become mere 'button pushers' and in a troubling scenario when they are asked to do the job manually, they are found to be 'deskilled'. Additionally, systems are becoming bigger, less visible and less comprehensible day by day; workers are intimidated by greater power and responsibilities and in some cases becoming technologically illiterate. Furthermore, operators tend to be overwhelmed by the power of the invisible machine, develop an idea that they are not contributing and abandon their responsibility of production control. Ultimately, the workers who used to boast about their productive capacity feel encapsulated by 'blissful enslavement'.

Compliance relates to the idea of aligning with set orders, rules or even informal requirements (Mohibullah et al., 2018). Stretching the idea to a factory context, it embraces various other specific notions, such as labor law, labor rights and buyers' code of conduct (Baral, 2010). In the RMG sector, compliance boils down to the persuasion of labor rights, buyers demand, ILO conventions, labor laws and industrial laws (Ashwin et al., 2020). In the Bangladeshi RMG sector, 'compliance' and 'social compliance' are used interchangeably; however, it is imperative to note that the former term refers to the related laws of the land and the second one is more skewed towards the criterion of social accountability; to add, the implementation of the idea of compliance deviates drastically in this sector, as Bangladesh has both globally recognized model garments and subcontracting sweatshops (Mariani, 2013).

RMG industries are found to be concerned about four vital compliance issues, such as social compliance (employee benefits, occupational health & safety, human rights), environmental compliance (pollution, waste management), occupational compliance (product quality, reliability, aesthetics and related specifications) and physical compliance (building structure, ventilation, emergency exits) (Azim et al., 2021). Major overseas catalysts that influence and inspect these compliance factors are global buyers, western consumers and international institutions (e.g., ILO); local catalysts are BGMEA, BKMEA and BEPZA (Ahmed, 2012). Interestingly, the ministry of commerce is responsible for monitoring the RMG sector of Bangladesh and the ministry of labor leads the compliance and related inspection system; this division of responsibility leads to a b lame game and suboptimal output (Mariani, 2013).

A sincere management of compliance might fetch various benefits for the RMG sector, such as minimizing labor unrest, satisfying buyers' demand, getting a higher quote, reducing labor turnover rate, increasing workers' morale, increasing product quality, improving occupational health & safety, establishing global impression and developing a healthy relationship with regulators (Das et al., 2021). Numerous Bangladeshi RMG factories have realized these benefits and marked themselves as globally recognized green/mode garments; nonetheless, there remain at least 2000 unregistered subcontracting garments in Bangladesh who are operating with minimum margin paying bare minimum wage with no regard to compliance, code of conduct and local regulations (Alamgir and Alakavuklar, 2020).

3. Hypotheses Development

Contemporary innovations in production technology have caused anxiety in the human resource realm. The anxiety is sourced to the assumption that technological innovation will lead to job loss (Ramaswamy, 2018). Both developed and developing countries are expected to be tasting the poison pill of job loss. However, developing countries will be taking the most hits of this phenomenon (Oxford Martin School, 2016) and Bangladesh falls within the periphery of a developing nation (CPD, 2022). However, Bessen (2016) has an alternative view toward automation-based job loss and holds that when all tasks of a given occupation are automated completely, it might lead to a net loss of jobs; interestingly, partial automation of the same occupation will not result in a net loss scenario. He refers to the partial automation of the publishing industry in the 1980s. Desktop publishing software replaced some tasks of type setting in this industry; nonetheless, it created a lot of jobs for graphic designers in the same occupation. Moreover, it is argued (Acemoglu and Autor, 2011; Acemoglu and Restrepo, 2016; Acemoglu and Restrepo, 2017) that automation saves organizational resources and leads to higher industry output; this increased output results in the expansion of all industries and might end up creating more jobs than it displaced. This context has pushed to formulate the following hypothesis:

H-1: Increasing automation does not seem to cause a loss of employment in the aggregate.

Low-skilled workers conduct process-driven tasks with insignificant abstract thinking, whereas high-skilled workers undertake complicated tasks that warrant expertise, autonomy and abstract thinking; low-skilled workers are more vulnerable to job displacement as an aftermath of automation (HFS, 2017). Furthermore, low-skilled jobs are being tagged with a number of related factors—nature of the task, wage rate and education level—and it is predicted that jobs with these factors will be under the guillotine of automation. A task is assumed as a 'routine' one when it can be completed by machines following set programs; to add, a task consisting of problem-solving, complex communication and tacit knowledge is understood as a 'non-routine' task. Unfortunately, routine tasks can be substituted by machines without issues and are more vulnerable to automation than non-routine ones; this phenomenon is called Routine-biased Technical Change (RBTC) (Autor et al., 2003). Therefore, the subsequent can be hypothesized:

H-2: Due to automation low skilled workers in routine jobs are more likely to suffer job losses.

Success in any capacity depends on educating and training personnel; and only upgrading technology will not fetch the expected results (Schumacher, 2001). Organizations' adaptability, production, competence, safety and ultimately profit are positively influenced by training (Salas, 2001); the Bangladeshi RMG sector is no exception. Factory owners from this sector realize the importance of training programs; however, to them, in some cases, training is somewhat effective and in others, it does not have any desired impact. They are also discounting the impact of training sessions sourced to various formal and informal bodies, such as BGMEA, Accord and Alliance. On the flip side, workers hold a positive vibe regarding training and acknowledge its contribution to their workplace and household (Mausumi and Rahman, 2018). This ambience leads toward an ambivalent perspective regarding the impact of training and development efforts in an organization.

On the same note, BGMEA concedes that there are a number of excellent in-house training facilities in the Bangladeshi RMG factories; nonetheless, not all the factories are on the same page as regards acknowledging the necessity of such a facility (Textile Today, 2022). Logically, based on this platform, the following hypothesis arises:

H-3: Training is considered a vital factor of automation success and is conducted by the respective organization.

In an automated system, the vulnerable workers are removed spatially, temporally, functionally and cognitively; this context gives rise to the issue of 'alienation' (Sheridan and Parasuraman, 2005). As an aftermath of automation, the workers are exposed to various human factors: a) threat of actual unemployment for the workers (especially true for the unskilled ones), b) erratic mental workload leading to boredom or dissatisfaction, c) psychological notation of losing control, d) desocialization due to virtual world dominance along with work-community shifting, e) deskilling sourced to mere button pushing, f) intimidation of greater power stemming from greater economic risk, g) technological illiteracy, h) misplaced trust on machines, i) abandonment of responsibility sourced to too much dependency on machines and j) blissful enslavement for being controlled by machines (Hofstede, 1994; Moray, 2000; Sheridan, 1980). However, these problems and other related issues can be mitigated mostly by pursuing social compliance and law of the land.

Compliance issues belonging to garments happen to be one of the major concerns of international buyers. More often than not, reputed international buyers post their orders considering four factors, i.e., quality, price, lead time and social compliance (Alam et al., 2017). Additionally, these buyers enduring various efforts to ensure safety compliance and improve transparency (integrity) of the supply chain; namely, Accord on Fire and Building Safety and Alliances for Bangladesh Workers Safety are among these efforts. Moreover, they give utter importance to inspecting all the alliance member factories, developing common safety standards, sharing inspection results and formulating a democratic workers' participation committee (Elbert et al., 2016). Therefore, the Bangladeshi RMG industry is under constant pressure to comply, specifically, on the issues of workplace safety and international standards of labor. Nonetheless, despite having a tremendous push from international buyers, Bangladeshi garment factories are lagging from the perception of social compliance related to workplace safety and security (Chowdhury et al., 2013; Shadat et al., 2016). Non-compliance invariably leads to cancellations and subsequent lower orders; after the infamous 'Rana Plaza' accident, an order worth $110 million (approx.) was canceled from 37 factories (Dhaka Tribune, 2014). Interestingly, a large number of the Bangladeshi RMG factory owners are still unwilling to implement compliance standards and labor law to improve workplace ambience; this context is one of the major drives for labor unrest in this sector (Das, 2008; Muku et al., 2013). Potential human factors arising from automation are part of the compliance checklist which is considered to be a coercive force stemming from international buyers, in the context of the Bangladeshi RMG scenario – this position guides us to this hypothesis:

H-4: Consideration of human factors by the management is pushed by compliance pressure from the international buyer, not by humanitarian considerations.

4. Methodology

This study is conducted based on manual interpretive content analysis. Berelson (1952) characterized content analysis as a systematic and quantitative description of the manifest content of the communication. Other researchers postulate that content analysis is beyond a counting process (Downe-Wambolt, 1992); it is capable of—by coding themes or patterns—providing subjective interpretation (Hsieh and Shannon, 2005), can elicit meaning (Bengtsson, 2016), and draw replicable and valid inferences from it (Krippendorff, 2004). Quantitative content analysis is about reporting frequency, percentage or actual numbers, and the research questions are formulated embracing a 'how many' approach; inversely, qualitative content analysis depends on words and themes to provide underlying meaning or interpretation of results (Bengtsson, 2016; Krippendorff, 2004; Neuendorf, 2002).

Using semi-structured questionnaires face-to-face interviews were conducted engaging befitting representatives from these Bangladeshi RMG factories: Aman Textiles, Epyllion Group, Fakir Fashion, MASCO Knit Group, Norban Comtex Ltd., SP Garments, Spider Group, Square Fashion, Universal Jeans and Urmi Group. These samples are chosen based on convenience sampling; however, a proper mix of green (model) garments and garments of other levels are maintained, so that the views of all possible types of garments regarding automation and human factors are accounted for. While building the semi-structured questionnaire, the following issues are addressed: a) overall view regarding automation (tools/machinery used in automation and frequency/degree automation adoption, b) factors considered before adopting automation (financial and non-financial), c) automation-related job displacement (net increase/decrease from displacement and category of workers that suffers the most from displacement), d) automation related training (in-house facilities, suppliers role and on-the-job training), e) views regarding human factors and related management (low wage labor supply and compliances' impacts on human factor management), f) resource allocation and sincerity regarding compliance, g) concluding remarks highlighting the challenges and improvement scopes of automation, training and human factor management in the current Bangladeshi RMG context.

5. Findings and Discussion

5.1 General View – Automation

In the Bangladesh RMG sector, concerned executives define automation as a technology that warrants minimal manual intervention and can produce a greater number of goods maintaining the same, perhaps assuring more, quality. They view automation as an operation optimization tool that reflects the necessity of the new era, occasionally stemming from the demand of major international buyers. The garments that are producing standardized products do not require that much automation, whereas giant (model) garments that produce high-value designer or signature products are pushed by the product nature to embrace automation as much as possible. While responding regarding the frequency of automation usage, one company asserted that they rarely used automation (Spider Group); most of the companies pointed towards a slow and steady approach towards automation, i.e., they prefer only feasible and competitive technologies. Interestingly, a few (Urmi Group, Pacific Jeans and Epyllion Group) of the companies pressed that the benefits of automation can be reaped in an optimal manner only when it is utilized in a comprehensive manner connecting all the value chain activities. Respondents from the Epyllion group, focusing on the connection among *Kaizen*, lean management, six-sigma and automation, asserted:

"…*from supply chain to the delivery system management – we have the touch of automation everywhere*!"

Before opting for automation RMGs consider various factors; these factors can be categorized into two major branches, such as financial and non-financial. Commonly considered financial factors before going for automation are fulfilling buyers' demand, ROI, payback period, cost of implementation, commercial availability of the technology, cost per minute, cost per product, improved throughput, productivity, quality of products, technical support, availability of skilled manpower, competitiveness. On the flips side, non-financial factors are potential social issues, probability of workers' displacement, potential resistance or acceptability from the workers, user-friendliness of the new technology, training requirements, energy management, environmental externalities & sustainability, safety & security (risk minimization, health hazard) of the working environment and related ethical issues. Interestingly, compliance—social audit requirements, labor law and other governmental boundaries—can be classified both as a financial or non-financial factor based on the perception of RMG management. Naturally, most garments reflected their preference towards financial factors; interestingly, garments with a comprehensive alignment towards automation noted their preference towards non-financial factors over financial ones.

According to the interview responses it is documented that RMGs utilize automation in various manufacturing-connected departments, such as sewing, cutting, ironing, printing, washing, dying, lab, Computer Aided Designing (CAD), production management, Effluent Treatment Plant (ETP), Water Treatment Plant (WTP), quality checking, sampling, smart measurements system, Key Performance Indicator (KPI) dashboard, warehouse management and so on. The demand for automation technologies is mostly determined by the major international buyer – it is pushed by the type of product they order, and the compliance check boxes that they want the manufacturers to tick. Utilization of automation is also dictated by the available skill sets in the existing manpower and/or the potentiality of getting the workers trained. Hence, the capability (mostly education) of learning new skills effectively is a vital factor in selecting automation tools or usage. Emphasizing the leverage of automation, the respondent from Urmi Group drew a fascinating comparison between Vietnamese and Bangladeshi RMGs:

"…Vietnam has 1.2 million fewer workers than Bangladesh, but they are exporting more than Bangladesh, since they have embraced the idea of automation with both hands."

The automation using factories of the BD RMG sectors are doing so for the following reasons:

- To align with the product design and quality
- To save time – Cost per Minute!
- To simplify operation
- To increase productivity
- To get a competitive edge
- To avail technical advantage and prepare for the inevitable future
- To ensure safety in the workplace
- To minimize the dependency on manual labor
- To align with law, social compliance and environmental concerns

5.2 Automation and Displacement

Automation may decrease jobs drastically to start with. Cut-to-pack factories are not impacted much by automation; nonetheless, in sweater factories, due to the mass implementation of 'jacquard' machines, there could be (up to) 60-70% of job displacement. According to most of the respondents, initially, automation will displace a lot of workers, however, in the long run, job opportunity is most likely to increase. It is argued that automation, through extensive production and cost saving, expands industries and ultimately ends up creating more jobs in aggregate in the future; academically it is termed as 'scale productivity effect' (Acemoglu and Restrepo, 2017; Acemoglu and Autor, 2011).

To some respondents, automation-bound displacement will not be an issue because of these reasons: a) there are various levels of automation (some are highly automated and some are running traditional automation) in the Bangladeshi RMG sectors; hence, impacted workers have the opportunity to adjust themselves in the factories with lower level automation, b) there is always a 5% shortage in the required level of workers due to worker-migration and fresh workers capable of learning new skills can always be adjusted with new technology. Alternatively, automation-related displacement could be intensive because of these issues: a) operators have highly machine-specific skills and it is utterly difficult to make them learn new skills, b) currently, there are shortage of skilled operators, which is predicted to be a more acute issue (by some), c) if all the RMGs of Bangladesh become poised at the same automation footing, backward adjustment of displaced labors will be complex. Notably, to reduce such displacement some of the concerned factories arrange training for the vulnerable workers and offer them suitable alternative placements; if none of this is possible, the laborers become displaced.

Intriguingly, varied categories of employees face a distinguishable degree of automation-related displacement. Employees can be segregated into two broad categories, such as doing 'non-routine' (requiring high skills) and 'routine' (warranting low skills) jobs (Autor et al., 2003). Factory owners are primarily concerned with the efficiency (cost per product and minute) of the production facility. Therefore, they are motivated to erect (mostly) those technologies that can do repetitive work following basic algorithms; such preference pushes the jobs of the routine, low-skilled workers under an extreme degree of threat. According to the respondent from SP Garments:

"…earlier, there used to be 30% helpers along with operators in every production line; these days, it is being reduced to 5%!"

There is a high correlation between the skill sets of the non-routine worker and their miserably low education level. Only 5% (optimistic estimate) of the total low-skilled workers get secondary school certification, other 95% hardly get primary-level education. This phenomenon makes the condition of the routine workers worse; they are not in a strong position to learn new skills and get themselves accommodated with new technology. There is (almost) a unanimous verdict regarding the potential suffering of the low-skilled workers doing routine jobs in the Bangladeshi RMG factories with only one exception, Square Fashion – who thinks that the required high-skill matrix of the automation exposes the non-routine workers towards extended risk because they will be the ones primarily dealing with automation.

5.3 Automation-Related Training

HR professionals in the RMG sector are enthusiastic to run various types of training facilities to upgrade the skills of workers and managers. They have objectively noted the benefits of training, as the respondents from Aman text mentioned:

"…it is possible to increase the output of a garment factory with the same hardware and manpower, only by providing training and modifying systems thereby. In 2016, our production was 4 million units, now it is around 10 million in 2022, with the same facilities."

Marking the importance of training facilities respondents cited various reasons: a) it is not possible for the factories to hire all-and-sundry with pre-installed automation-related skills, b) occasionally, highly skilled employees might become technology irrelevant, due to sudden changes in technology, c) there are high contrasts among working cultures of different factories (even in different floors of a single factory) that require blending though training, d) training introduce the workers to different perspectives of efficiency, e) mental development and embedment of soft-skills extend overall output in long-run, f) behavioral modifications and counseling through training reduce worker unrest, g) training reduces absenteeism, migration and increases attentiveness and ownership of the workers. Some of the respondents made an obvious positive connection between training and human factor management – the respondent from Universal Jeans claimed:

"…human factors are sourced to the displacement or migration of workers. If it can be addressed in the first place by training and addressing psychological issues through counseling, most of the human factors can be minimized."

Therefore, it is transparent from the previous paragraph that the major stakeholders of the Bangladeshi RMG sector are positive regarding the imperativeness of training. Interestingly, these factors are hindering the installation of training capacities: a) some owners do not want to bear the cost of training—especially, for the huge initial investment, b) the evaluation of output is mostly subjective, c) the result remains intangible in the short run bear fruits (mostly) in the long run, d) managers/owner assume that a thirty-minute training session translates to a huge loss to the overall productivity and it does not pass the cost-benefit test, e) mostly, there is no clear budget allocation for training, f) Bangladeshi RMG factories are critically dependent on the overseas resource personnel (trainers from the vendor or professional firms) who retain technical 'know-how' and demand high remuneration.

Various types of training modalities exist in the Bangladeshi RMG industry, such as in-house training, training from the erection team (technology vendor), training from local institutions, overseas training and NGO-sponsored training. The responses suggest that almost half of the sampled companies have in-house training facilities. Unfortunately, some of these provide training based on compliance, safety measures, health hazards, core electrical or mechanical skills, grievance handling and other soft skills. Therefore, it can be inferred that in-house training related to factory automation or new technologies is few and far between.

5.4 Management of Human Factors and its Relationship with Compliance

Most of the managers are positive towards human factor management and have a preventive mindset towards human factors: they want to stop human factors from happening, in the first place. They have mentioned various preventive actions, such as providing training for new skills before the displacement-related human factor happens, reskilling and/or upskilling the vulnerable workers, psychological counseling, modifying behavioral patterns and providing them with golden handshake benefits.

Respondents confirmed the appreciative approaches of the managers in providing for the human factors or taking preventive measures for those factors. Nonetheless, there are several challenges that block this appreciative feeling from being realized on the factory floor. The respondent from Fakir Fashion asserted:

"…HR managers in Bangladesh, mostly, lack the technical know-how and academic background of human resource management. There are lots of HR managers who are educated in an Arts (Humanities) or social science but managing the HR department of a garment."

Other related challenges in addressing the human factors are: a) owners/shareholders are not oriented towards the human factors, b) there is an eternal communication gap between the HR management body and the top management and board of directors, c) there is a dearth of qualified or entrepreneurial managers who could justify the importance of managing the human factors and who could make educated recommendations to the board of directors, d) both the owners and the managers lack social orientation of organization, e) most of the Bangladeshi RMGs are family run who lack accountability to the external parties, such as non-family stakeholders. Additionally, there remains a contrasting difference between the model and par/sub-par RMG factories while addressing the human factors owing to the deviation in capability and long-term vision among them, as one of the respondents from Spider Group asserted:

"…leading RMG factories are setting examples and installing systemic elements for addressing the potential human factors, whereas the same types of efforts are not visible in other concerns."

Very few of the respondents poised themselves at the two extremes: a) compliance is the only driver for human factors and b) compliance is not the driver at all. The majority of the responses fall somewhere between these two extremes and some of those are retrospective in nature, too. In the early days of the Bangladeshi garment industry, there was no concept of compliance or human factor whatsoever! It was common instance to rebuke, scold, or to beat up the floor laborers; subsequently, the emergence of the Bangladesh Labor Law (2006) changed the scenario and factory managers stopped abusing the RMG workers. Interestingly, the whole landscape of compliance and human factor consideration changed completely following two major garment factory catastrophes—Tazrin Garments and Rana Plaza—in 2011 and 2013. After these disasters the international RMG buyers got intensively serious regarding social compliance and audit; this changed the whole context of human factor consideration, working environment and employee welfare.

RMGs are pushed by various aspects to pursuing compliance, such as labor law, company law, labor court, labor union, Bangladesh national building code and international buyer groups; the last one being the strongest. International buyers define the boundaries of compliance in various areas of RMG factories: holiday, wage,

working hours, labor welfare, sexual harassment, child labor, hiring, security, health & safety, food & water, suggestion box, sewage system, lavatory, waste disposal, medical care, temperature, lighting, environmental issues, sustainability and so on. Consequently, they send a social audit inspection team to the respective garments to find out the ground reality; sometimes these team members belong to their own organization and come from overseas, and in some cases, the audit team stems from the local third-party professional audit or inspection firms. In either case, the future order volume and types of orders depend on the scores of the social audit. Factory owners may have to spend millions to improve compliance issues as an aftermath of low social audit scores and ultimately, they might lose orders by hundreds of millions. Trying to convey the magnitude of the international buyers' pressure one of the respondents mentioned:

"…minimum compliance is set by law of the land and actual compliance is set by the international buyers"

Since the mere existence of the business depends on the social audit score of the international buyer groups (almost) all the respondents said that international buyers are the vital most pressure for being compliant. However, there are a couple of respondents from Epyllion group and Norban Comtex who mentioned a few alternative sources for being compliant: legitimacy, business sustainability, social responsibility and natural pursuance of doing the right thing.

6. Conclusion

Bangladeshi RMG management believes that automation will decrease jobs drastically to start with; however, In the long run, automation will expand the RMG industry and other related job opportunities. To add, most of the factories are keen to train and/or reinstate laborers in alternative capacities and displaced workers can be adjusted in the factories where backdated technologies will still be used. Therefore, it is acceptable that Increasing automation does not seem to cause a loss of employment in the aggregate (H1). Moreover, Bangladeshi RMG owners' automation choice revolves around the motivation of saving cost per production and cost per minute – more concerned about the financial consideration. Repetitive routine tasks are easier to be automated, where machines can simply follow a given algorithm and low-skilled workers are engaged with such tasks. They rarely do have the capability to learn new skills easily due to their education level; hence, it is acceptable that due to automation low skilled workers in routine jobs are more likely to suffer job losses (H2). Interestingly, based on the following reasoning H3—Training is considered a vital factor of automation success and conducted by the respective organization—is rejected: management is convinced regarding the importance of training facilities, majority of the owners are not comfortable with the training related investments, Bangladeshi RMG factories with high revenue do not have in-house training facilities, they are dependent on erection team, third party training firm and NGOs and most of the in-house training centers are focused on non-factory skill development. On the other hand, the Bangladeshi RMG industry has a history of worker abuse, disregarding human factors and non-compliance; the Idea of compliance came to the scene after Labor Law (2006). In addition, factories became sincere regarding compliance and human factors due to the pressures from international buyers after Tazrin garments (2011) and Rana Plaza (2013) accidents. International buyers reduce or cancel orders responding to a low social audit score. Rarely do organizations put the idea of humanity/morality before economic reality. To them, laws of the land define minimum compliance and international buyers define actual compliance! Based on all these, it is confirmed that H4—consideration of human factors by the management is pushed by compliance pressure from the international buyer, not by humanitarian considerations—is accepted.

Potential human factors can be minimized through proper training and counseling. This paragraph points out various recommendations regarding human factor management and training capacity building. For managing human factors: the RMGs should develop a human resource manual—a Standard Operating Procedures (SOP)—for installing a system for human factor consideration, there should be a continuous study to understand the dynamics of workforce psychology, HR managers should be more amicable and understanding while dealing with the labors and their grievances, HR managers should go beyond their traditional roles—

hiring, firing, compensating, counting overtime—and should concentrate more on behavioral management of the labors and mediation of human factor-based issues to the owners and/or board members, top management should hire HR mangers with related academic background and embedding contemporary HR technicalities in them, the working hours and production target of the workforce should be optimized considering the humanoid limitation and non-coerced management of human factors should be given more importance for it may push the regulatory body to add more befitting humanitarian clauses to the local act. Consequently for optimizing the capacity-building training sessions: RMGs must reduce the dependency on overseas (overpaid) resources for facilitating training and develop effective internal training facilities with special attention on creating a knowledge hub with professional trainers, NGOs, foreign buyers, compliance auditors, local regulatory bodies and other government agencies should play a more active role, Training Needs Assessment (TNA) should precede automation related training sessions, training sessions should focus on core automation related skills development rather than petty-compliance issues and soft-skills, active training hours should be increased and there should be a skill-matrix driven salary structure to reinforce the importance of learning new skills in the workforce. To conclude, A knowledge-based approach towards human factor management and training might lead to a holistic modification in these two phenomena and in other functional aspects of the Bangladeshi RMG factories. Additionally, entrepreneurs should be made aware, through various projects or seminars, regarding the long-term benefits of investing in human factor management and training (capacity building).

The study has considered a few green (model) garments, some above average and average garments; nonetheless, conducting further research segregating all those levels of garments might offer fresh insights regarding the same variables. Additionally, the generalization of the outcome of this research might not be valid due to the consideration of multi-level garments. Management of the Bangladeshi RMG factories, academics, related business associations and regulators might draw operational, research-oriented and policy issue-related discernments from this research.

References

Acemoglu, D., Autor, D. (2011). Skills, tasks and technologies: Implications for employment and earnings, in: Card, D., Ashenfelter, O. (eds.), Handbook of Labor Economics, Volume 4B, Amsterdam and New York, North Holland, pp. 1043-1171.

Acemoglu, D., Restrepo, P. (2016). The Race between Machine and Man: Implications of Technology for Growth, Factor Shares and Employment, National Bureau of Economic Research Working Paper No. 22252, Cambridge, MA.

Acemoglu, D., Restrepo, P. (2017). Robots and jobs: Evidence from US labour markets, National Bureau of Economic Research Working Paper No. 23285, Cambridge, MA.

Ahmed, N. (2012). Economic and Social Upgrading in the Ready-made Garment Sector of Bangladesh: Some experiences, Centre of Policy Dialogue, Dhaka.

Akter, P. (2020). An Overview of the Ready-made Garment (RMG) Sector of Bangladesh: From Origin to the Current State of Pinnacle. The Keizai Ronkyu. 167, 01-18.

Alam, M.N., Azim, M.T., Alias, R.B. (2017). Social Compliance in Ready-Made Garment Industry in Bangladesh: Challenges for HR Personnel. Journal of Applied Environmental and Biological Sciences. 7(10), 8-18.

Alamgir, F., Alakavuklar, O.Z. (2020). Compliance Codes and Women Workers' (Mis)representation and (Non)recognition in the Apparel Industry of Bangladesh. Journal of Business Ethics. 165, 295-310.

Ashwin, S., Kabeer, N., Schüßler, E. (2020). Contested understandings in the global garment industry after Rana Plaza. Development and Change. 51(5), 1296-1305.

Autor, D. Levy, F., Murnane, R. (2003). The skill content of recent technological change: An empirical exploration. Quarterly Journal of Economics. 118(4), 1279-1333.

Azim, M.T., Uddin, M.A., Haque, M.M. (2021). Does compliance to standards in the ready-made garments industry affect employee attitudes? A study in Bangladesh. Global Business and Organizational Excellence. 40(2), 43-58.

Baral, L. M. (2010). Comparative Study of Compliant and Non-Compliant RMG Factories in Bangladesh. International Journal of Engineering & Technology. 10(2), 119-131.

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. NursingPlus Open. 2, 8-14.

Berelson, B.L. (1952). Content analysis in communications research, Free press, New York.

Bessen, J. (2016). How Computer Automation Affects Occupations: Technology, Jobs, and Skills, Boston Univ. School of Law. Law and Economics Research Paper No. 15-49. https://ssrn.com/abstract=269043 (accessed 4 March 2022)

Chowdhury, M., Dewan, M.N., Quaddus, M.A. (2013). Sustainable Supply Chain Management through Compliance of Stakeholders' Requirements: A Study on Ready-Made Garment (RMG) Industry of Bangladesh, PACIS 2013 Proceedings, 269.

CPD (2022). Bangladesh is a developing country. https://cpd.org.bd/bangladesh-transitioning-to-developing-country (accessed 5 July 2022)

Das, B., Dey, P.K., Sumon, M.H., Islam, A., Mukherjee, P., Afroz, K.M. (2021). Compliance issue of ready-made garments industry in Bangladesh: A case study. Global Journal of Engineering and Technology Advances. 09(1), 1-10.

Das, S. (2008). Social Compliance Issues in the Apparel Sector of Bangladesh. http://www.fibre2fashion.com/industry-article/2071/social-compliance-issues-in-the-apparel-sector-ofbangladesh (accessed 2 March 2022)

Dhaka Tribune (2014). Safety compliance- a Make or Break for garments factories. https://mygoldenbengal.wordpress.com/2014/05/06/safety-compliance-a-make-or-break-for-many-garment-factories (accessed 11 April 2022)

Downe-Wamboldt, B. (1992). Content analysis: Method, applications, and issues. Health Care for Women International. 13(3), 313-321.

Elbert C., Gessese N., Konishi Y. (2016). Value Chain Analysis for Polo Shirts, in: Sanjay, K. et. al. (eds.), Attracting investment in Bangladesh - Sectoral Analyses: a diagnostic trade integration study (English), Washington, D.C. 2016: World Bank Group.

Groover, M.P. (2018). Automation, Encyclopedia Britannica. https://www.britannica.com/technology/automation (accessed 14 March 2022)

HFS (2017). Impact of Automation and AI on Services Jobs:2016-2022. https://www.hfsresearch.com/market-analyses/impact-of-automation-and-ai-on-services-jobs-2016-2022 (accessed 9 March 2022)

Hofstede, G. (1994). Cultures and organizations, HarperCollins, London.

Hsieh, H.F., Shannon, S.E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research. 15(9), 1277-1288.

Krippendorff, K. (2004). Content Analysis: An Introduction to Its Methodology, Sage Publications Inc., Thousand Oaks, California.

Mariani, R.D (2013), Working conditions in the Bangladeshi garment sector: social dialogue and compliance. https://repository.tudelft.nl/islandora/object/uuid:33c040ea-c468-49ca-bce7-2d0e9f0a098c?collection= education (accessed 17 March 2022)

Mausumi, N., Rahman, M.M. (2018). Impact of Stakeholer Initiatives: Bangladesh Garment Industry, SCMS Journal of Indian Management. April-June, 31-41.

Mohibullah, A., Takebira, U., Moni, K., Rahman, M. (2018), Social compliance, occupational health and environmental safety management practice in the apparel industry of Bangladesh: An overview. Journal of Textile Science & Engineering. 8(2), 1–5.

Moray, N. (2000), Culture, politics and ergonomics. Ergonomics. 43, 858-868.

Muku A.Z.A., Rayhan, S.J., Haque, F., Islam, F. (2013). Job Characteristics Model of Hackman and Oldham in Garment Sector in Bangladesh: A Case Study in Savar Area in Dhaka District. International Journal of Economics, Finance and Management Science. 1(4), 188-195.

Neuendorf, K. (2002). The content analysis guidebook, Sage Publications Inc., Thousand Oaks, California.

Oxford Martin School (2016). Technology at Work v2: The Future Is Not What It Used To Be. http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work_2.pdf (accessed 9 March 2022)

Parasuraman, R. (1997). Human and Automation, Use, Misuse, Disuse, Abuse. Human Factors. 39(2), 230-253.

Ramaswamy, K. (2018). Technological Change, Automation and Employment: A Short Review of Theory and Evidence, Indira Gandhi Institute of Development Research, Working Paper No. 2018-002, Mumbai.

Salas, J.A., Canoon, B. (2001). The science of training: A decade of progress. Annual Review of Psychology. 52, 471-499.

Schumacher, E.F. (2001). Cited in 'knowledge worker's hold key of garment industry's future' by Ramaswamy, The Indian Textiles Journal. Feb. 2001, 133-135.

Shadat, W.B., Rahman, M.T., Rahman, K.M., Hawlader, A. (2016). Cost Benefit Analysis of RMG Compliance to Increasing Presence of Ready-Made Garments (RMG) and New Specialized RMG Industry Zone, Bangladesh Priorities, Copenhagen Consensus Center. https://www.copenhagenconsensus.com/sites/default/files/bin_shadat_rmg.pdf (accessed 2 April 2022)

Sheridan, T. B. (1980). Computer control and human alienation. Technology Review. October, 60-73.

Sheridan, T.B., Parasuraman, R. (2005). Human-Automation Interaction. Reviews in Human Factors and Ergonomics. 1(1), 89-132.

Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G. (2016). Artificial Intelligence and Life in 2030, Stanford University, Stanford, CA.

Textile Today (2022). BGMEA Urges RMG factories for skill based development training. https://www.textiletoday.com.bd/bgmea-rmg-factories-skill-based-development-training (accessed 5 May 2022)

Watts, R.L., Zimmerman, J.L. (1986). Positive Accounting Theory, Prentice-Hall Inc., Englewood Cliffs.

Appendix

Managerial Perspectives on Automation and Human Factors: Evidence from the Bangladeshi Garment Industry

Interview Guide and Field Notes

Introductory Part (Confidential) Code:

Name:	Age:	Organization:
Founding Year:	Size:	Department:
Designation:	Experience:	

1. Could you please brief me regarding your job description and/or responsibility?

2. Could you please describe the types of interactions that you have with the workers/ supervisors/ production managers of the factory?

3. What do you think about Automation? Your overall view about Automation?

Probing additions:

a. Tools/machinery used in automation

b. Do you use Automation often or is it a rare scenario?

c. Why do you use it rarely, why not regularly (if used rarely)?

4. What type of factors do you consider (your organization considers) before opting for Automation?

Probing question:

a. In which specific scenario (and how), you do opt for Automation?

Factor guides for probing questions:

a. Technical aspect

b. Cost of automation

c. Labor market

d. Performance benefits

Probing notes:

i. Greater throughput

ii. High quality products

iii. Improved safety conditions

iv. Higher productivity

v. Competitive edge

e. Commercial availability

f. Cost of implementation

g. Social, legal and ethical acceptance

5. How do you view the idea of Displacement due to Automation?

Probing questions:

a. Does Automation increase or decrease jobs, what do you think? What is the case for your organization?

b. Who suffers more from Automation low skilled (routine) or high skilled workers?

6. When a new technology/machine (or automation) is due to be installed, how do you train or prepare the potential workforce so that they can work efficiently with the new automated setup?

Probing questions:

a. Are new technology (automation) related trainings conducted by the Organization?

b. Are these trainings conducted by the supplying firms? If it is how do they interact with the trainees (operators)?

c. Or are there alternative sources/methods of training, such as on-the-job training?

Probing factors:

a. TNA assessment

b. Skill transfer issues

c. Training items

d. Training schema

e. Session details

f. Resource employed

7. As a human resource manager, what is your view regarding the human factors related to Automation?

Probes:

a. Unemployment

b. Loss of work control and confidence

c. Desocialization

d. Deskilling

e. Technological illiteracy

f. Abandonment of responsibility

g. Blissful enslavement

8. What is your view on the human-factor-based consideration in the Bangladeshi garment factory-based setup?

Probing questions:

a. Is it important to the HR managers / managers? Is it important to you?

b. Bangladesh has immense amount of low-wage labor supply – its impact on human-factor-based consideration.

c. Do you think human factors are pushed by compliance only and not by humanitarian considerations?

d. Could you please provide us with some human-factor-based entrepreneurship related to garment factories (your or other factories)

9. Why (and how) do you allocate (extended) resource to compliance-based activities / why are you more sincere about the compliance (rational) compared to the humanitarian (irrational) considerations?

Probes:

a. Pressure from foreign buyers, international activists and other stakeholders

b. National or international regulations, local authority

c. Monetary ground, lack of fund

d. Administrative preference

10. Concluding remarks:

Probing notes:

a. Bangladeshi garments factories' current position in addressing Automation, related trainings and job displacement

b. Improving HR-managers consideration/responsibility in embedding human-factors in automation/ factories along with the compliance pushed issues

c. Improving training facilities; why the managers do or do not consider it seriously?