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Digital Leadership: The Perspectives of the Apparel Manufacturing

Mohammad Alam Tareque[1], & Nazrul Islam[2]

[1] PhD Researcher, Bangladesh University of Professionals

[2] PhD, Pro VC Northern University of Bangladesh

Correspondence: Mohammad Alam Tareque, School of Management, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka 1216., Bangladesh.

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Abstract

The prime objective of the research was to determine how the apparel manufacturing sector is embracing digitization and its leaders are preparing for the digital age? so we wanted to find out what type of leadership style is needed for digital leadership. The present study used a sample of 50 RMG companies. We investigated relationships between three variables, Internet od Things, use of digitization-automation, use of smart phones and apps. Further, the variables' influence on digitization has been assessed through multiple factors leading to digitization by allotment of weightage for each factor. The findings in this paper supports two variables; use of automized digital machines and internet of things being significant whereas, use of smartphones and apps is insignificant. It implies that preparation for leading in the digital age remains limited which require change oriented leadership behavior at all levels. Limitations of the paper include the data which is specific to Bangladesh RMG industry, therefore it cannot be generalized, further the economic meltdown due to COVID-19 pandemic might have influenced the results. The paper's prime contribution is based on the assessment of predictor variables and their influence that it makes in providing leadership in the digital age which demand change oriented behavior of leaders.

Keywords: ready made garments, leadership, digitization, apparel manufacturing, Bangladesh

1. Introduction

Today's works of literature on technology and digitization dominate volatility, uncertainty, complexity and ambiguity (VUCA), together they name it a "VUCA WORLD". Industry 4.0, Smart Factory, Disruptive Changes, Fast-Paced Innovations, Smart clothing are buzzwords dominating technological vocabularies. Changing to digitization, organizations will have to intensely contribute in building capabilities in information and network, analytics and intelligence, conversion to the physical and virtual world, and human-machine interaction to urge the foremost out of Industry 4.0 or Apparel 4.0 (Oberer & Erkollar, 2018). The savvy production lines and the rise of the ramble time emphasize the utility of sewbots in attire fabricating and apparel manufacturing – smart clothes.

HL Chan (2016) found apparel producers are driven to embrace RFID innovation with the extension of both retail stores and online commerce. Brands like Levi's, Zara, M&S, Walmart actualized the innovation, Radio-Frequency Recognizable proof (RFID) tag provided the brands to their producers around the world for item-level labelling. The RFID tag is sent around the world to production lines, put interior the security alert, and connected to each attire thing. When the wrapped up /stuffed items are transported to brand's distribution centre, the item data (such as the measure, color, PO no, producer id, nation code of that specific thing) are composed into the RFID tag by encoding an interesting distinguishing proof (ID) number, and after that, the tag is associated to stockroom/ supply chain or stock administration computer program (Swedberg, 2014).

When clothing is sold, the RFID tag is evacuated utilizing the RFID detacher that transmitted the item ID to the package to overhaul the stock record and deactivated in the long run. The labels are collected and sent to retailers/store to remove all of the memory and after that are transported to the production line for reuse. The labels are moreover used for tagging the returned items on the shop floor. This is often an illustration of digitization of attire fabricating (HL Chan, 2016). Long before, in the 90s, we (RMG Bangladesh) have already adopted Enterprise Resource Planning (ERP) for production planning and monitoring, management information system (MIS) for HR, payrolls, attendance and fingerprint access controls for workers, facial or biometric access

control for offices, management enterprise system (MES) for productivity etc. The use of computer-aided manufacturing (CAD/CAM) tools have not only increased the precision level, reduced wastages but also enabled apparel manufacturers to relate with the previous designs, and proposed designs. The computer can consolidate other references and can compare using logic (Choi, 2016). Digitization in apparel manufacturing is progressing in a fast-paced, disruptive way. It is not only reducing the lead time, lowering the cost of manufacturing, lessening periodical maintenance by predictive maintenance, minimizing the time of machine breakdown and creating a synergistic environment of production with zero re-work. The modeling and simulation of sewing lines through the batch process or a single piece flow enables the planner to find out the accurate method and achieve zero change over time.

It is, therefore, significant that we study the process of digitization in apparel manufacturing sector taking Bangladesh as a case study which is the second-largest exporter of apparels after China and finds out our present status with a view to advancing to the next level to remain competitive in the global market. We have to identify the factors needed to graduate to the next level and what leaders need to do for achieving the digital progress. The purpose of the article is to explore and explain the terms of digital leadership and leadership in the digital age and relate it to the RMG sector of Bangladesh. The aim is simple: to find out how are we (RMG) preparing for the leadership in the digital age in the RMG sector of Bangladesh?

2. Literature Review and Definitions

2.1 Cyber-Physical Systems (CPS)

CPS may be defined as a complex/ built framework that integrates physical, computation and organizing, and communication of different forms. CPS can be illustrated as a virtual or physical gadget, equipment, gear that's interpreted into the internet as a virtual show/reality or a model (Lee, 2015)

2.2 Internet of Things (IoT)

IoT can be characterized as communication among gadgets, machines, and gear with their virtual identities and capabilities as a result of mechanical propels and technological advances. These physical frameworks have ended up being smart and can consequently conduct a few mechanical operations as a result of these automatic associations (Görçün, 2018). The IoT could be a broadly utilized term for a set of advances, frameworks, and plan standards related with the rising wave of Internet-connected things that are based on the physical environment (Holler et al. 2014). Today's literatures on technology and digitization dominates volatility, uncertainty, complexity and ambiguity (VUCA),[1] together they name it a "VUCA WORLD".

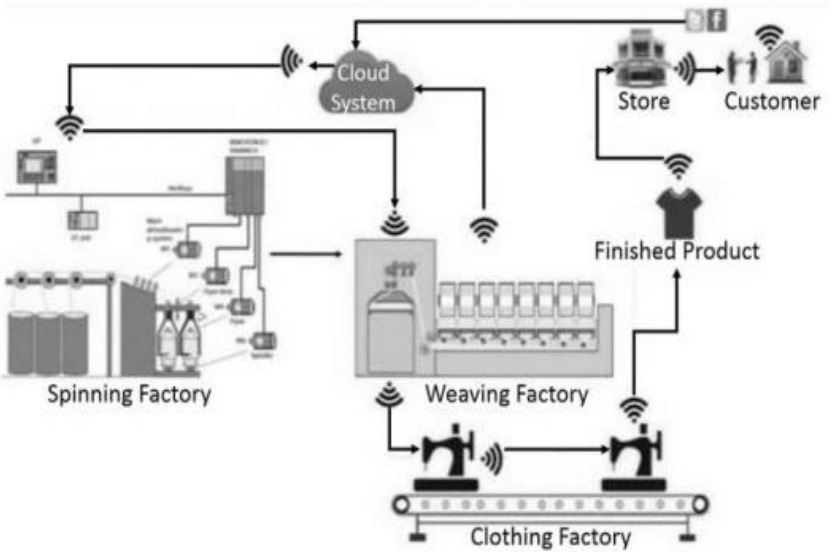

Figure 1. An Example of IoT in RMG (Adapted from Ömer Faruk Görçün, 2018)

[1] https://hbr.org/2014/01/what-vuca-really-means-for-you

2.3 Smart Phones

Now, IoT is circled around the smartphones and the heart of IOT, machine learning , M2M HMI, AI, VR, we see developments that center on the gadget (smartphones) as a controller, a framework dashboard, and a security get to key, or a combination of all three, the smartphones are set as the essential human-machine interface (HMI) (Goethals et al., 2003).

2.4 Digital Leadership

Computerized/digital pioneers can be characterized practically by their commitments to the move toward a computerized stage and known as digital leaders. These incorporate mindfulness leadership, building, asset mobilization, operational leadership and administration and basic structural administration and leadership. As digital leaders, we need to evolve faster than the pace of change; we need to hone our skills and capabilities to constantly ride on top of the changes and innovations (Hensellek, 2019). There is a need to distinguish between two related but different leadership categories. The two styles of leadership are closely related - many leadership innovations originated in the core ICT sectors and diffused from there. The most inclusive is "leadership in the digital age", which refers to leadership in any institution or sector embedded in the broader transitions toward a more knowledge-intensive digitalized society. The second, "digital leadership" refers to leadership in the core sectors of the ICT society – the three 'C's of computing, communications and content (broadcasting and print), and now multi-media.

2.5 Leadership Behaviors

The Ohio and Michigan studies argued that leader displays mainly two types of behaviours: Concern for Task or Task-Oriented behaviour and Concern for People or People-Oriented Behaviour (Likert, 1960). Gary Yukl (2009) added a different notion and named it as Change Oriented Behaviours (COB). It seems in the world the only constant is the Change. The changes in technology are not only fast-paced, rather can be expressed as everyday changes. The drones, electronic cars, android and iOS all are competing for an updated version. 2.3 Smart Phones. Smartphones are at the heart of all the later patterns in IoT and machine learning in this manner, each day we see developments that center on the gadget as a controller, a framework dashboard, and a security get to key, or a combination of all three, the smartphones are set as the essential human machine interface (HMI) (Goethals et al., 2003).

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3. The Process of Transformation

The RMG industry experiencing a transformation which incorporates the digitization of RMG new generation forms extending from concept to post-retail. Bangladesh RMG is receiving the 'Apparel 4.0' concept and this will empower the producers to screen and robotize the whole generation handle with total supply chain. Attire fabricating 4.0 has major applications in keen clothing, lean clothing and smart clothing, mechanical-technological mechanization, independent and shared automation, mechanical IOT, expanded reality, augmented reality, virtual reality, Machine-to-Machine (M2M) communication in sewing machines, lean automated lines, 3D printing, sharp surfaces and counterfeit insights or artificial intelligence (AI) RMG implanted mechanical automated ERP (undertaking resource orchestrating) etc. Neighbouring countries of

Bangladesh such as India, China and Vietnam are also rapidly implementing the Apparel 4.0 technologies in their factories. Raymond from India has started using the sewbot technology. Chinese garment manufacturers are introducing the smart clothing, augmented reality, and 3D printing in their factories. Vietnam has significantly developed Radio Frequency Identification Device (RFID), additive manufacturing and ERP[2].

To contribute to improving efficiency, transparency and accountability of RMG in Bangladesh, "Mapped in Bangladesh (MiB)" has been undertaking a 4-year research initiative by Centre for Entrepreneurship Development (CED) of BRAC University [CED-BRACU] and BRAC. The implementing organisation is aiming to map the RMG industry across all garment-producing districts in the country. MiB's design and implementation are in response to a lack of essential industry data, such as: how many export-oriented factories exist in the country? RMG gender ratio of workers employed, kind of products are produced and if any smart clothes 4.0? and brands working with them, etc., and other relevant information.[3] Since Industry 4.0 or Apparels /Smart attire 4.0 involves digitization of manufacturing processes of clothing, industrial facilities are in its introductory stage, it is advised to seek experts and aim only to important ones taher than to overstate its importance for the industry. We should avoid exaggerating its significance for the manufacturing industry. Most textile manufacturing, lacking innovation, is at mid-low end of the value chain. It is feasible to consider the ROI for both the new upgrading and the basic construction. Several issues must be resolved, such as setting and implementation of the industry standard, device protocol and information sharing scheme (Chen & Xing, 2015).

4. Leadership Styles in Digital Age

Leadership and managers play a crucial role in firms' innovation efforts (Damanpour, 1991; Smith & Tushman, 2005; Wrede & Dauth, 2020). Digital leadership is based on innovations and rapid changes. The most important is to remain updated on changes that affects the firm's competency, innovations that need to be incorporated to remain competitive. Research findings on digital leadership style indicated that it is highly impactful in transforming organizations and employee-based involvement and input played a critical role in the success of the change effort. the development of a digital culture is launched by top managers and leaders actively shape the transformation by building relationships with various and diverse stakeholders (Cortellazzo et al. 2019).

5. Where Do We Stand?

The literatures suggest that the digital transformation progresses in phases. It begins with the simple conversion of information from an analog into a digital format (i.e., 'digitization') (Loebbecke & Picot, 2015), changes into the use of digital technologies to transform existing business processes (i.e., 'digitalization') (Li, Nucciarelli, Roden, & Graham, 2016), and finally the 'digital transformation' (Pagani & Pardo, 2017) affects firms in their entirety, changes and adjustments will be observable at different levels of the organization (Hausberg et al., 2019). The digital transformation is predominantly relevant to RMG sector, and China is leading in this transformation with new innovations, use of sewbot, manufacturing smart clothes, whereas India, Vietnam and Bangladesh have started the process which is very slow and to some extent limited to certain processes only. These above factors are to be used to measure the maturity of digitization in an RMG factory.

6. Research Questions and Conceptual Framework

From the literature review we have constructed the conceptual framework and incorporated the factors with in it.

- What is the state of digitization in the RMG sector?
- How the RMG leaders are preparing for digital leadership?

[2] (www.fibre2fashion.com).

[3] (https://www.thefinancialexpress.com.bd/views/analysis/digital-initiative-to-promote-rmg-good-governance-1594402818).

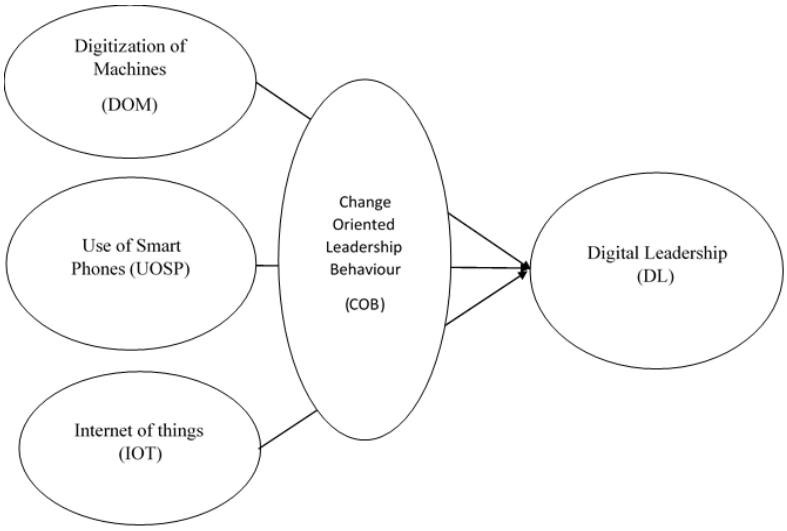


Figure 1. Conceptual Framework

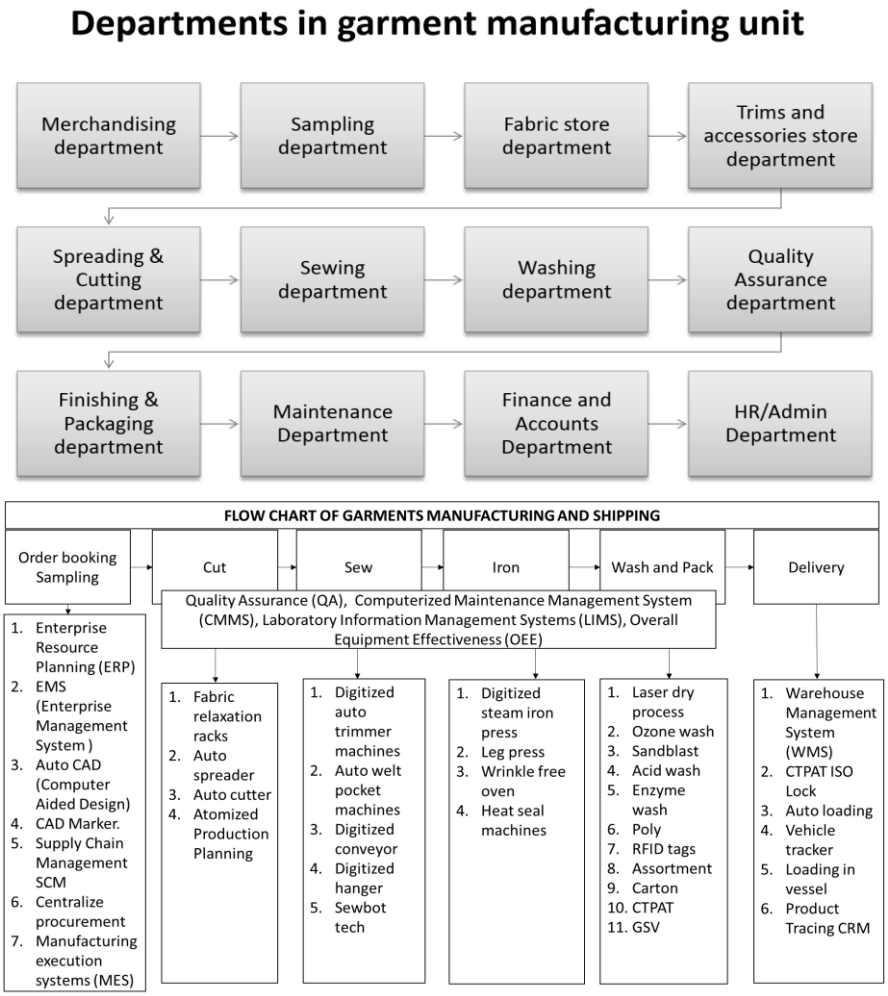


Figure 1. Flow chart of apparel manufacturing /RMG (Prepared by author)

7. Methodology

We collected primary data from 50 RMG factories by visiting them and talking to the owners, mangers regarding

their digitization, automation and innovation. The digitization factors had been filtered through to reach to the most relevant ones in RMG sector, we collected data on following factors:

1. Use of auto machine
2. AR
3. Use of RFID
4. Use of Smart Phones and Apps
5. AI
6. Cloud Computing
7. Big Data
8. M2M Communication
9. VR
10. Automation, modeling and simulation
11. Automation in production of yarns, woven, and knitted fabrics
12. Automation in fabric inspection
13. Automation in spreading and cutting
14. Computer-aided design—garment designing and patternmaking
15. Automation in quality monitoring of fabrics and garment seams
16. Use of advanced tools and equipment in industrial engineering
17. Advancements in production planning and control
18. Mobile Technologies
19. 3D Printers
20. CRM and Product Traceability
21. Leadership Style/Behaviour

After collecting data, we put this into a model and found out the maturity level of digitization in the RMG sector of Bangladesh.

The model is:

$$M_{D=} \; n + i * g$$

$M_{D=}$ Maturity Dimension

n = Number of Factors

i = number of maturity items

g = weightage

There is total 21 factors and 4 maturity items, and the maturity item each weightage being, 5.

A factory having 16 factors incorporated and 2 maturity items will score as:

$M_D = 16 + 2*5 = 26$ out of total score available 40.

A hundred percent score will be a matured level, while a score within or below 60% is considered level 1, 80% is level 2, and level 3 is matured one. There is total 21 general factors and 4 maturity factors, maturity factors are the most advanced forms of digitization.

8. Results

8.1 Description of the Sample of 50 RMG Factories

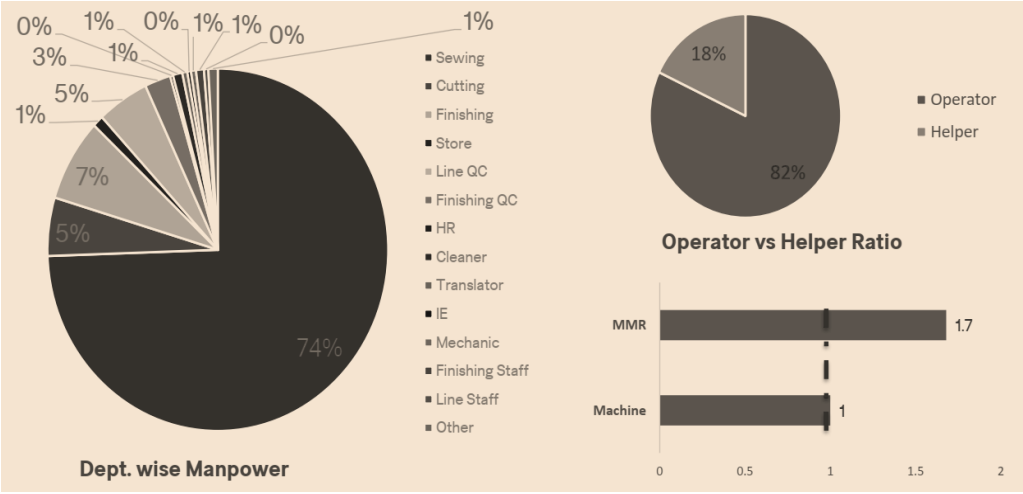


Figure 2. Man, and Machine Ratio (MMR)

A RMG factory with limited or no automation is having a Man to Machine Ratio (MMR) higher than 1:2.2 that means for one machine there are 2.2 Men employed. With medium automation it becomes 1:1.8 or 1:1.7. The automation and digitization reduce and MMR upto 1:1.4. It is well understood the more manpower employed is the more of cost of manufacturing.

The RMG sector employs direct manpower who are behind machines, and needle works and add value directly to the productivity. These are the operators, helpers and ironmen. Indirect support manpower like quality assurance staffs, industrial engineers etc. add value indirectly. Other support or admin staffs are considered as non-value add manpower. Though in MMR we calculate all held in strength, the more machines we can run and reduce support staffs the better the MMR. A lower MMR will lead to a greater productivity and reduce cost of manufacturing, digitization and automation allows to reduce support staff and increase the standard minute values produced thus shorten the lead time, change over time and nonproductive times.

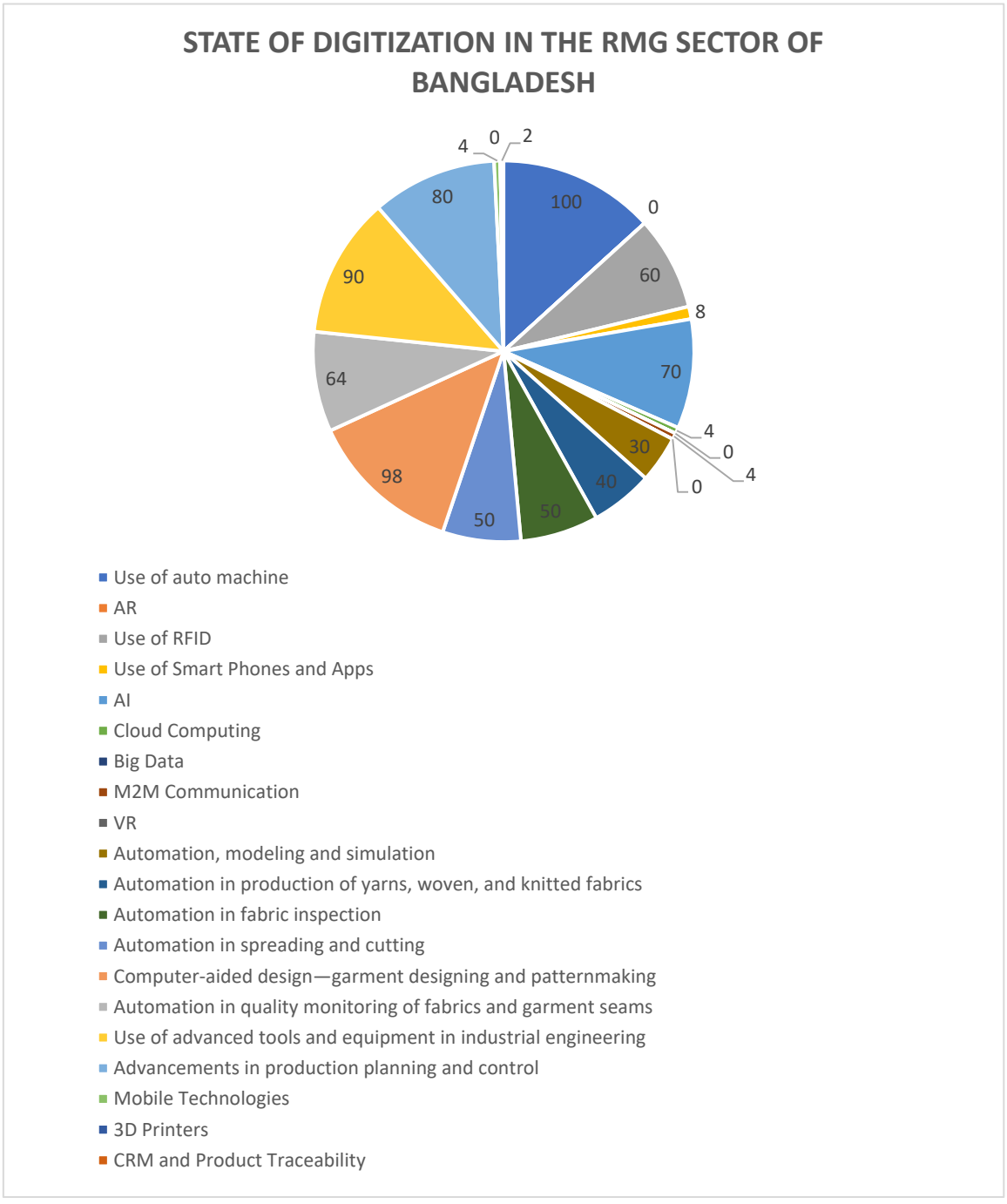
The truth is, apparel brands presently perceive that in arrange to convert their working models and to end up truly consumer-centric, they will ought to drive end-to-end digitization, prepare effectiveness, cross-functional and cross-company collaboration and deeper immersion within the sourcing materials.

The benefits of digitization are numerous, the primary one, and may be the most important one is it can bring huge sustainability and transparency benefits. is colossal maintainability and straightforwardness benefits. Digitization is a major game-changer in terms of efficiency, quality and on time deliveries thus a ROI ensured in long term benefits. Digitization can help strengthening and overseeing manufacturing plant security, ensuring compliance issues, expanding traceability and even paying the workers through mobile financial services.

8.2 Tabulated Result

Serial	Factor/Digitization	Percentage	Weightage
1	Use of auto machine	100	
2,3	AR VR	0	5
4	Use of RFID	60	
5	Use of Smart Phones and Apps	8	5
6	AI	70	
7	Cloud Computing	4	
8	Big Data	0	5
9	M2M Communication	4	5
10	Automation, modeling and simulation	30	
11	Automation in production of yarns, woven, and knitted fabrics	40	
12	Automation in fabric inspection	50	
13	Automation in spreading and cutting	50	
14	Computer-aided design—garment designing and patternmaking	98	

15	Automation in quality monitoring of fabrics and garment seams	64	
16	Use of advanced tools and equipment in industrial engineering	90	
17	Advancements in production planning and control	80	
18, 19	Mobile Technologies, CRM and Product Traceability	4	
20	3D Printers	0	



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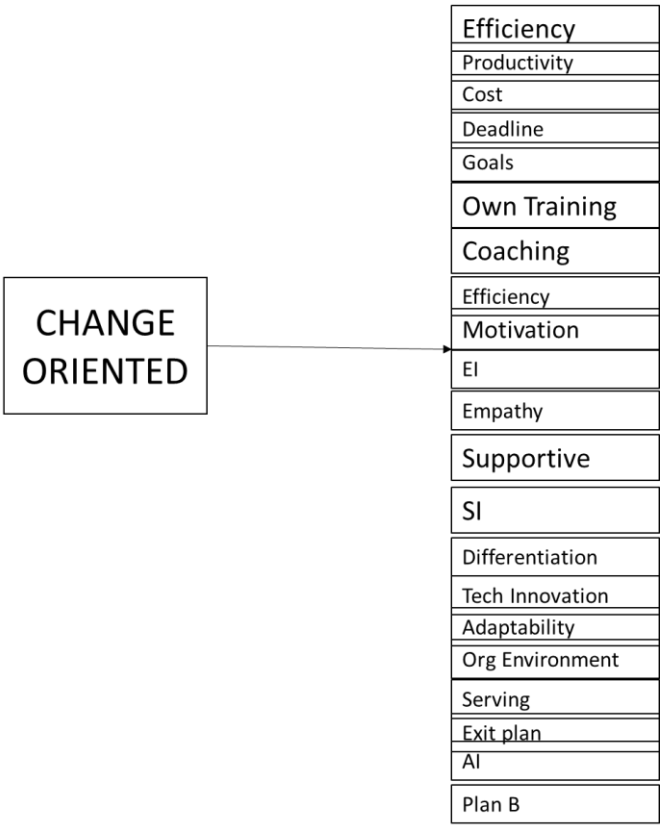

Figure 6. Results CFA

9. Discussion and Conclusion

Modern companies, today, connect information and communication technology in production and operational process (Dewan and Kraemer, 2000; Eason, 2005). In the advanced stage of the industry, however, this will be controlled and documented around the entire supply chain from the inception or idea of a product, research and development, production, use, and maintenance to recycling (Roth, 2016).

Bangladesh RMG has digitized its Global Security Verification (GSV) and Customs-Trade Partnership Against Terrorism (CTPAT) through CCTV cameras, IP cameras and RFID and through use of ISO locks and real-time product tracing. However, product design remains limited to auto CAD (computer-aided design), the 3D modelling and use of 3D printers are yet to be incorporated.

The process of manufacturing is automated and to some extent digitized isolated, for example, the cutting process is automated but not linked with the input process. The Digitized sewing process is also working stand-alone and not linked to packing. The quality assurance is more of manual then digitized ones.

From the result of the model, and the tabulations we can argue that UOSP (Use of Smart Phones is limited to information sharing through apps like WhatsApp, Viber or other apps like Skype. The use of remote apps like Zoom, Meeting, etc. facilitate the COVID time work from the home meeting, however, apps with dedicated dashboards and interface connected to processes are yet to be introduced.

The result further confirms that digitization of machines has advanced though not incorporated in a seamless machine to machines communication, 80% of the factories digitized the manufacturing process department wise. Similarly, the IoT is limited to cloud computing acting as a backup server only. In demand forecasting, decision making, the most critical information is historical data. Datasets of both products and related fast fashions are useful. Then, there must be an efficient tool to help provide reliable and useful forecasts. However, the apparel sector has not yet started using the Big Data concept for demand forecast or decision making.

Leadership styles are essential to any organization and can drive successful results; however, not all organizations can employ the appropriate styles for their existing business practices, while others utilize leadership styles to align organizational needs and required changes, the appropriate leadership style make this

transition easier (Holten & Brenner, 2015) but Bangladesh RMG leaders lacked some of the technical knowledge required to lead digitization project. Most of the leaders wanted to remain updated on the recent technological advancement however in practice they failed to show COB.

We can conclude that automation in RMG is in intermediate/level 2 stage, however, the digitization of RMG is at beginner's /level 1 where the use of smartphones are scarce, only 4% of the studied factories started using smartphones only to track and monitor productivity but yet not integrated/interfaced with IoT.

The future challenges include:

- Lack of adaptation of atomized machinery, digitization and use of advanced technologies.
- Lack of educated, highly skilled workforce
- Political unrest and unfavorable law and order
- Inadequate financial measures
- Leaders lacking in (COB) Change Oriented Leadership Behavioural mindset. Modern companies, today, connect information and communication technology in production and operational process (Dewan and Kraemer, 2000; Eason, 2005). In the advanced stage of the industry, however, this will be controlled and documented around the entire supply chain from the inception or idea of a product, research and development, production, use, and maintenance to recycling (Roth, 2016).

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10. Implications for Practice and Further Research

The implication of the study is to measure the maturity of the digitization through the model explained in methods. This study generates following questions for further research:

1. Is the manufacturing set up matured enough for digital transformation?
2. Will the digital solution meet company objectives?
3. How are digital transformations strategized?
4. How digital transformations prioritized?
5. What is the estimated time for ROI/break even cost analysis?
6. Why the COB is necessary and why are we failing to adopt this correctly?

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