# Risk Management Practices and Productivity in Integrated Waste Management Facility towards Operational Resilience

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***Abstract –*** *The biggest mistake that the present generation could make is to forget the experiences during the COVID-19 pandemic, the genuine experiences of hardship, and difficulty performing what used to be normal work. The extraordinary disruptions that affect every organization exposing companies to several operational risks and productivity problems. Companies that cannot adapt felt the severity of the disruptions and at risk of a business closure. A company like in the Waste Management Sector must sustain its facility's operation to ensure that piles of waste in the community are collected and processed, a critical service to avoid domestic waste being a super spreader of the virus. This pandemic era research explores risk management practices and productivity in Integrated Waste Management Facility (IWMF) towards operational resilience. More specifically, it determines the risk management practices in terms of plant operation, company reputation, and regulatory compliance. It also determines the productivity in terms of workforce performance, production process, and process innovation; test the significant relation of risk management and productivity and operational resilience in IWMF and developed an action plan for IWMF operational resilience. The study utilizes the descriptive research method in gathering needed information where the survey instrument was tested for its reliability and made acceptable for distribution. The researcher distributed a digital survey questionnaire to every employee of IWMF that results in 188 responses which are 94% of the population. The study reveals that risk management practices in IWMF have high recognition from the employee resulting in a strong agreement. Likewise, for the employee's agreement in productivity in the IWMF. Additionally, the study's main implication is that the risk management practices, and productivity are highly significant towards the operational resilience of the IWMF – an empirical finding in developing resilient operation in a waste management facility during the COVID-19 pandemic.*

***Keywords –*** *Operational Resilience, Productivity, Risk Management Waste Management Facility*

## INTRODUCTION

Waste Management Sector is an essential infrastructure in developing sustainable economic growth. Whereby facilities are design-capable in withstanding internal failures that ensure continuous service in the community where it operates. However, the risk of disruption caused by a catastrophe such as the pandemic significantly threatened the facility's operation. The developing disruptions caused by the Corona Virus Disease 2019, commonly known as COVID-19, significantly affect society's social, economic, health, education, environmental, and tourism sector [1-2] Several establishments have been affected, resulting in business closure. Enterprises that cannot adapt felt the severity of the disruption [3].

In Qatar, the Integrated Waste Management Facility felt this disruption whereby the plant operation is affected and disrupted the workforce productivity because of potential local virus transmission. The COVID-19 is a disease caused by the virus SARS-CoV-2. World Health Organization indicates that SARS-CoV 2 transmits via droplets and contaminated objects during close unprotected contact from the person carrying the virus [2]. The virus transmission may also be present in inanimate environments, such as in domestic waste. Nghiem et al [2] describe that Fomites are a common medium in spreading viruses during outbreaks because viruses remain viable for few hours up to several days. The survival time of SARS-CoV-2 on hard surfaces and plastic is in the order of days, which suggests that waste materials originating from household and quarantine

facilities with positive or suspected COVID-19 patients may contain viable SARS-CoV-2 and could be a source of infection [4].

Waste Management is always one of the biggest challenges in every nation, and it became more challenging during the COVID-19 pandemic. Municipal Solid Waste handling processes generation, composition, collection, and disposal play a critical role in not becoming a super spreader of the virus [5]. United Nation recognized waste management during the COVID-19 pandemic as an essential public service because of the virus's potential spread through domestic waste [6]. Hence, the waste management sector must be in continuous operation; the vital service needed to collect and process piles of waste even at the high risk brought by the pandemics [7]. This situation creates a critical requirement of the facility's productivity on where it needs to adapt and sustain operation considering long-term business implications such as reputation and regulatory compliance. The Business Continuity Plan is a viable solution for restoring business processes whenever significant disruptions occur with an estimated duration. On the contrary, operational disruptions caused by the pandemic differ because of global impact and uncertain periods. As a result, operational resilience gains crucial importance.

Operational Resilience is a prominent business strategy that is highly recognized during the pandemic. The enterprise can alter operations in the face of changing business conditions on which it allows people, processes, and informational systems to adapt to the evolving patterns. However, transforming to a resilient operation is not an easy task as it requires a deeper examination of what the business does and what it needs to continue. Resilience is a relevant property to be achieved as it allows the network to withstand all types of perturbations affecting its functions and provide its service with continuity. Resilience comes from combining several specific properties related to intrinsic network technologies and the operator's management skills. Achieving operational resilience is inherently challenging given the increasing complexity of processes, technology infrastructure, and organizational silos. However, the business benefits go beyond pure risk and compliance, often forming an inherent part of a firm's value proposition [8].

The pre-COVID-19 operational risk management lacks meaningful remediation activity to reduce heightened levels of risk associated with prolonged tail-ends events. Many organizations planned their pandemic scenario through historical analysis that most failed due to the severity of impact or disruptions caused by the COVID-19 pandemic. Risk Management, when properly perform and all facets of risk are identified could result in resilient operation. On the other hand, productivity needs careful evaluation and trade-offs because it could expose the company to vulnerable conditions. Productivity tends to optimize resources in producing output, thus increasing efficiency. However, such a strategy could limit the resources on hand in sustaining operation due to the condition change resulting from an external factor such as the Government's imposition of pandemic control measures.

Qatar declared its first case of COVID-19 on 29th February, and in response, the Qatar Ministry has implemented travel restriction, community restriction, and logistics restriction (Hassen et al., 2020). On the 9th of March 2020, Qatar announced a travel ban on 15 countries: Bangladesh, China, Egypt, India, Iran, Iraq, Italy, Lebanon, Nepal, Pakistan, the Philippines, South Korea, SriLanka, Syria, and Thailand Hamad Medical Corporation-Qatar (2020) & Ministry of Public Health-Qatar (2019). The Ministry of Municipal and Environment, on 21st March 2020, closed all parks and public beaches to curb the spread of coronavirus. On 23rd March 2020, the Ministry of Commerce and Industry temporarily close all restaurants, cafes, food outlets, and food trucks in the main public area. Also, the Ministry of Commerce and Industry decided to close all the unnecessary business on March 2020 [9].

The Ministry also release an instruction to maintain a skeletal work structure onsite. A challenging mandate to follow because of the productivity demand on the facility. Instead of thirty percent workforce onsite, the IWMF management has implemented a work bubble where the employees staying within the plant premises were kept inside with limited contact from external parties. Then the staff who leaves in the city accommodation were declared non-resident staff who are forbidden to interact with the resident staff. Then all the projects and activities that are non-essential were put on hold until the situation subsides. Major Overhauls such as the Boiler Overhaul are re-scheduled to the following year. Social distancing via groupings was in place. These are some of the immediately implemented measures by the IWMF management team in preventing or reducing operational impact. A proactive approach that affected the facility's productivity since the Organization is generally incapable of stopping the crisis from occurring that even the Business Continuity Plan in place is

surprisingly unfit in the actual scenario caused by the pandemic.

The greatest mistake that the present generation could make now is to forget the experiences during the COVID-19 pandemic era. It is vital to develop and manage novel paradigms at the enterprise level to create a sustainable economy and adaptive society [10]. Companies now shall need to redesign operations to protect against broader and more acute potential disruptive events in the future. Analysis in risk management practices and productivity during disruptive situations provides genuine considerations of all factors involved—the needed research in establishing stability [2]. The Integrated Waste Management Facility in Qatar is the largest and the only operating Integrated Waste Management Facility in the region, processing 2,300 tons of Qatar Municipality's Solid Waste and produces 42 MW of electricity exported to the electric grid. The facility's obligation of productivity is high during this pandemic, and it is crucial more than ever that if the facility failed to process the daily waste, the waste would end up in landfills—an undesirable option for Qatar considering the limited land of the peninsula [11]. and the potential super spreader of the virus. Additionally, the future of waste management facilities and waste to resource is promising and a contributor to a sustainable economy. World Energy Council valued the global waste to energy market at 9.1 billion USD in 2016 and is expected to rise over 25 billion USD by 2025 (World Energy Council, 2016). Thereby, onboarding Operational Resilience as a strategy shall support business opportunity for the company's value proposition in the future.

Objectives of the Study

This study aimed to explore on the Risk Management Practices and Productivity in Integrated Waste Management Facility towards Operational Resilience. Specifically, it aims to: describe the Risk Management Practices in terms of Plant Operation, Company Reputation and Regulatory Compliance; determine the Productivity in terms of Workforce Performance, Production Process and Process Innovation; assess potential activities in developing Operational Resilience; Test the significant relationship of Risk Management Practices and Productivity and Operational Resilience in IWMF; and develop an action plan for the IWMF Operational Resilience

## METHODS

### Research Design

This study utilized the descriptive method of research in gathering needed information in exploring the risk management practices and productivity towards operational resilience. The survey questionnaires were the main instruments use in data gathering to answer questions about the practices, preferences, and insight among the respondents. The questions of the survey focus on the present condition of the subject.

Descriptive method of research presents statistical information about a specific phenomenon or the phenomenon's frequency to gain resolution of the subject studies [12].

### Respondents of the Research

Respondents of the survey questionnaire are the employee of IWMF. All the employees of the facility were contacted and invited to participate in the survey.

**Table 1**
**Percentage Distribution of the Respondents Profile**

| **Sex** | **F** | **(%)** |
|---|---|---|
| Male | 184 | 97.90 |
| Female | 4 | 2.10 |
| **Age** | | |
| Below 25 y/o | 1 | .50 |
| 25 y/o – 35 y/o | 91 | 48.40 |
| 36 y/o – 55 y/o | 90 | 47.90 |
| More than 55 yrs | 6 | 3.20 |
| **Years in Service** | | |
| Less than 5 yrs | 56 | 29.80 |
| 5 yrs – 10 yrs | 86 | 45.70 |
| More than 10 yrs | 46 | 24.50 |
| **Position** | | |
| Executive | 52 | 27.70 |
| Non-Executive | 136 | 72.30 |

The survey garnered one hundred and eighty-eight responses. The facility has Two Hundred employees, on which the company categorizes the employees into "executive and non-executive position. The Engineers, administrative staff, section heads, and managers comprise the executive group. While technical officers, technicians, welders, fitters, and drivers form the non-executive group.

The IWMF has a diverse workforce dominated by male employees due to the labor-intensive and hazardous working environment. It has a good employee retention record that the majority are with the company for more than five years, considering that all the employees are expatriates. The team is young but mature in terms of experience. It is commendable that the facility

has about twenty-five percent of employees that are more than ten years now, which develop with the company since it started operation back in 2010.

**Data Gathering Instrument**

The researcher uses self-structured questionnaire four-part data gathering instrument. The questionnaire was validated, and reliability test was conducted.

Part 1 pertains to the respondent's profile particularly age, years of service, and position. Part 2 pertains to the respondent's understanding, insight, and experience about the Risk Management Practices in terms of Plant Operation, Company Reputation, and Regulatory Compliance. Part 3 of the survey questionnaire pertains to the respondent's understanding, insight, and experience about Productivity in terms of Workforce Performance, Production Process, and Process Innovation. Part 4 are the activities that company adopts towards operational resilience. The questions are derived from an article entitled "Striving for operational resilience and from the questions boards and senior management should ask" (Brandenburg et al., 2019). Results of reliability testing are as follow:

| Indicators | Cronbach Alpha |
|---|---|
| Plant Operation | 0.866 |
| Company Reputation | 0.830 |
| Regulatory Compliance | 0.886 |
| Workforce Performance | 0.742 |
| Production Process | 0.904 |
| Process Innovation | 0.898 |
| Operational Resilience | 0.953 |

**Data Gathering Procedures**

The survey questionnaire was prepared and distributed through a google form. The researcher utilized the digital platform in sending survey links via social media, WhatsApp messages, and email with a letter of participation request explaining the study and the mechanics of the survey. The survey participation request letter also emphasizes the approval from the facility's General Manager to ease the respondent's hesitation about the information disclosure.

**Data Analysis**

Weighted Mean and Ranking were used to assess Risk Management Practices in terms of Plant Operation, Company Reputation, and Regulatory Compliance; and determine the Productivity in terms of Workforce Performance, Production Process, and Process Innovation.

Spearman's rho - value was used to test the Null Hypothesis that the "Risk Management Practices and Productivity are not significantly related towards Operational Resilience in Integrated Waste Management Facility."

The four points Likert Scale was used to remove the central tendency with the following values: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 – 1.49 = Strongly Disagree

**Ethical Consideration**

In this study, the researcher seeks approval from the facility's General Manager (GM) to conduct the survey. Utmost confidentiality and anonymity were assured with the GM that any information gathered is only for research purposes. Likewise, respondents are assured of confidentiality and anonymity. The participants were given full details on the study and instructions on how to fill the survey form. Participants specified their consent of participation by acknowledging the consent approval.

RESULTS AND DISCUSSIONS

**Table 2**
**Risk Management Practices in terms of Plant Operation**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Employees undergo training to be competent in identifying Plant Operational Risk. | 3.57 | SA | 2 |
| 2. Employees conduct personal risk assessment to ensure safety in performing their jobs. | 3.53 | SA | 4.5 |
| 3. Environmental, health and safety objectives of the company is well communicated among employees. | 3.65 | SA | 1 |
| 4. Risk Management Team perform Operational Hazard and risk identification and control measures is prepared. | 3.56 | SA | 3 |
| 5. Careful evaluation is done through risk matrix scoring to ensure reduction of risk to acceptable level. | 3.53 | SA | 4.5 |
| **Composite Mean** | **3.57** | SA | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 2 presents the respondent's assessment of Risk Management Practices in the IWMF in terms of Plant Operation. The composite means of 3.57 indicates that the respondents strongly agreed on the above indicators. Among the items cited, "environmental, health and safety objectives of the company is well communicated among employees" got the highest weighted mean score of 3.65. Notable feedback from the respondents acknowledges the company's communication effort to ensure that every employee

understands the environment, health, and safety objectives.

Last in the ranking is the "Employees conduct a personal risk assessment to ensure safety in performing their jobs" and "Careful evaluation is done through risk matrix scoring to ensure reduction of risk to an acceptable level" with a weighted mean score of 3.53. It attributes to the skills and expertise requisite in performing a risk assessment. Performing risk assessment needs an in-depth understanding of the activity to complete. Some employees may not concur because they are still in doubt due to non-exposure to such tasks even with the training. Additionally, worker's complacency in following the actions mandated by risk management is inevitable because some workers may perceive it as an obstruction [14] The risk can be process safety and personnel safety-related, whereby process safety involves a primary task or project in production. In contrast, personal safety is a person's actions resulting in harm. Therefore, it is vital to investigate the significance of risk against the production of a facility.

**Table 3**
**Risk Management in terms of Company Reputation**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Employees are all obliged to undergo annual training exercises on company reputation. | 3.48 | A | 4 |
| 2. Employees are strictly prohibited to engage on such acts like graft, bribery, theft, corruption and others that may ruin the reputation of the company. | 3.71 | SA | 1 |
| 3. Employees are well -oriented on the importance of upholding the company reputation and quality workmanship. | 3.58 | SA | 2 |
| 4. Reputation risk is included in the quality objectives to attain zero complaints among customers. | 3.57 | A | 3 |
| 5. Constant communication with stakeholder is done including plant tour and visitation to shape its reputation. | 3.47 | SA | 5 |
| **Composite Mean** | **3.56** | SA | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 3 presents the respondent's assessment of Risk Management Practices in the IWMF in terms of Company Reputation. The composite mean of 3.56 indicates that the respondents strongly agreed on the above indicators. It shows the company's commitment to ensuring that every employee ethically performs their duties and responsibilities at work. Another risk management practices by the facility are the "Reputation risk is included in the quality objectives to attain zero complaints among customers" is in the third rank. The company's objective is from the company's mission as an actionable statement. The company ensures that "zero complain" is maintained as it will dent the established work relationship with the client. The facility is subject to stringent compliance, and any doubt from the client could trigger a contract compliance audit.

Another indicator is the "Employees are all obliged to undergo annual training exercises on company reputation" which is in the fourth rank with a weighted mean score of 3.48. Annual training exercise "virtual" along with declaration policy ensures awareness among employees. Although not every employee asserts this indicator. The mandatory training refreshes the employee's understanding. However, some employees disregard the essence of attending the training since they are already complying. Some may question the use of recurring similar training that they consider a burden to perform on top of their daily duties.

And in the last rank, "Constant communication with stakeholder is done including plant tour and visitation to shape its reputation" is in the last rank. Employees perform their daily task, and facing any visitors or client are not for every employee. The visitors visit the facility accompanied by the top management or by certain personnel. It is also crucial to note that even it was in the last rank, the employee recognized the importance of sustaining a good reputation. The company's reputation must be managed holistically in the minds of all stakeholders because the ability of a company to make a profit also depends on its reputation [15]. Customer perception develops the credibility and reputation of a company that supports its capability to do business. The organization earns a good reputation for many years of doing business. However, reputation may result in the disappearance in a matter of weeks that negatively affect business; that's why it is an essential intangible asset in sustaining operation and future business development.

Table 4 presents the respondent's assessment of Risk Management Practices in the IWMF in terms of Regulatory Compliance. The composite mean of 3.56 indicates that the respondents strongly agreed on the above practices. It signifies that the generated objectives, laws, and policies/procedures are communicated and understood by the employees, a management commitment to ensuring an environment of regulatory compliance. The "tool-box-talk" is a two–way communication that the company exercises in communicating with its staff; it is a briefing or meeting

on the production floor where senior personnel of the department conduct the briefing.

**Table 4**
**Risk Management in terms of Regulatory Compliance**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Regulatory compliance is well-defined in the Key Performance Indicators (KPI's) of each department as part of the quality objectives. | 3.61 | SA | 2 |
| 2. Employees undergo "toolbox talk" to communicate compliance objectives, laws and policies/procedures that governs the industry. | 3.70 | SA | 1 |
| 3. Ensures meeting regulatory compliance through constant conduct of monitoring analysis on quality objectives. | 3.54 | SA | 3 |
| 4. Investigation Report is issued by the Quality Assurance Department on cases of non-compliance or not meeting the KPI's. | 3.46 | A | 5 |
| 5. Employees reporting non-compliance are protected by ensuring confidentiality of reports and proper sanction is given to the accountable employees. | 3.52 | SA | 4 |
| **Composite Mean** | **3.56** | SA | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Furthermore, the employee understands the KPI's involved by acknowledging their presence in each department's quality objectives. The policy and procedures are essential in assessing compliance risk and monitoring legislative compliance. It also standardized the training needs and in building a culture of compliance [16].

Another risk management practice in the facility is the "Ensures meeting regulatory compliance through constant conduct of monitoring analysis on quality objectives". The Quality Assurance Department maintains monthly monitoring of the quality objective targets. The task ensures avoidance of major non-compliance. The employees involved in these activities are limited to the executive position; that's why it's understandable if some employees did not give complete agreement. The fourth rank of practices is the "Employees reporting non-compliance are protected by ensuring the confidentiality of reports and proper sanction is given to the accountable employees". It is commendable that it has been ten years since the last major non-compliance. However, it is noticeable that the facility has its near misses during this pandemic.

And in the last rank of risk management practices, the "Investigation Report is issued by the Quality Assurance Department on cases of non-compliance or not meeting the KPI's" is in the last rank In any non-compliance or not meeting the KPI's, the corrective action was prepared and discussed between the Department Heads and the Quality Assurance Department. Subordinates received the corrective action as a work order with less information about non-compliance. The result indicates that even it receives agreement among employees, ranking it last attributes to exposure of the staff in the investigation process. It is essential to note that a company like IWMF has a public image responsibility since it is a flagship project of the State of Qatar in waste management. Hence, it is common for the facility to find itself subject to stricter ministry expectations and regulations.

**Table 5**
**Summary Table on the Risk Management Practices**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Plant Operation | 3.57 | SA | 1 |
| 2. Company Reputation | 3.56 | SA | 2.5 |
| 3. Regulatory Compliance | 3.56 | SA | 2.5 |
| **Composite Mean** | **3.56** | **SA** | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 5 presents the respondent's assessment of Risk Management Practices in the IWMF. The result attributes to employee's exposure in daily works in Plant Operation. The Plant Operational Risk is the risk associated with IWMF Operation, including but not limited to running the business, workplace, people, and environment. The facility is a complex production process of integrated facilities. The complexity of the process or activity, such as heavy equipment operation, crane operation, sorting, recycling operation, boiler operation, water treatment operation, composting operation, and energy generation, possesses different hazards and risks. The results show that employee of IWMF recognizes the importance of performing risk management in the facility to ensure safety at work and maintain an uninterrupted production process.

The IWMF embodies a safety culture where everyone is responsible for safety and that safety incidents can be preventable. Employees are trained in upholding basic safety instructions before performing any activity in the facility; stop, identify, access, mitigate, and then only proceed. Mitigating the hazards through the hierarchy of controls starts from elimination, substitution, engineering controls, administrative controls, and personal protective equipment. The hierarchy of managing hazards provides corrective measures as much as practicable. The facility involves every employee in hazards and risk identification by

performing a hazard reporting program to report any hazards found. The company likewise determines the risk related to the facility's business operation. Fortunately, threats of competition are not a factor for the company because of long-term contracts. Although, the company still must safeguard the contract obligation compliance because of the annual review. Business strategy and risk management need to be future-minded, considering that holistic risk management in plant operation includes regulatory compliance for all the local and international related regulations and keeping company reputation intact. There is a need to exercise due diligence in enforcement is still a must. It is prevalent for risk management to perform as paper works only with superficial content because of the time and effort needed in preparing genuine risk management. The novelty of risk plays a significant role in risk management because of the incomplete information and untested risk-mitigating measures. When the risk management became too wordy and complicated because of impracticable action, the employee tends to skip the risk management measures, resulting in unfavorable outcomes.

The company first performs epidemic-tailored risk management during the spread of Middle East Respiratory Syndrome (MERS) but being in the pandemic scenario is entirely different from planning it in a convenient air-conditioned meeting room. The pandemic reveals several considerations for decision-makers: financial, operational, reputation, regulations, supply chains, information, and each employee's anxiety. Risk is inherent in all business functions and every kind of activity. Knowing how to identify risks, attribute a value and a priority scale, design actions and mechanisms to minimize risks, and continuously monitor them, are essential to guarantee companies' survival and create sustainable value. The company acted quickly with incomplete information trying to avoid the spread of COVID-19 in the facility.

Unfortunately, the COVID-19 still infected some of the employees, resulting in a more difficult situation and affecting the facility's productivity. Improvisation in developing strategies is a must, citing that the pandemic is new and that the whole world is in uncharted waters. The execution of strategy gains some confusion and triggers questions and requests. The company recognizes the need for the continuous evolution of Risk Management practices in the facility, a valuable experience on this ongoing pandemic that will alleviate impact to the facility and the employee's trust for future business operation planning. Risk Management must address the ability to understand and manage a pandemic as a tail event and develop reasonable scenarios for future events [17].

**Table 6**
**Productivity in terms of Workforce Performance**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Provides competency development training to enhance employee performance. | 3.49 | A | 3 |
| 2. Recognizes performing employee thru best employee award as a motivating factor to perform well. | 3.46 | A | 5 |
| 3. Uses scorecard in performance appraisal of employees based on Key Performance Indicators (KPI's) | 3.56 | SA | 2 |
| 4. Conducts periodic employee performance appraisal. | 3.63 | SA | 1 |
| 5. Encourages team work, cooperation and collaboration among employees to achieve highest standard of productivity. | 3.47 | A | 4 |
| **Composite Mean** | **3.52** | A | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 6 presents the respondent's assessment of productivity in the IWMF in terms of Workforce Performance. The composite mean of 3.52 indicates that the respondents strongly agreed on the above indicators. The survey results show the employee's acknowledgment that the company uses scorecards as the basis of employee's periodic appraisals. Although, it is essential to note that work arrangements are still new during the survey. The optimism of the employee is still high, along with the compassion. However, in-balance work distributions are inevitable in sustaining business operations due to remote management and productivity management. Work from Home (WFH), for instance, is one of the work arrangements resulting from the disruptions. It undoubtedly supports operation, but evidence reveals less productivity in industries and occupational workers [18]. However, it is foreseeable that hybrid work arrangements will likely continue until the global pandemic is under control and even post-pandemic. Hence, it needs to revisit regulations and policies to maintain worker's wellbeing and appreciate productive employees.

And in the last rank is the "Recognizes performing employee thru best employee award as a motivating factor to perform well". The awards are subject to a personal mindset from different employees. The process of selection starts from nominations raise by colleagues, on which are department heads conduct reviews. Each nominee shall undergo an interview from the management panel, resulting in a recommendation for

GM approval. It's a complex process, that tainting it is inevitable. It is also essential to recognize that the continuous pursuit of better productivity during the pandemic may result in employee disobedience considering the stressful condition. The management team needs to be sensitive because it is potentially counterproductive, not only in terms of worker's wellbeing but also in long-term productivity [19].

**Table 7**
**Productivity in terms of Production Process**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Provides and maintain operational procedures which is accessible by employee through "share-point" | 3.55 | SA | 1 |
| 2. Identifies essential and non-essential production process for prioritization during disruptive events. | 3.42 | A | 5 |
| 3. Ensures production equipment's are all in good working condition through preventive maintenance program to minimize disruptions of operations. | 3.52 | SA | 2 |
| 4. Optimizes input resources by maintaining efficient production process. | 3.46 | A | 3 |
| 5. Organizes production process structure for effective work performance in departmental level. | 3.44 | A | 4 |
| **Composite Mean** | **3.48** | A | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 7 presents the respondent's assessment of Productivity in the IWMF in terms of the Production Process. The composite mean of 3.48 indicates that the respondents agreed on the above indicators.

The company maintains operational procedures in a shared folder following the filing matrix in share-point. The server is accessible through an intranet connection from the company's hardware. An authorized employee can easily access the updated version of documents. The accessibility of such information is vital for an employee operating the facility in ensuring that all parameters comply. The result signifies the commitment of the management to providing a competent and reliable workforce.

Similarly, the need for competent workers and reliable equipment is valued to ensure the facility's longevity since it has a long-term contract with the Ministry. Additionally, budget operating and maintaining the facility are already known, and the only means of further profit contribution is through an efficient process. An effective work structure shall ensure that the supervision of employees in performing their work follows the company's mission and vision.

And in the last rank is the "Identifies essential and non-essential production process for prioritization during disruptive events" with a weighted mean score of 3.42. The facility's employee recognizes its importance, although making it last rank means not everyone entirely agrees. The COVID-19 pandemic is still ongoing; accounting for the actual impact of disruption will only be on post-pandemic. In the production process, identifying critical and priority processes enables the company to focus the limited resources in the event of a disruption. The resilience of a system is the ability to recover and retain critical system functionality [20].

**Table 8**
**Productivity in terms of Process Innovation**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Conducts value creation training for employees to better understand the importance of process innovation and to develop innovation skills | 3.45 | A | 3.5 |
| 2. Fosters Process Innovation and encourages creativity through Innovation Contest Program | 3.45 | A | 3.5 |
| 3. Recognizes and awards employee for their successful Process Innovation Projects | 3.55 | SA | 1 |
| 4. Controls the innovation process through Management of Change proposal review and determine its effectiveness before implemented. | 3.47 | A | 2 |
| 5. Adopts digitalization in process innovation. | 3.38 | A | 5 |
| **Composite Mean** | **3.46** | A | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 8 presents the respondent's assessment of Productivity in the IWMF in terms of Process Innovation, having a composite mean of 3.46, indicating the respondent's agreement.

IWMF has an annual Innovation Project program where the employee formed their project team to establish value-added innovation. All entries were recognized and award the winning project. The survey result shows recognition of the company's effort in developing innovative culture among the employee. Similarly, the result also signifies acknowledgment that "Management of Change" ensures the effectiveness of the project. The management encourages employees to develop valuable ideas in production and safety. The development of such awareness is through "value creation training." The annual innovation program intends to establish a culture of creativity that employees can apply in performing their daily activities. The company exerts this effort and budget in innovation

projects because they believe that experiences and challenges face by the employee shall be a great tool to generate ideas for improvement.

And in the last rank is "Adopts digitalization in process innovation". The IWMF process of "waste-to-resource" is complex technology in meeting productivity targets and regulatory compliance. It is a modern technology in producing green energy while managing the waste of Qatar. Although, it doesn't mean that digitalization for everything is necessary. Digitalization is not mandatory and unrealistic for every task [21]. Digitalization in the last rank in the survey attributes to the employee's exposure in their daily activities. Information Technology infrastructure positively impacts the company's productivity [22]. The company recently adopted digitalizing "invoice and work order" transactions; this value innovation project helps sustain the business operation during the disrupted times. However, performing digital invoices and work orders are not for every employee; this explains why not every employee entirely agrees with the digitalization projects of the facility.

**Table 9**
**Summary Table on Productivity**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Workforce Performance | 3.52 | SA | 1 |
| 2. Production Process | 3.48 | A | 2 |
| 3. Process Innovation | 3.46 | A | 3 |
| **Composite Mean** | **3.49** | A | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 9 presents the respondent's assessment of Productivity in the IWMF. The composite mean of 3.49 indicates that the respondents agreed on the above indicators.

The production process in IWMF is a continuous process of systematic technology working together to produce output. The IWMF employee works according to their duties and responsibilities in meeting their objectives guided by KPI's. The company ensures workforce competency through training and development equipped with the proper procedures accessible through the intranet from the "share-point." All production parameters, methods, and procedures are communicated and available to ensure the production process on its optimum state. The Facility's production process is "from-waste-to-resource," where the Facility receives tonnage of municipal solid waste from the municipalities of Qatar. The production process is calculated per tonnage of processed municipal waste, a multi-factor productivity measurement accounting for multiple inputs. The multi-factor productivity reflects the overall efficiency of the workforce and capital inputs used in the production process [23]. The IWMF continuously develops means of improving quality, reducing downtime, optimizing resource inputs, and ensuring workplace safety. The company believes that even a simple change in the production process could increase productivity and safety at work. The creation of process innovation was through an "innovation project" that encourages every employee to join the program. The program includes recognition and award as a token of appreciation to the team. The presented innovation project also demonstrates the tangible and intangible benefits of providing the investment return rate and the indirect value, such as gaining knowledge and developing a reputation.

Innovation has gained a new avenue from the disruptions brought by the pandemic, value innovations that shall support companies to weather future disruptive events by building operational resilience. Although, even before the COVID-19 pandemic, organizations already embark on technologies of industrial revolution 4.0. The digitalization age offers the Internet of Things, Cloud Computing, Big Data Analytics, and many more. The pandemic accelerated the acceptance of digital innovation in building resiliency [24]. Adopting the latest technology gains better productivity, Lakhwani et al., [22] supporting flexibility for building operational resilience. The digitalized transaction enables operation with lesser human intervention, thus reducing risk. Financial transaction through digitalization enables companies to sustain active dealings with external stakeholders such as invoice billing. The IWMF is in line with process digitalization even before the COVID-19 pandemic, a rewarding business strategy optimized during the pandemic. The paper-less transaction was found helpful during the pandemic where external parties transact digitally, and this somehow accelerated the acceptance of the technologies offered by industrial revolution 4.0. Technology adaption is the new standard of the production process that creates leverage in businesses [25].

On the contrary, productivity is also perceived negatively towards resiliency. Efficiency is the quality of productivity [26] and efficiency is against resiliency [27]. IWMF, like any other company, has its plan laid for the rest of the contract period, and optimizing resources towards better output means better profit for the company. However, the business strategy became

questionable during unpredictable conditions where workforce performance was affected by the COVID-19 pandemic control measures. The risk brought by the COVID-19 pandemic was new to the plant's risk management and productivity plan. The IWMF proactively acts by implementing the work-from-home arrangement. However, these measures are only applicable to clerical staff that the operation and maintenance team still needs to continue the regular job in a bubble set-up. The continuation of this work arrangement may result in compensation trouble because of the different perceptions of employees working on site considering the workload and risk exposure that could jeopardize productivity.

**Table 10**
**Operational Resilience**

| Indicators | WM | VI | R |
|---|---|---|---|
| 1. Clearly define the Management accountability during the events of crisis. | 3.48 | A | 11 |
| 2. Encourage adaptive and flexible culture to quickly shift in "business as usual" after surge of crisis or changing conditions. | 3.55 | SA | 3.5 |
| 3. Prepare succession plan to fill the roles whenever the key people are unavailable. | 3.44 | A | 13 |
| 4. Exercise collaboration, teamwork and support from concerned employees during the time of crisis. | 3.59 | SA | 1.5 |
| 5. Develop "Standing Instruction" that can readily be used during disruptive events to immediately act/respond to the situation. | 3.59 | SA | 1.5 |
| 6. Establish good relationships among external partners to ensure support during times of disruptive events. | 3.49 | A | 10 |
| 7. Prepare upfront recovery-centric framework for business continuity | 3.37 | A | 15 |
| 8. Perform crisis mock drill among employees to understand the impact of operational disruptions. | 3.50 | SA | 8 |
| 9. Define tolerances in production to determine the extent of flexibility, strength and weaknesses thru "stress test". | 3.40 | A | 14 |
| 10. Conduct regular updates and reports on the disruptive events to promptly adjust the plan of action based on the situation. | 3.51 | SA | 5.5 |
| 11. Conduct continuous monitoring and measurement of risk and identify the opportunities it brings during disruptive event. | 3.51 | SA | 5.5 |
| 12. Communicate with stakeholders to build trust during disruptions of operation. | 3.50 | SA | 8 |
| 13. Build adaptable and flexible structures and processes like strong internet connection, online communication platform to enable continuous operations during crisis. | 3.50 | SA | 8 |
| 14. Use common language that allows everyone to communicate in like manner in the interpretation of risk to deepen understanding of the interconnected risk in the organization. | 3.55 | SA | 3.5 |
| 15. Adapt Holistic Risk Management Approach in identifying risk to determine the interdependence of risk throughout the organization. | 3.47 | A | 12 |
| **Composite Mean** | **3.50** | **SA** | |

*Legend: 3.50 – 4.00 = Strongly Agree (SA); 2.50 – 3.49 = Agree(A); 1.50 – 2.49 = Disagree(D); 1.00 – 1.49 = Strongly Disagree (SD)*

Table 10 presents the respondent's assessment of the proposed activity that the IWMF could perform towards Operational Resilience. The composite mean of 3.50 indicates that the respondents strongly agreed on the above indicators; the employee accepted all the activity proposed in building operational resilience.

The employee's responses are associated with the facility's present state, where the usual works became too challenging to perform because of the measures implemented in managing the disruptions. The employee emphasizes the importance of unity in achieving tasks during a crisis and the importance of having firm instruction from the management with strict implementation. The employee also recognizes the importance of having an adaptive and flexible culture to thrive the disruptive events. And the importance of practical and easy-to-understand mode of communication in achieving deepen understanding of the situation. The results reveal that the top 4 ranked were associated with people—a vital intervention to ensure successful operational resilience. Systematic resilience reduces the probability of failure and the consequence of losses such as physical damages, injuries, deaths, and adverse economic and social effects [28]. However, "Prepare upfront recovery-centric framework for business continuity" is in the last rank. Although this indicator has agreement from the employee, the attribution of this indicator to be the last in ranking is the effectivity of such pre-defined actions. The IWMF has a strategy established with multiple revisions to ensure its effectiveness. However, the

continuously developing disruptions caused by the COVID-19 pandemic reveals its inadequacy. The employee recognizes these needs and gathers every experience on these ongoing disruptions. The upfront resilience system identifies and anticipates scenarios that possibly reduce uncertainty, an adaptive approach in coping with external shocks [28]. Organizations that can develop programs towards resilient operations shall leverage the effectiveness and efficiency of measures in cost optimization during the disruptions and potentially drive investment in critical business services [8].

**Table 11**
**Relationship between Risk Management and Productivity on Operational Resilience**

| Risk Management | rho-value | p-value | Interpretation |
|---|---|---|---|
| Plant Operation | 0.696** | 0.000 | Highly Significant |
| Company Reputation | 0.743** | 0.000 | Highly Significant |
| Regulatory Compliance | 0.740** | 0.000 | Highly Significant |
| **Productivity** | | | |
| Workforce Performance | 0.836** | 0.000 | Highly Significant |
| Production Process | 0.842** | 0.000 | Highly Significant |
| Process Innovation | 0.801** | 0.000 | Highly Significant |

*Legend: Significant at p-value < 0.05*

Table 11 displays the association between risk management & productivity on operational resilience. It was observed that the obtained rho-values indicate a strong direct correlation, and the computed p-values were all less than 0.01 alpha level. Thus, the null hypothesis is rejected and shows that there was a significant relationship exists. It means that the better the assessment of risk management and productivity, the better operational resilience. An enterprise needs to develop contingency in production to build resiliency. Enterprises with financial contingency plans sustain their business operations during the pandemic [10].

IWMF operation at the height of the pandemic was threatened to shut down because of the risk involved in continuing the operation. The productivity of the facility is greatly affected by the availability of the production process and workforce. The operation of the facility can be interrupted for several reasons: scheduled maintenance, ad-hoc maintenance, system failure, accident, and external catastrophe. And out of these several reasons, the pandemic causes adverse internal and external disruptions. The interpretation shared by the employee of IWMF signifies the relation of resilient culture in sustaining productivity where the production process is vulnerable due to depleted resources and health restrictions. The employee also experiences the contradicting effects of disruption in the facility where the demand for production output remains high while the workforce and resources gradually decline. As a result, the employee shares an understanding of the needs of systematic infrastructure adapting resiliency. The resilient enterprise considers how the disruptions brought by adverse events impact the entire industry [10].

Similarly, risk management is significantly related to building operational resilience because a lack of managing risk shall result in unpredictable outcomes. The IWMF maintains a high level of productivity and safety in its complex operation, considering the risk and hazards in operating the facility. Actions for risk mitigation are balanced continuously with the productivity in a normal operational condition. However, the disruptions brought by the pandemic disturbed this balance that mandatory favors the safety of the employee; this developing action in the business continuity management somehow alleviates the impact in operation, although its inadequacy is still noticeable. Thus, resiliency focus strategies are required to develop. Companies shall realize the benefits of risk management as it reveals the shortcomings and enables the company to prepare mitigating measures. Additionally, one of the attributes for employee's performance is the established core values of the company. The core values help guide the employees to working towards the same goals. It supports the culture that the company intends to create. However, the company needs to review these core values in developing resiliency because the challenges brought by the COVID-19 are beyond normal.

**Table 13**
**IWMF Operational Resilience Action Plan**

| Findings | Strategies | Objectives | Persons Involved | Expected Outcome |
|---|---|---|---|---|
| Key Result Area: Risk Management | | | | |
| A. Company Reputation<br>• Employees are obliged to undergo annual training on company reputation and need for constant communication with stakeholders. | • Develop a training plan that will include discussions on company reputation.<br>• Prepare stakeholders feedback mechanism<br>• Conduct regular meetings with employees and discuss status of stakeholders' feedback.<br>• Solicit from employees "wise ideas to maintain good company reputation.<br>• Enhance Risk Management Structure for employee's engagement | To increase employee values on company reputation and proper communication with stakeholders. | O&M Department Manager<br>Safety Manager<br>IT Manager<br>IWMF Employees | Enhanced company reputation and better communication among stakeholders. |
| B. Compliance<br>• Investigation report i issued in cases of no compliance and for r meeting KPI | • Create a committee that will monitor on the issuance of non-compliance and not meeting KPI.<br>• Evaluates workers competency in Risk Management | To ensure that all employees with non-compliance and not meeting KPI's are sanctioned.<br>. To engage employee in performing suitable risk management<br>To ensure that employee performs risk management not just by paper compliance | O&M Department Manager<br>Safety Manager | Equal implementation of policies among employees<br>Better risk compliance among employees |
| Key Result Area: Productivity | | | | |
| A. Production Process<br>Identifies essential and non-essential production process for prioritization during disruptive events. | • Develop Strategic Resilient Productivity Plan<br>• Determine the desired productivity outcome in building operational resilience<br>• Streamline the gathered data considering trade-offs and benefits in building operational resilience<br>• Perform workforce analysis and have a sense of workforce feedback<br>• Develop process diagram | To develop a strategic productivity which is adaptive in situational change with conformance to business objectives<br>To develop a repeatable and easy implementation productivity plan | O&M Department Manager<br>Safety Manager<br>IT Manager<br>General Manager | Productivity Management which is adaptable in condition change without endangering the productivity targets |
| B. Process Innovation<br>Adopt digital process innovation. | • Standardized the process and Digitalization for easy implementation<br>• Establish Research and Development Department that will spearhead the innovation process. | To adopt the use of advanced technological digital facility. | O&M Department Manager<br>Safety Manager<br>IT Manager<br>General Manager | State of the art digital facility in use. |

## CONCLUSION AND RECOMMENDATION

The results revealed the status of Risk Management Practices in IWMF on where the employee provides strong agreement in terms of Plant Operation Risk, Company Reputation, and Regulatory Compliance. It signifies recognition of its importance in the facility's production process, especially during the condition change like the ongoing COVID-19 pandemic. However, it is still essential to establish a genuine Risk Management suitable in changing conditions.

The productivity in IWMF is vital in keeping the contract-to-operate with the Qatar government's annual review. The employee agrees to IWMF productivity in terms of workforce performance, production process, and process innovation. The workforce of the facility has experienced challenges in sustaining productivity. Aside from the risk of contracting the virus, employees have additional stress worrying about their loved ones back in their home country. Nevertheless, the IWMF facility needs to sustain its importance in processing the Municipal Solid Waste of Qatar, avoiding heaps of uncollected waste and landfilling.

The Risk Management Practices and Productivity in IWMF has high significance towards Operational Resilience. The agreement from the employees recognizes the importance and contribution of establishing risk management and productivity towards resiliency. Additionally, the IWMF possess extensive importance in the community where it operates. Hence, developing an objective connection between company policy and performance characteristics in the event of disruptions shall add value towards resiliency.

The potential activities proposed in the survey gain strong agreement, having the least as agreed, and the employee's interpretation supported the creation of an operational resilience action plan. The practicability and value of the activities proposed attributed its acceptance among the employees of the facility. The matured environment and workforce contribute to understanding what is needed to survive and thrive in the COVID-19 pandemic. The complexity of business operations requires the capacity to respond, react and recover quickly & effectively from natural or man-made hazards. Additionally, resiliency may constitute a competitive advantage, and a means to sustain and pursue the organizations' mission. A plan of action of operational resilience is prepared that can be used by the company.

The Risk Management of the facility has high recognition among the employee. Nevertheless, the management should emphasize in empowerment and enforcement. On-the-job training exercise and cross department appointment shall enable every employee to experience Risk Management and truly understand its importance. Additionally, the Human Resource Management should draft pandemic policy and guidelines to support the already stressed workforce. Review the business objectives, goals, and target. Department Heads could develop a contingency matrix for adjusted objectives, goals, and target during disruptive events. A long-term planning considering the current disrupted productivity that shall enlighten recovery outlook to the management team. The employees of the facility have high optimism in terms of operational resilience, the management should establish a training and development program for the employees especially for the key personnel identified in the facility. The employees of the facility are diverse and with different customs and culture, Operational Resilience Plan is encouraged to be people centered and has practical implementation and benefit. The detailed and sub-plan shall be comprising of actions before the disruptions and during the disruptions and shall add value to the existing Business Continuity Management. The management team may develop an objective policy emphasizing the expected performance of the workforce in the event of disruptions. Additionally, investment analysis must be presented to understand the expected return of the program, the increased spending must be measured against consequences of not improving the resilience. Further study may be performed integrating quantifiable operational resilience in IWMF. The data driven actions shall streamline efforts and resources in the event of disruptions.

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