**Appendix 1**

**S1: Desk Review of Potential QA Practices of Cb-CLSC**

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| --- | --- | --- | --- |
| **No** | **Proposed QA practices** | **Brief description** | **Source**  |
| 1 | Formulating quality strategies and goals between companies in two different countries/borders | Effective strategy formulation between two countries/borders ensures the cross-border projects are executed per pre-stated requirements is vital. With this, consensus can arrive on such projects at the feasibility and planning stage before experts start task execution. Such strategies could include adopting collaboration and communication techniques, logistics handling, etc. | Tummala and Tang (1996); Nyakala (2017) |
| 2 | Participating in quality improvement activities | It is essential for construction organisations to empower employees to take part in quality improvement programmes. Such programmes include continuous development programmes in the field’s specialities by professional bodies that can help employees understand the QA process towards specific cross-border projects. This tailors experts’ understandings of achieving the quality of specific projects through the organisation’s quality management system. | Mane and Patil (2015); Mallawaarachchi and Senaratne (2015); Kiew et al. (2016) |
| 3 | Accepting quality responsibility | To achieve the pre-stated quality of a cross-border project, experts must know and accepts their specific responsibility. Though it is important in the QA process for experts to know what others are doing, they must also accept and execute their responsibility, ensuring service fits the broader quality requirements of the project. | Kraft and Molenaar (2013); Kraft and Molenaar (2014); Thorpe and Summer et al. (2017); Bhattacharjee (2018) |
| 4 | Proposing quality improvement initiatives between two companies | During cross-border construction project execution, participating organisations must initiate programs between the two countries/borders to ensure effective collaboration and communication among the experts. Effective collaboration among experts is crucial in achieving quality and must be emphasised throughout the QA process on cross-border construction projects. | Mohammad et al. (2009) |
| 5 | Understanding norms and standards of quality | To achieve the quality of a project, understanding the norms and standards regarding a specific project in a particular country is crucial. This is because projects need not only satisfy the users but also must satisfy the environment and community. As such, every country has regulations and standards on specific projects, and these must be understood and considered by experts during cross-border project execution. | Mane and Patil (2015); Pambreni et al. (2019) |
| 6 | Realising customer demand | As cross-border projects get executed, it is vital to have a major concentration on satisfying the customers’/clients’ requirements. This is significantly achieved by understanding what the customers want and collaborating with other experts to execute such requirements. | Byrne et al. (1995); Chung (2002); Femi (2015): Ali et al. (2021) |
| 7 | Keeping close contact with customers | Adhering closely to customers’ requirements and keeping close contact with them to inform them of possible updates is important in the QA process. This enables always staying on point with what the customer wants, avoiding side-stepping, and preventing errors. | Femi (2015); Ali et al. (2021) |
| 8 | Providing quality training for participants toward project execution | Training and orienting experts in an organisation during cross-border project execution is crucial as it helps experts ask questions about the project’s requirements to some extent. It may be an organisation’s internal training or probably external training. This could help the experts to learn new things that may aid them in the project execution towards the pre-stated requirements. | Kraft and Molenaar (2014); Faeq et al. (2021) |
| 9 | Maintaining quality standards | Consistency with quality standards is important in the QA of Cb-CLSC as there is the chance of avoiding side-stepping and preventing errors. The maintenance of quality standards may be geared toward regulatory requirements, clients’ needs, and the like throughout the project lifecycle (either for traditional construction or modular construction). | Mane and Patil (2015); Pambreni et al. (2019) |
| 10 | Written working processes, steps, project routines, and seamless implementations | Documentation is critical in the QA processes of Cb-CLSC, and this keeps the experts focused on knowing the status and progress of projects. This includes making available the extent of project requirements (i.e., clients and statutory requirements) covered and the ones yet to cover throughout the project lifecycle. | Fischer et al. (2020); Jang et al. (2022) |
| 11 | Obtaining information about the project | Collecting information on the quality of cross-border projects is important via the QA process of Cb-CLSC, which relies on effective collaboration and communication among clients, experts, and statutory authorities across borders. | Sheng et al. (2020); Atout (2020) |
| 12 | Strategic planning based on client requirements | Planning is crucial in the QA of Cb-CLSC, which must be strategically done by relying on the client’s requirements. It is important to note that client requirements are not the sole requirements to depend on throughout the QA process but also the statutory requirements and quality standards. | Byrne et al. (1995); Chung (2002) |
| 13 | Strategic planning based on corporate capability | As clients’ requirements are critical in the QA process, it is also important to consider the corporate capabilities of a firm. This relates to a firm’s resource availability in achieving the required quality of cross-border projects in terms of management, technology, etc. Also, achieving project quality at the end must not be detrimental to an organisation. | Ghobakhloo and Fathi (2019); Fischer et al. (2020) |
| 14 | Collaborating with other construction experts | Collaboration is crucial in the QA process, especially when it involves two countries/borders. To collect information on the quality of cross-border projects, experts’ collaboration must be at a different level with innovative management styles, usually empowered by digital technology. Also, collaboration among other experts, which may be statutory authorities, is vital as such collaboration may help meet regulatory requirements.  | Mane and Patil (2015); Bosch-Sijtsema et al. (2019) |
|  | **Keywords used for the literature search** | “quality assurance”, “managing quality”, construction”, “construction industry”, and “COVID-19 pandemic”. |

**Biography to S1**

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**S2: Literature source to Table 1 in manuscript**

|  |  |
| --- | --- |
| **Serial Number** | **References**  |
| 1 | Tummala and Tang (1996) |
| 2 | Mohammad et al. (2009) |
| 3 | Nyakala (2017) |
| 4 | Thorpe and Summer et al. (2017) |
| 5 | Bhattacharjee (2018) |
| 6 | Mane and Patil (2015) |
| 7 | Pambreni et al. (2019) |
| 8 | Byrne et al. (1995) |
| 9 | Chung (2002) |
| 10 | Femi (2015) |
| 11 | Ali et al. (2021) |
| 12 | Kiew et al. (2016) |
| 13 | Kraft and Molenaar (2013) |
| 14 | Kraft and Molenaar (2014) |
| 15 | Faeq et al. (2021) |
| 16 | Mallawaarachchi and Senaratne (2015) |
| 17 | Fischer et al. (2020) |
| 18 | Jang et al. (2022) |
| 19 | Bosch-Sijtsema et al. (2019) |
| 20 | Sheng et al. (2020) |
| 21 | Atout (2020) |
| 22 | Ghobakhloo and Fathi (2019); |

**S3: Informed Consent Form**

**Questionnaire/Interview**

Dear Sir/Madam,

**Quality Assurance of Cross-border Construction Logistics and Supply Chain in the Covid-19 Pandemic Era**

You are invited to participate in an ongoing study that forms part of a PhD research by Mr. Frank Ato Ghansah in the Department of Real Estate and Construction, the University of Hong Kong.

I hope to collect data based on your knowledge and experience regarding the implications of COVID-19 on the quality assurance of construction projects. The survey/interview will only take you about 15-20 minutes to complete. I would like to stress that all information collected will remain strictly confidential. Individual details will not be disclosed or identifiable from this survey.

If you have any questions about the research, please feel free to contact Mr. Frank Ato Ghansah (66554852)/(fghansah@connect.hku.hk). If you have questions about your rights as a research participant, please contact the Human Research Ethics Committee (HREC), HKU (2241-5267).

 HREC Reference Number: EA210435

I understand the procedures described above and agree to participate in this study (tick the box and proceed to Part II).

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|  |

**S4: The questionnaire adopted for the study**

**A. Demographic Data Section**

**Kindly respond to the questions by carefully ticking [√] the appropriate box OR typing in the appropriate space for each item based on your valuable knowledge and experience.**

1. Please state your country of origin?........................................................

2. Which sector do you belong?

a. Industry [ ] b. Academia [ ]

3. What is your designation?

 a. Academician [ ] b. Quality Auditor [ ] c. Quality Engineer [ ] d. Quality Assurance/Control Manager [ ] e. Authorised person from the government [ ] f. Client representative [ ] g. Other [ ] Please specify………………………………………………………….

4. How long have you been working in the organisation?

1. Less than 5 years [ ] b. 5-10 years [ ] c. 11-20 years [ ] d. 21-30 years [ ] e. More than 30 years

**B. Main Questions**

**Kindly respond by carefully ticking [√] the appropriate section of the tables based on your valuable knowledge and experience.**

**Examining The Impact of Covid-19 On Quality Assurance of Cross-Border Construction Logistics and Supply Chain**

1. What is your level of agreement on the following quality assurance practices of Cross-border Construction Logistics and Supply Chain? Please answer using the Five-point Likert Scales: **1= Strongly disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly agree.**
2. What has been the sentiment with the quality assurance practices during the COVID-19 pandemic?Please rate using **Negative, Neutral, or Positive.**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Quality Assurance Practices | Level of Agreement | Level of Sentiment |
| **1** | **2** | **3** | **4** | **5** | **Negative**  | **Neutral** | **Positive** |
| 1 | Clearly defining responsibilities based on the quality requirements. |  |  |  |  |  |  |  |  |
| 2 | Assigning clear responsibilities to qualified workers. |  |  |  |  |  |  |  |  |
| 3 | Understanding requirements, norms, and standards of quality. |  |  |  |  |  |  |  |  |
| 4 | Keeping close contact with clients to realise their demands. |  |  |  |  |  |  |  |  |
| 5 | Providing quality training for workers toward project execution. |  |  |  |  |  |  |  |  |
| 6 | Maintaining quality standards. |  |  |  |  |  |  |  |  |
| 7 | Recording and documenting work processes, steps, project routine, and seamless implementations. |  |  |  |  |  |  |  |  |
| 8 | Communicating and coordinating with other workers to obtaining information about the project. |  |  |  |  |  |  |  |  |
| 9 | Strategic planning based on client requirements and corporate capability. |  |  |  |  |  |  |  |  |
| 10 | Analysing results of work operations and quality records. |  |  |  |  |  |  |  |  |
|  | **Other, please state clearly and rank** |  |  |  |  |  |  |  |  |
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**S5: Interview Questions**

**A. Demographic Data Section**

1. What is your country of origin?

2. What is your designation?

3. How long have you been working in the firm?

**B. Main Question**

How has COVID-19 impacted the quality assurance process of your organisation, especially in the course of executing cross-border construction projects and assuring their quality?

Prompt 1: negative?

Prompt 2: Positive?

Thank you

**S6: Mean’s Confidence Level at 95% Confidence Level**

|  |  |
| --- | --- |
| **Code** | **95% Confidence level for mean** |
|
| **Lower bound** | **Upper bound** |
| QAP1 | 3.75 | 4.33 |
| QAP2 | 3.77 | 4.37 |
| QAP3 | 3.89 | 4.50 |
| QAP4 | 3.62 | 4.17 |
| QAP5 | 3.46 | 4.06 |
| QAP6 | 3.73 | 4.25 |
| QAP7 | 3.67 | 4.19 |
| QAP8 | 3.44 | 4.06 |
| QAP9 | 3.62 | 4.13 |
| QAP10 | 3.50 | 4.06 |

**S7: P-values, Sig. (2-tailed), for the Spearman’s Correlation Test**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Code** |  | **QAP1** | **QAP2** | **QAP3** | **QAP4** | **QAP5** | **QAP6** | **QAP7** | **QAP8** | **QAP9** | **QAP10** |
| QAP1 | *ρ* | 1.00 |   |   |   |   |   |   |   |   |   |
|   | Sig. (2-tailed) |   |   |   |   |   |   |   |   |   |   |
| QAP2 | *ρ* | 0.78\*\* | 1.00 |   |   |   |   |   |   |   |   |
|   | Sig. (2-tailed) | 0.00 |   |   |   |   |   |   |   |   |   |
| QAP3 | *ρ* | 0.53\*\* | 0.71\*\* | 1.00 |   |   |   |   |   |   |   |
|   | Sig. (2-tailed) | 0.00 | 0.00 |   |   |   |   |   |   |   |   |
| QAP4 | *ρ* | 0.46\*\* | 0.50\*\* | 0.57\*\* | 1.00 |   |   |   |   |   |   |
|   | Sig. (2-tailed) | 0.00 | 0.00 | 0.00 |   |   |   |   |   |   |   |
| QAP5 | *ρ* | -0.07 | 0.08 | 0.27 | 0.25 | 1.00 |   |   |   |   |   |
|   | Sig. (2-tailed) | 0.61 | 0.59 | 0.05 | 0.08 |   |   |   |   |   |   |
| QAP6 | *ρ* | 0.17 | 0.30\* | 0.49\*\* | 0.728\*\* | 0.423\*\* | 1.00 |   |   |   |   |
|   | Sig. (2-tailed) | 0.23 | 0.03 | 0.00 | 0.00 | 0.00 |   |   |   |   |   |
| QAP7 | *ρ* | 0.21 | 0.45\*\* | 0.62\*\* | 0.66\*\* | 0.53\*\* | 0.67\*\* | 1.00 |   |   |   |
|   | Sig. (2-tailed) | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |   |   |   |   |
| QAP8 | *ρ* | 0.195 | 0.22 | 0.44\*\* | 0.62\*\* | 0.51\*\* | 0.64\*\* | 0.647\*\* | 1.00 |   |   |
|   | Sig. (2-tailed) | 0.17 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |   |   |   |
| QAP9 | *ρ* | 0.32\* | 0.55\*\* | 0.64\*\* | 0.54\*\* | 0.34\* | 0.56\*\* | 0.52\*\* | 0.60\*\* | 1.00 |   |
|   | Sig. (2-tailed) | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |   |   |
| QAP10 | *ρ* | 0.07 | 0.20 | 0.41\*\* | 0.55\*\* | 0.47\*\* | 0.78\*\* | 0.72\*\* | 0.76\*\* | 0.60\*\* | 1.00 |
|   | Sig. (2-tailed) | 0.60 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |   |

For P-values [Sig. (2-tailed)], see Appendix S5; ρ = Coefficient value

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).