

Assessment and Develop the Saudi's Contractors Classification System

by

Saud Almutairi

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Graduate Supervisory Committee:

Dean Kashiwagi, Chair
Kenneth Sullivan
Jacob Kashiwagi

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ABSTRACT

Research has shown that construction projects in Saudi Arabia have had a perceived poor performance for the past three decades, from 1970-2016. The Saudi construction industry relies on a Contractor Classification System (CCS) to determine contractors' capabilities, and prevent underperformance. Through this study, a survey was conducted among persons involved in the Saudi Arabian construction industry to identify the perception of the performance of the Saudi Arabian construction industry, and the satisfaction with the CCS. The results of the survey showed that 71.59% of the participants agreed that the CCS does not accurately assess contractors' capabilities for projects they are allowed to work on. A critical review of the CCS is presented through a case study and comparisons are made from worldwide CCSs found in a literature review. All the parts of the Kingdom of Saudi Arabia's CCS, including the work flow and the evaluation criteria were reviewed. Several observations of the CCS include a lack of transparency in the process, no performance feedback, complexity of the system, the system being outdated in relation to the worldwide systems, and no continuous performance measurements. To develop an appropriate continuous performance measurement model and benchmarking, other worldwide performance measurement models and benchmarking models were reviewed and discussed. Through these findings, a modified version of the current CCS was developed. A test was performed on the financial assessment portion of the developed model using 5,751 contractors who were classified at the time of this study. The results showed that only 14% of the 5,751 contractors are financially capable in their respective CCS grades. The proposed new CCS model which is outlined in this study includes two major modifications. The first

modification is on existing components, which will improve the transparency, simplicity, and speed of the CCS process. The second modification is the addition of a new component, which will continually track contractor performance over time and motivate contractors to improve their performance.

DEDICATION

I want to dedicate this to my father and mother for the love and life experiences they gave me. I also want to dedicate this to all those who have taught me over the course of my education, including my professors and friends.

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CHAPTER 1: INTRODUCTION

The economy of Saudi Arabia is based on petroleum, with 90% of their export earnings coming from the oil industry. According to Global Alliance of SMEs (GASME, 2016), Saudi Arabia is the largest producer and exporter of oil globally. However, Saudi Arabia is currently seeking to increase non-oil revenue sources because of the low oil prices and uncertainty in the future of oil markets. One of these important non-oil revenue sources is the construction industry, which represents 6-10% of the Saudi Arabia's GDP (Wibowo, 2009). According to the Jeddah Chamber of Commerce and Industry (2016):

The growth in Saudi Arabia's construction industry is expected to continue in 2016 and beyond, with planned projects valued at ~USD 999 billion. The construction sector is currently valued at USD 600 billion until 2020, with the infrastructure projects alone amounting to USD 350 billion. It is expected to grow by 7.8% by 2019. (p. 10)

The construction sector of Saudi Arabia plays a significant role in developing and supporting infrastructure and other sectors that are productive in Saudi Arabia. The government sector has the largest demand for the services of the construction industry, due to requirements for public construction projects of different sizes. The government agencies also have organizational responsibilities to provide a suitable environment for the construction industry so the industry can work efficiently.

In 2016, the Kingdom of Saudi Arabia launched Saudi Vision 2030, the new economic direction for Saudi Arabia, which seeks to raise the performance and efficiency, as well as reduce financial waste, combat corruption, and increase

transparency in all sectors (Saudi Vision 2030, 2016). Official speakers and several studies done on the Saudi construction industry (SCI) indicated that, over the past three decades, the industry has been facing significant challenges and overall performance weakness.

The Kingdom of Saudi Arabia does not have a centralized system for tracking and collecting data on the actual performance of SCI projects. Because of this, there is little quantitative and precise data on project performance (Al-Otaibi & Price, 2009), and there is only a reported perception of poor performance of SCI projects. A review of literature on the perception of SCI performance of projects reveals the following metrics:

- Al-Abedien (1983) discovered that among 70% of the projects undertaken by the Ministry of Housing and Public Works, the delays were the norm.
- Al-Sultan (1989) also reported a similar percentage six years later. He reported that 70% of the public projects in Saudi Arabia had issues of time overruns.
- The estimated time overrun versus the total original time specified for a project amounted to about 39% as reported by Al-Ghafly (1995).
- It was also discovered by Assaf and Al-Hejji (2006) that in the Eastern province, 70% of the projects experienced an overrun of time, and the average time overrun was between 10-30%.
- Falqi (2004) documented that delay cases were reported in 952 out of 2,379 completed construction projects in the Kingdom of Saudi Arabia, which represented about 40%.

In a case study done by Alzara, M. Kashiwagi, J. Kashiwagi, and Al-Tassan (2016) with the main goal being identification of the major causes of delays in projects

on university campuses, the researchers discovered that the universities were experiencing delays of about 50%-150%.

According to Al Turkey (2011), more than 300 project managers from various disciplines and sectors in the construction industry agreed that 80% of the projects were subject to overrun costs, and about 97% of them faced issues of time.

Alsuliman, Bowles, Chen, and Smith (2012) also pointed out in their study that the construction industry in Saudi Arabia suffered from poor performance.

In addition to these metrics, a number of studies have found issues with contractor performance to be a key component in the perceived poor performance of the SCI. The findings can be summarized as follows:

- Contractor's lack of expertise (Al-Kharashi & Skitmore, 2009; Alzara, Kashiwagi, Kashiwagi, and Al-Tassan, 2016; Assaf & Al-Hejji, 2006; Elawi, Algahtany, & Kashiwagi, 2016).
- Poor qualification, skills, and experience of the contractor's technical staff (Albogamy, Scott, Dawood, & Bekr, 2013; Al-Emad & Nagapan, 2015; Al-Kharashi & Skitmore, 2009; Alzara, et al., 2016).
- Poor planning, scheduling, and project management of the project by the contractor (Al-Kharashi & Skitmore, 2009; Assaf & Al-Hejji, 2006; Ikediashi, Ogunlana, & Alotaibi, 2014; Mahamid, 2013).
- Poor communication (Ikediashi et al., 2014).
- Cash flow problems faced by the contractor (Albogamy et al., 2013; Assaf & Al-Hejji, 2006; Ikediashi et al., 2014).

These studies show that a frequent cause of poor project performance is a lack of contractor capability to adequately perform the responsibilities required of their role. If this is true, then the method of assessing contractor capabilities may be inaccurate.

The Kingdom of Saudi Arabia relies on the CCS and the low bid delivery method as the basis for a contractor's prequalification in the majority of the public agencies' work to ensure contractor performance and capabilities (Bubshait and Al-Gobali, 1996). According to the Ministry of Municipal and Rural Affairs (2013), the CCS was originally established in 1973 and has been overseen by different agencies since its creation. The Ministry of Municipal and Rural Affairs (MOMRA), an administration in the Kingdom of Saudi Arabia's government, currently oversees the CCS.

A survey was conducted by Alsugair and AbuThnain (2011) using questionnaires to evaluate the CCS. The study findings indicated that the CCS does not properly reflect the capabilities of the contractors. However, Alsugair and AbuThnain did not find out the reasons underlying the issue. Similarly, in a study conducted by Mahamid (2014) to identify the common indirect and direct (macro and micro level) causes of disputes in Saudi Arabia's residential building projects, Mahamid referred to the CCS as one of the highly relevant causes of problems between parties involved in construction projects.

Because of the Saudi Vision 2030 and the low performance experienced in the construction industry, MOMRA launched a strategic plan to improve the CCS and contribute to the improvement of the performance of Saudi Arabia's construction industry (MOMRA, 2016a).

PROBLEM

There are perceived problems with the performance of the Saudi Construction Industry (SCI) and the CCS. The literature indicates that there are limited publications related to Saudi construction project performance. In addition, the Kingdom of Saudi Arabia lacks records of construction industry performance. The Kingdom of Saudi Arabia uses the CCS to ensure contractors are sufficiently qualified for the projects they receive. Due to this and Saudi Vision 2030, MOMRA has determined a need to modify the CCS to fit the Saudi Vision 2030 (MOMRA, 2016a). Therefore, the problem is a perception of low performance in the SCI, and if the perception is accurate, the CCS is not functioning in accordance with its purpose.

Though, the primary focus of this study is on the CCS, because the factors influencing poor performance are numerous and interconnected, reviewing the CCS in isolation would likely result in an incorrect analysis. Therefore, some of these other factors are briefly discussed in this study in order to better analyze the CCS in relation to overall SCI poor performance.

MAIN RESEARCH QUESTION

How can the Kingdom of Saudi Arabia's CCS be modified to contribute to the improvement of contractors' performance?

SUB QUESTIONS

- What is the performance of the Saudi Arabia's CI?
- What is the performance of the CCS?
- What is the accuracy of the CCS's evaluation of contractor's capability and performance?

- What improvements can be made to the CCS?

OBJECTIVES OF THE STUDY

- Confirm if the perception of the performance level of the SCI is valid.
- Identify the current perspective of the accuracy of and satisfaction with the Kingdom of Saudi Arabia's CCS in assessing contractors' capabilities and identifying their performance.
- Research and assess the Kingdom of Saudi Arabia's CCS and compare it with other existing CCSs worldwide.
- If potential improvements are discovered through the study, propose a new CCS model in order assist MOMRA in improving the performance level in the SCI.

CHAPTER 2: METHODOLOGY

The purpose of the Kingdom of Saudi Arabia's CCS is to ensure the contactors' capabilities and performance, and MOMRA desires to improve the CCS and the performance level of the SCI (MOMRA, 2016a). This study was designed to assess and improve the existing CCS. The methodology of this study contains four main parts: (a) survey, (b) case study, (c) literature search, and (d) design of a new CCS model.

The first part is a survey designed to identify the current perceptions of the performance levels of the SCI and the CCS. The survey is also used to determine if the previously reported perceptions of SCI performance still exist.

Because there is a lack of quantitative and precise data on project performance, the study objective of identifying the actual SCI performance could not be achieved. Since this was not possible, the study could not identify where the CCS may need improvement. Because of this, and MOMRA's expressed desire to improve the CCS, the second part of the methodology is a case study on the existing CCS which reviews how the system works and identifies how the system assesses contractor capability and performance. This led to observations and analyses of potential issues in the CCS process.

To further identify potential issues or improvements that could be implemented in the current CCS, the third part of the methodology is a literature search on other CCSs. The systems found in the search are then compared with the Kingdom of Saudi Arabia's CCS. Additionally, a review is performed on performance measurement models used worldwide to determine the best ways to measure performance.

The last part of the methodology is the proposal of modifications that can be made to the existing CCS in order to assist MOMRA in improving the SCI's level of performance.

These modifications include the implementation of some best CCSs' practices worldwide, and the integration of PIPS/PIRMS which can then be used to better track root causes of inaccurate contractor assessments.

SURVEY

The survey was conducted with a sample involving 510 randomly selected participants who worked in the SCI at the time of this study. The survey was designed to assess the perception of the SCI performance, and the perception of the accuracy of the CCS in determining a contractor's capabilities. In addition, the survey assessed the participants' satisfactions with the current CCS. The design of the survey and the survey results are outlined in detail in Chapter 3.

CASE STUDY

In the case study, the process and all of the components of the CCS were described and areas with potential issues were analyzed. The case study of the CCS was conducted through review of internal reports and interviews with the key people in MOMRA who are responsible for managing and improving the CCS. The case study method and the resulting observations are outlined in detail in Chapter 4.

LITERATURE SEARCH

The results from the literature search for information on other CCSs and performance measurement models used worldwide included reviewed academic papers and industry application reports. After the search was completed, the data from the literature on other CCSs were analyzed and compared with the Kingdom of Saudi

Arabia's CCS. Then, the results from the search on performance measurement models were analyzed to determine if an appropriate model could be found to be adapted to the CCS. The literature search results and comparison are outlined in detail in Chapter 5.

DESIGN A NEW MODEL

Finally, a new model for the CCS is proposed based on the current CCS, worldwide best practices and MOMRA goals (MOMRA, 2016a) with two main parts. First, the current CCS model is modified with the goal of simplifying and increasing transparency of the classification process. The method of total criteria evaluation was also modified with the goal of more accurately assessing contractor capabilities. A portion of the modified criteria and process for evaluating the criteria was then used in a test on a sample of currently classified contractors. The proposed modifications and test results are outlined in more detail in Chapter 6. Second, a new component is proposed for integration into the CCS process to track the actual and ongoing performance of contractors and to distinguish their performance from the performance of other parties, also known as benchmarking. The proposed new component is outlined in more detail in Chapter 7.

CHAPTER 3: SURVEY ON THE SCI AND PERFORMANCE PERCEPTION

The survey (see Appendix A) was carefully designed to obtain the participants' perceptions of the SCI level of performance and to identify perceptions and satisfaction with the current CCS. The participants in the survey sample work in the construction industry in both private and governmental sectors. The questionnaire was divided into three main parts:

Part 1: Questions related to the performance of projects in which the participants have been involved. All the participants were asked to answer questions pertaining to their experience about the average percentages of (a) project delays, (b) the delay amount, (c) projects over budget, and (d) the over-budget amount.

Part 2: Questions related to the participants' perceptions of SCI. All the participants were asked to give their opinions, based on their experience, in terms of (a) delay, (b) cost overrun, (c) client satisfaction, (d) quality, and (e) safety. The participants answered the questions using five Likert-type scales (strongly agree; agree; don't know; disagree; strongly disagree).

Part 3: Questions related to the participants' perceptions and satisfaction with CCS. All the participants were asked to give their opinions and satisfaction, based on their experience, in terms of the level of (a) performance of classified contractors, (b) CCS assessment accuracy, and (c) CCS transparency. The participants answered the questions using five Likert-type scales (strongly agree; agree; don't know; disagree; strongly disagree)

The survey was sent out to the participants who were licensed by the Kingdom of Saudi Arabia's engineering professional group, either through the organization or sent

directly to individuals who had contact with the author. Out of 508 individuals whom the survey was sent to, 177 complete responses were received. The total number of participants who sent back complete responses included those who worked only in private sectors (80), those who worked only in governmental sectors (73), and those who worked in both private and governmental sectors (24). Out of the 177 participants, there were 46 contractors, 45 consultants, and 86 owners. All the participants had experience, ranging between one year and more than 15 years on different construction projects, such as residential, commercial buildings, administration buildings, roads, and government buildings.

SURVEY FINDINGS AND RESULTS

All participants gave their perception of the percentage of projects delayed and the average delay in the projects in which they were involved. The results indicated that nearly half of all projects experienced delay, and the average delay was over 40% as shown in Figure 1.

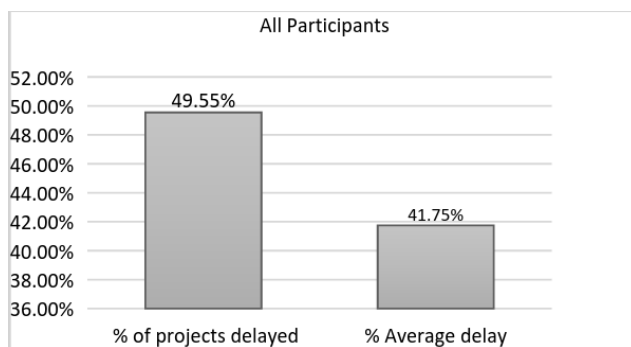


Figure 1. Project Delays

The perceptions of contractors, owners, and consultants on project delay are almost same. However, the perceptions of owners suggest a greater average delay than the perceptions

of the other groups. The percentage of total delayed projects from the viewpoint of the owners is 50.93% with a perceived average delay of 43.25%. Participants were also asked if they agree that the Saudi construction projects experience delay, and the responses were positive as shown in Table 1.

Table 1

Perception of SCI Project Delays

	Agree	Don't Know	Disagree
Contractor	95.65%	4.35%	0.00%
Owner	87.21%	9.30%	3.49%
Consultant	93.34%	6.67%	0.00%
All	90.96%	7.34%	1.69%

About 90.96% of the participants agreed that Saudi construction projects experience delay, and only 1.69% disagreed. In terms of projects' cost overruns, the perception of all participants, based on the projects in which they were involved, showed that more than 30% of the projects experienced cost overrun, and the average cost overrun is more than 20%, as shown in Figure 2.

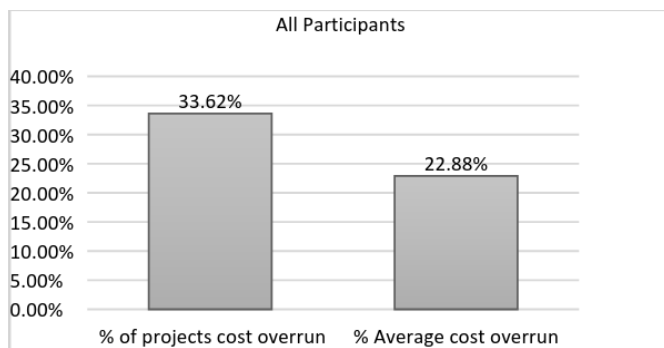


Figure 2. Project Cost Overruns

The participants were asked if they agreed that the Saudi construction projects experience cost overruns, and the responses were positive, as shown in Table 2. However, the contractors agreed less often, by around 10%, than the owners and consultants.

Table 2

Perception of SCI Project Cost Overruns

	Agree	Don't Know	Disagree
Contractor	73.04%	13.04%	13.04%
Owner	82.55%	15.12%	2.33%
Consultant	86.66%	6.67%	6.67%
All	81.36%	12.43%	6.21%

In terms of client satisfaction, the results showed that 72.15% agreed that the end result of construction projects in Saudi Arabia experience low client satisfaction, and only 4.55% disagreed. However, the contractors agreed 20% less than did the owners, as shown in Table 3.

Table 3

Perception of SCI on Client Satisfaction of Project Results

	Agree	Don't Know	Disagree
Contractor	58.69%	32.61%	8.70%
Owner	81.40%	12.79%	5.81%
Consultant	65.91%	34.09%	0

All	72.15%	23.30%	4.55%
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In terms of safety, quality, and performance of classified contractors, the responses can be summarized as follows:

- 79.66% of the participants agree that SCI experiences safety issues, and 14.69% said they did not know.
- 77.96% of the participants agreed that SCI experiences quality issues. More consultants (86.67%) agreed than did owners (77.91%) and contractors (69.57%)
- 50.85% of the participants were not satisfied with the performance of classified contractors. More owners (53.49%) and consultants (53.33%) were not satisfied than were contractors (43.47%)

The second part of the survey was to identify the perception in the SCI of the Kingdom of Saudi Arabia's CCS. According to the survey results, only 13.64% of the participants were satisfied with the existing CCS, as shown in Figure 3.

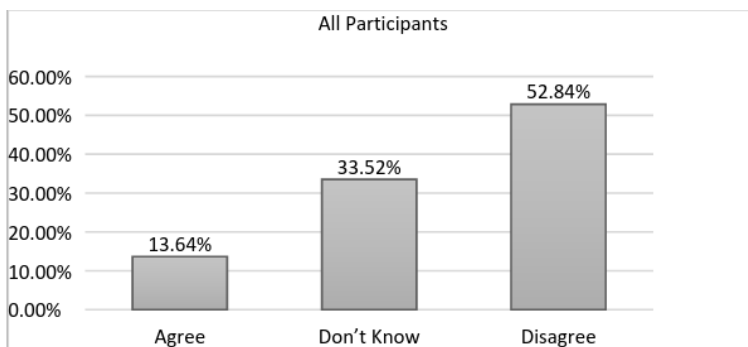


Figure 3: Perception in the SCI of the CCS

The results also showed the following:

- 71.59% of the participants agreed that the CCS does not accurately classify contractors for the size of projects they are allowed to compete for as determined by their classification grade.
- Only 16.57% disagreed that the CCS criteria and method of classifying contractors is complex and difficult to understand.
- 61.58% of the participants agreed that the CCS is not transparent, and 6.21% disagreed.

SURVEY FINDINGS SUMMARY AND CONCLUSION

The major findings of the survey on the perception about the level of performance of the SCI and the level of satisfaction with the CCS are shown in the following:

- More than 90% agreed that construction projects in Saudi Arabia experienced delay, and that more than 50% of the total projects are delayed by more than 40% of the original time scheduled for the projects.
- More than 70% agreed that the construction projects in Saudi Arabia experienced cost overruns, and that more than 30% of the total projects were cost overrun by more than 20% of the original cost of the projects.
- More than 70% agreed that the Saudi construction projects experience low client satisfaction, safety issues, and quality issues.
- The contractors' classification system was perceived to be of low performance in terms of the outputs of the systems, criteria, and transparency.
- The results from this survey verify that the perception of poor performance in the SCI is consistent with other previous reports. The results also imply that the CCS may be

at fault for inaccurately assessing contractor capabilities, as the satisfaction with the CCS is generally low.

CHAPTER 4: CASE STUDY ON SAUDI'S CCS

After the survey was completed, and the perception of poor performance within the SCI and low satisfaction with the CCS was identified and validated, a case study was conducted to analyze the existing CCS for potential problem areas. This chapter outlines the case study method and findings.

CASE STUDY METHOD

The case study used internal reports and interviews. The strategic plan team in MOMRA and other key personnel were interviewed in several meetings, starting in October 2015. In total, 10 officials from MOMRA were selected for interview based on their positions in working with the CCS (general, legal, technical, services directors, and consultants who work with the agency) and their experience with the existing CCS (average of 15 years). The CCS details described in this chapter are based on those internal reports and interviews. The internal reports used are as follows:

1. *Final Report, Volume 1 Current Situation* (MOMRA, 2009).
2. *First Stage Report* (MOMRA, 2014).
3. *Field & Office visits* (MOMRA, 2015).
4. *Technical and Administrative Classification Processes* (MOMRA, 2016b).

After describing the existing CCS model, areas with potential issues were analyzed. The results of this analysis are described in the Case Study Analysis portion of this chapter.

SYSTEM DESCRIPTION

It is important to note that there was no central source from which to obtain all the information required to describe the current classification system. As a result, the

information was retrieved from multiple sources which were compiled to produce the most accurate picture of the system within the described limitations.

Because of the large number of details in the existing CCS, the study describes the system in full detail in a separate appendix (see Appendix B).

CASE STUDY ANALYSIS AND OBSERVATIONS

The Saudi classification system operates within 5 grades and 29 fields. Within this system, a contractor can become classified within one or more of the 29 fields. Within each field, the contractor will be given a grade level between 1 and 5. The grade level they receive will determine the maximum project size (in terms of financial value) the contractor can compete for, within his field of classification. The classification grade the contractor receives is then valid for 4 years; however, there is an option to upgrade a grade level after two years (MOMRA, 2014). Figure 4 shows the current fields and financial limits.

#	Field	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	No Grade:Upper Limit
1	Buildings	>280	280	70	21	7	4.2
2	Roads	>420	420	140	42	14	4.2
3	Water and sanitation work	>420	420	140	42	14	4.2
4	Electrical works	>280	280	70	21	7	4.2
5	Electronic works	>280	280	70	21	7	4.2
6	Communication technology	>280	280	70	21	7	4.2
7	Mechanical works	>280	280	70	21	7	4.2
8	Industrial works	>420	420	140	42	14	4.2
9	Marine works	>420	420	140	42	14	4.2
10	Dams	>140	140	70	21	7	4.2
11	Landscaping and Parks	>140	140	42	21	7	4.2
12	Slaughterhouses	>140	140	42	21	7	4.2
13	Well drilling	>14	14	4.2	1.4	0.42	0.14
14	Buildings Maintenance	>140	140	42	14	4.2	1.4
15	Roads Maintenance	>140	140	42	14	4.2	1.4
16	Maintenance and operation of water and sanitation work	>140	140	42	14	4.2	1.4
17	Maintenance and operation of electrical work	>140	140	42	14	4.2	1.4
18	Maintenance and operation of electronic works	>140	140	42	14	4.2	1.4
19	Maintenance and operation of communication technology	>140	140	42	14	4.2	1.4
20	Maintenance and operation of mechanical works	>140	140	42	14	4.2	1.4
21	Maintenance and operation of industrial works	>140	140	42	14	4.2	1.4
22	Maintenance and operation of marine works	>140	140	42	14	4.2	1.4
23	Maintenance and operation of slaughterhouses	>140	140	42	14	4.2	1.4
24	City cleaning and waste disposal	>140	140	42	14	4.2	1.4
25	Landscaping and parks maintenance	>140	140	42	14	4.2	1.4
26	Maintenance and operation of dams	>140	140	42	14	4.2	1.4
27	Maintenance of medical centers	>140	140	42	14	4.2	1.4
28	Servicing and securing nutrition and medical centers	>140	140	42	14	4.2	1.4
29	Catering to serve and to individuals	>140	140	42	14	4.2	1.4

Figure 4: Current CCS Fields and Financial Limits. Note: Retrieved from Final report, Volume 1 Current Situation. MOMRA, 2009. Internal report unpublished.

To determine the grade level a contractor is qualified to receive, the CCS uses financial and technical criteria which differ slightly depending on the field and grade level. The system is based on a total of 100 points, of which a minimum of 45 points must be awarded. *Financial* criteria are generally given a distribution of 30 points, of which a minimum of 7.5 points must be awarded (MOMRA, 2009). *Technical* criteria, including *Personnel, Equipment, Projects, and Reports* are generally given a distribution of 70 points, of which a minimum of 7.5 must be awarded in projects. The summarized distribution of points is shown in Table 4 below. It is important to note that under this point-based evaluation process, a contractor is not obligated to receive points in each criterion individually, but can still be classified as long as the total points reach a

minimum of 45 points. For example, if a contractor only achieves 7.5 points out of the 30 maximum points possible in *Financial* criteria, they can still receive classification if they receive a large enough sum of points from the *Technical* criteria.

Table 4

CCS Criteria with Point Weights

Financial Criteria (30-32 Points)	Technical Criteria (68-70 Points)
• <u>Balance Sheet</u> (9 points)	• <u>Personnel</u> (15 points)
– Total Asset	– Principals
– Working Capital	– Engineers
– Net Worth	– Technicians
• <u>Profit & Loss</u> (13 points)	• <u>Equipment</u> (Construction Works only) (8 points)
– Total Revenue	• <u>Projects</u> (30 points)
– Contracting Revenue	– Project Value
– Net Income	– Monthly Load
– Net Cash Income	– Yearly Load
• <u>Financial Ratios</u> (8 points)	– High Value Projects
– Leverage	– Continuity
– Profitability	• <u>Reports</u> (20 points)
– Efficiency	– Site Visits
	– Head Office Visit
	– Client Surveys

* *Average points*

The overall process flow from a non-classified to a classified contractor includes applying for a specific field of classification through the CCS. MOMRA determines the grade level of the contractor based upon CCS criteria, and the contractor receives a

classification grade (which is valid for four years). Within those four years, the contractor can compete for projects which are below the contractor’s grade level limit, and, after 4 years, the contractor must reapply for classification (MOMRA, 2016b). This process is shown in Figure 5.

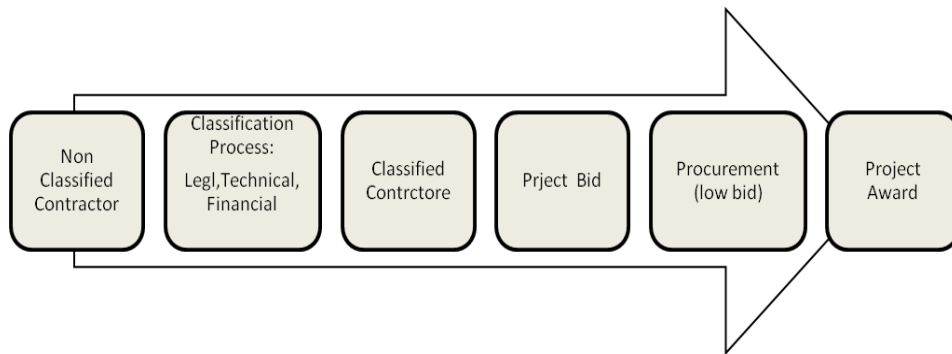


Figure 5: Current CCS Process

The overall structure and flow of the Kingdom of Saudi Arabia’s CCS is disconnected from the contractor performance. A contractor only interacts with the CCS to renew his classification after 4 years or to upgrade his classification in 2 years (MOMRA, 2014). Between these time periods, the CCS does not monitor the contractor’s performance.

The only measurement of a contractor’s performance (time, cost, satisfaction) is done upon the CCS’s evaluation of the contractor through the criteria *Projects* and *Reports*. The *Projects* criterion does not consider the performance of projects but rates the size and duration of the projects. In addition to this, the *Projects* criterion does not require high scoring as contractors are only required to get a minimum of 7.5 out of 30 points in this criterion. The *Reports* criterion has two sub-criteria, *Site Visit* and *Client Surveys*, which do not relate to the project time or cost. Also, both the *Site Visit* and *Client Surveys* criteria are based on one project that is selected by the contractor

(MOMRA, 2009), and therefore, subject to the contractor potentially using one favorable project that does not accurately represent his or her capabilities.

The current CCS uses the classification system that uses a point-based mathematical model to determine the deserved grade for the contractor. All the *Financial* and *Technical* criteria have different mathematical formulas to calculate their points, which are then added up to a total point amount which is used as the definitive assessment value when determining the contractor's grade (MOMRA, 2009). The model was developed about 26 years ago. The model philosophy for each field and each criterion has a number of points allocated that add up to 100 points. To determine the number of points a contractor is awarded for each criterion, the minimum, maximum, and mean values for the targeted grade are listed in grade tables that were created from an arithmetic mean of historical data.

Based upon historical data that was gathered over 28 years ago, each criterion has a minimum, mean and maximum limit. A contractor is awarded (a) full points if he reaches or goes above the maximum limit, (b) no points if he reaches below the minimum, and (c) half points if he reaches the mean. If a contractor falls between the minimum and mean or mean and max, he will receive partial points based upon a linear interpolation of the minimum, mean, and maximum (MOMRA, 2009).

The CCS point-based evaluation model is not transparent and does not give a clear understanding of what criteria makes a contractor capable within each grade level. Additionally, due to the point system, contractors can become classified without meeting the requirements in all the criteria of classification. Only 45 points out of 100 are required to become classified in a specific grade. The minimum, mean, and maximum

values are not distributed to the contractors. Even within MOMRA, the minimum, mean, and maximum values are not readily accessible (MOMRA, personal interview, 2015).

SUMMARY OF FINDINGS AND CONCLUSION

The case study analysis outlined three main observations. First, the CCS does not have a continuous and accurate method of measuring the actual performance of contractors. Second, the CCS does not have a means to motivate contractors to improve their performance. Third, due to the current CCS process complexity and lack of transparency, MOMRA does not know if the existing CCS is accurate in assessing contractor capability and performance. Because of this, it is difficult to predict and understand what is required to become classified within a grade level and field.

CHAPTER 5: LITERATURE RESEARCH ON WORLDWIDE CCSS

A literature search was conducted on CCSs and performance measurement models in other countries. The results of the search include reviewed academic papers, industry application reports and documents, and private/government reports and documents.

The first step taken in the review of the literature was to read published material in the English language, which included conference papers, academic journals, and theses/dissertations. The process used to find data and research papers to be consulted for this study included the following:

- In ensuring that maximum possible relevant and published materials about CCSs were included, the overall parameter was kept as broad as possible. During the search, relevant search terms or search codes, such as "contractors' classification" and "construction industry" were used.
- Five academic databases were accessed and used in sourcing the materials, and they included Google Scholar, EI Compendex, ASCE Library, Emerald Journals and ABI/Inform.

The same initial five parameters used in sourcing relevant articles were employed across all the database searches and search engines. The results metrics from the search terms/codes uses in the databases and search engines are shown in Table 5. The materials were identified by reading their abstracts, keywords, and titles and by scanning the manuscripts of the found publications as a way of filtering out papers that were not relevant. The author reviewed the first 200 publications from each database and search

engine. However, reviewing the results from the searches indicated limited academic publications related to CCSs that were relevant to this study.

Table 5

Papers Related to CCSs

KEY WORD	ABI	Google scholar	Emerald	ASCE	EI
"Subcontractor" OR "Supplier" OR "Built Environment" OR "Vendor" AND "Classification" AND "Construction"	1658555	330000	38659	6851	173
Hits	5	25	1	3	0
Key Papers	0	1	0	0	0
"Subcontractor" OR "Supplier" OR "Built Environment" OR "Vendor" AND "Rating" AND "Construction"	1662603	104000	38540	6834	180
Hits	3	17	0	1	0
Key Papers	0	0	0	0	0
"Subcontractor" OR "Supplier" OR "Built Environment" OR "Vendor" AND "Ranking" AND "Construction"	1657552	117000	38529	6793	80
Hits	6	23	1	2	2
Key Papers	0	0	0	0	0
"Subcontractor" OR "Supplier" OR "Built Environment" OR "Vendor" AND "Registration" AND "Construction"	1661835	101000	38554	6763	47
Hits	8	35	5	4	7
Key Papers	0	0	0	0	0
"contractors' classification " and "construction industry"	26194	155000	8503	3673	34
Hits	7	13	5	5	3
Key Papers	0	2	0	0	1

For more collection of data and research, the second step of the literature search investigated the websites of the top 80 developed countries worldwide according to the

U.S News report *Overall Best Countries* (2017). This ranking system was used in order to find out if these top countries use a CCS.

Out of the countries reviewed, only 14 use a CCS and they include Saudi Arabia and the 8 countries from which the author has been able to gain access to their CCS information, as shown in Table 6. The countries that are not using CCS use other regulations, such as pre-qualification, licenses, and third-party insurance.

Table 6

Country Rankings and Information Access

Country	U.S news ranking	Access to information
Australia	8	√
Singapore	15	√
UAE	22	√
Greece	29	
<i>Saudi Arabia</i>	32	√
Qatar	34	√
Malaysia	35	√
Egypt	45	√
Sri Lanka	49	
Tanzania	58	
Kenya	60	
Oman	66	
Jordan	67	√
Ghana	68	√

CCS LITERATURE ANALYSIS

Through the results of first literature search, four relevant academic publications were identified. Three of these publications were related to the Kingdom of Saudi Arabia's CCS (Bubshait & Al-Gobali, 1996; Alsugair & AbuThnain, 2011; Mahamid, 2014), and one was related to the CCS used in Ghana (Yeboah, 2008). A survey was

conducted by Alsugair and AbuThnain (2011) using questionnaires to evaluate the CCS. The study findings indicated that the CCS does not properly reflect the capabilities of the contractors. However, Alsugair and AbuThnain did not find out the reasons underlying the issue. In a study conducted by Mahamid (2014) to identify the common indirect and direct (macro and micro level) causes of disputes in Saudi Arabia's residential building projects, Mahamid referred to the CCS as one of the highly relevant causes of problems between parties involved in construction projects.

The study that involved the CCS used in Ghana (Yeboah, 2008) concluded that there are a number of issues with the Ghanaian CCS, especially with the criteria used and the process of evaluating the criteria. Some important things to note in Yeboah's conclusion that are somewhat related to the Kingdom of Saudi Arabia's CCS, as explained in the previous chapter, are the subjectivity in evaluation, which leads to contractors being rejected or classified based on the subjective opinions of the classification committee, and the lack of project performance records for use in contractor classification.

From the second part of the search for literature, the literature on the 8 countries' CCSs other than Saudi Arabia that was accessible is as follows:

- Australia ("Prequalification for Transport and Building Structure", n.d.)
- Singapore ("CW SRR", 2017)
- United Arab Emirates ("Contractors Classification", n.d.)
- Qatar ("[Contractor Classification System]", 2015)
- Malaysia ("Contractor Registration Requirements", 2016)
- Egypt ("[First Type Division: Integrated building works]", n.d.)

- The Kingdom of Jordan (“[Classification System Instructions]”, 2007)
- Ghana (Yeboah, 2008)

The author analyzed each system individually and summarized the results in two tables. Table 7 compares the systems in terms of number of grades, number of fields, certificate validation period and the calculation method. Table 8 is a summarization of the results of analyzing and comparing the criteria of the identified systems.

Table 7

Worldwide CCS Overview

Criteria/System	1	2	3	4	5	6	7	8	9
# of grades	5	7	7	5	6	7	7	5	4
# of fields	3	63	8	29	5	129	12	4	5
# of criteria	26	16	9	32	23	7	8	6	23
Validation period	2	3	2	4	3	3	3	3	N/A
Calculation Method	M	M	M	F	F	M	M	M	M

Note: (4: The Kingdom of Saudi Arabia, 1: Australia, 2: Singapore, 3: UAE, 5: Qatar, 6: Malaysia, 7: Egypt, 8: Jordan, 9: Ghana, F: Formula/points, M: minimum/requirement)

Table 8

Worldwide CCS Criteria

Criteria/System	1	2	3	4	5	6	7	8	9
Financial									
Capital	√	√	√	√	√	√	√	√	√
Assets	√	√	√	√	√				
Income/Revenue/Profit	√			√					√
Financial Ratios	√			√					
Technical									
Staff	√	√	√	√	√	√	√	√	√
Equipment				√		√	√	√	√
Past Projects	√	√	√	√	√	√	√	√	
Site and office visits				√				√	√
Other									
Health, safety and environment	√	√	√		√	√			
Quality	√	√	√		√	√			
Sustainability	√								√
Contractor Continuous Development						√			
Contractor continuous tracking performance									

Note :(1: Australia, 2: Singapore, 3: UAE, 4: Kingdom of Saudi Arabia, 5: Qatar, 6: Malaysia, 7: Egypt, 8: Jordan, 9: Ghana)

The systems analyses reveal that the Kingdom of Saudi Arabia has some criteria that may not be required and may be missing other criteria that are needed for a more

accurate contractor capabilities assessment. For instance, two out of the eight systems use a *Site Visit* criterion, and both are the two lowest-ranking countries, while four out of the eight systems use an *Equipment* criterion, and all four are the lowest ranking countries. The more advanced countries use advanced criteria, such as *Health, Safety, and Environment; Quality; and Sustainability*. Saudi Arabia does not use any of these criteria in its current model.

The Kingdom of Saudi Arabia's CCS structure is more complex than other systems and uses a large number of criteria and a point-based formula for evaluating the results of the criteria. Out of the eight systems, only one other CCS uses a point-based formula system like Saudi Arabia, and no other system has more criteria than Saudi Arabia. However, all worldwide systems, like Saudi Arabia, have a CCS structure that is disconnected from the contractor's performance.

PERFORMANCE MEASUREMENT MODELS AND PERFORMANCE BENCHMARKING MODELS

Because of the limited documentation on existing CCSs worldwide and finding that no other CCS uses a method for assessing contractor performance, the third part of this literature review performed a search on performance measurement models (PMM). Additionally, because MOMRA oversees the classification of contractors and wants to contribute to the improvement of the SCI as a whole, a search on performance benchmarking models (PBM) was performed. Benchmarking is different than a PMM in that it is a specific utilization of PMMs which "aims at comparing the performance of firms relative to each other" (El-Mashaleh, Minchin, & O'Brien, 2007). With a benchmarking model, MOMRA can gain more insight into the SCI performance, such as

performance by region, contractor grade, contractor field, and identify common strengths and weaknesses in performance areas.

In the search for PMMs used worldwide, many PMMs were found, but a comprehensive analysis of these systems is beyond the scope of this study. Therefore, the study has chosen to analyze three most commonly used PMMs according to Bassioni, Price, and Hassan (2004), which are as follows:

1. European Foundation for Quality Management (EFQM)
2. Balanced Scorecard (BSC)
3. Key Performance Indicators (KPI)

The results of the search for PBMs, the study found many publications; However, the search revealed that there aren't any commonly used PBMs, and the PBMs currently used are mostly country-specific. Two reasons for this are that "rigorous benchmarking is still an embryonic field" (El-Mashaleh et al., 2007), the lack of standards and little adaption of construction PBMs (Fisher, Miertschin, & Pollock, 1995; Lema & Price, 1995) , and difficulties in determining appropriate measurements (Mohamed, 1996), thus there is still a lot of subjectivity in the development of PBMs. Comparing all these different PBMs in the context of their creation and adoption, while taking into account the complex region-specific relationship between public agencies, stakeholders, industry culture, contractors, subcontractors, and other involved parties, is beyond the scope of this study.

ANALYSIS OF PERFORMANCE MEASUREMENT MODELS

KPI is a generic term for quantifiable measurements of performance. A KPI is not an explicit framework for holistic performance measuring, but is a tool for measuring

quantifiable performance metrics. Even though KPI is not a performance measurement framework, KPIs are often used as a PMM (Yang, 2010). Though the process of construction is a complex system with many factors that interactively influence each other, KPIs have traditionally been used to rigidly measure data without taking into consideration the data's relationships with other factors (Kärnä & Junnonen, 2015). Though KPIs are an essential measurement tool, the opinion in this study is that KPIs alone cannot be used to draw any insightful conclusions on performance; therefore, they have a limited use, and are insufficient as a foundation for a PMM.

The EFQM excellence model is a model that was developed by the European Foundation for Quality Management. The model was designed to holistically measure the performance of an organization. Yang (2010) criticizes the EFQM excellence model as being resistant to change, poorly documented, and vague in certain areas.

The BSC is widely utilized, and is generally perceived as a good tool (Bassioni, Price, A. D., & Hassan, 2004); although Alsulamy (2015) criticized it by stating that it is a decision and strategizing tool and doesn't actually measure performance.

Alsulamy (2015) observed that the EFQM excellence model and BSC do not measure project performance throughout the construction process of a project. He stated that the KPIs do, but this study believes that KPIs are insufficient as a foundation. Alsulamy (2015) also stated that most of the models in his research were "developed theoretically rather than empirically."

ANALYSIS OF PERFORMANCE BENCHMARKING MODELS

Because "rigorous benchmarking is still an embryonic field" (El-Mashaleh et al., 2007), it is difficult to confidently determine what comprises a good benchmarking

model. Additionally, in reviewing literature on PBMs, the study found no public agencies that measure the performance of the industries they help to regulate. All of the reviewed literature on PBMs assumes that benchmarking is self-performed. Therefore, an intimate and detailed knowledge of the organization is assumed. The literature also assumes the motive for benchmarking is primarily self-improvement. These assumptions have likely reinforced one reasons benchmarking has not been widely adopted in the CI. This reason was identified by Alsulamy (2015) as the “lack of information and data through the historical absence of data collection and documentation in the construction sector” (p. 36).

SUMMARY OF LITERATURE FINDINGS AND CONCLUSION

According to the results from the literature search, there are limited publications that discuss other worldwide CCSs. Out of the first section search results, and the review of government websites of the top 80 Overall Best Countries (U.S. News, 2017), 8 countries other than Saudi Arabia were identified that use a CCS and had publicly available information on their CCSs. The documentation found on these CCSs was then compared with the Kingdom of Saudi Arabia’s CCS. The main observations found in this comparison are as follows:

- No other CCS had a system for tracking contractor performance continuously over time.
- The other worldwide CCSs are simpler and more transparent than the Kingdom of Saudi Arabia’s CCS.

Because other CCSs lack a system for tracking contractor performance, the study then included a review of currently used performance measurement models (PMM) and

performance benchmarking models (PBM) worldwide. The review found that the three most commonly used PMMs do not fit the context or goals of the changes required to address the issues with the CCS as outlined in Chapter 4, and in this chapter.

CHAPTER 6: THE PROPOSED MODIFICATIONS TO THE EXISTING ENTRY

POINT OF THE CCS

Based on the results shown in Chapters 4 and 5 and the interviews with the MOMRA strategic plan team (2015), it is proposed that the Kingdom of Saudi Arabia's CCS be modified using the changes outlined in this chapter. The changes include simplifying and modifying the CCS grades, criteria, and process for evaluating the criteria. A portion of the changes suggested in this chapter (*Financial* criteria) were tested using a sampling of contractors classified in Saudi Arabia, and the results are discussed.

ADDITION OF GRADE 6 AND SUPERCLASS GRADE

The existing CCS has five grade levels, from Grade 5 (lowest required classification) to Grade 1 (highest). Depending on the field, projects under 4.2M SR or 1.0M SR do not require a contractor to be classified (MOMRA, 2014). The new strategic plan for the CCS has the following objectives for the CCS grade modifications:

1. Classify all contractors.
2. Motivate the contractors to increase their participation in the CCS.
3. Motivate the contractors to improve their performance.
4. Minimize the risk of large, long duration construction projects.

The classification of all contractors requires the creation of a new Grade 6. The current Grade 5 has a project financial lower bound set at 1.0M SR. The new Grade 6 will cover all fields just as other grades do, but with no project financial lower limit and

up to the lower limit of Grade 5, 1.0M SR. This new grade will cover any currently unclassified contractors.

In order to minimize the risk of large and long duration projects, a new grade called Superclass (Grade S) should be created. According to MOMRA (MOMRA, 2014), 84% of all construction funding is in Grade 1 which currently covers these large and long duration projects. These projects are critical to the development and modernization of Saudi Arabia. The Grade S classified contractors will come from Grade 1 classified contractors. There are currently no Grade S contractors as the Grade S requires Grade 1 contractors to re-apply for Grade S. Implementation of the Grade S classification will motivate Grade 1 contractors to become more educated and to increase their performance (project cost and time deviation should decrease) to become Grade S contractors.

MODIFICATION OF FINANCIAL CRITERIA

The objective of the *Financial* criteria is to assess the financial stability and capacity of a contractor (MOMRA, 2009). With the goal of simplifying and improving requirements, 10 of the 11 *Financial* criteria were removed and two more criteria were added. The *Working Capital* criterion was kept and the new criteria are *Asset Turnover* and *DuPont Model*. This decision was made due to the following factors:

1. The literature analyses as described in Chapter 5 show that in global classification systems, the following financial criteria are used:
 - a. Australia and Ghana: *Capital, Profit, and Financial Ratios*.
 - b. Singapore, UAE, Qatar: *Capital and Assets*.
 - c. Malaysia, Egypt, and Jordan: *Capital*.

2. In the interviews with MOMRA in 2015, the interviewees expressed their desire to use the *DuPont Model* and *Asset Turnover*. This change replaces the current four financial ratios used in the *Financial* criteria.
3. Working capital is a good reflection of a company's short-term financial health and efficiency. It is an indicator that the company is able to repay short-term obligations, and to provide excess liquidity to develop its business and reduce debt.

It is a common practice to allow contractors to perform a certain value of work in proportion to their working capital. The greater the ratio, the greater the risk brought to the owner. For example, if a contractor has a working capital of 10M SR and this ratio was 1 to 5, then the contractor would be able to perform up to 5 times his financial capital (10 X 5 = 50M SR of work). The *Working Capital* criterion uses an average of the last three years and is calculated using Equation 1.

$$\text{Working capital} = \text{current assets} - \text{current liabilities} \quad (1)$$

Asset turnover explains the company's asset efficiency in the use of its assets to generate sales or revenue. This ratio is used to measure the sales generated by each of the real values of the assets' size. It also refers to the pricing strategy: high profit margins tend to achieve low rates, while asset turnover rises with low profit margins. The calculation of the asset turnover is done based on the contractor's financial statement from the last two years, 1st year and 2nd year, where the 2nd year is the most recent:

$$\text{Asset Turnover} = \frac{(\text{2}^{\text{nd}} \text{ year revenue})}{[(\text{Total Assets 1}^{\text{st}} \text{ year} + \text{Total Assets 2}^{\text{nd}} \text{ year}) / 2]} \quad (2)$$

In cases where a contractor only has one year for the financial statement, Equation 3 is used.

$$\text{Asset Turnover} = (1^{\text{st}} \text{ year revenue}) / (1^{\text{st}} \text{ year Total Assets}) \quad (3)$$

The DuPont model has gained wide acclaim as a tool in financial performance and control by analyzing the profitability and productivity of the sales of assets and because of the effective measurement of resources in both the income statement and balance sheet. The DuPont model's analysis involves a few simple calculations that are within the capacity of any student, manager, or small and large business owners. The DuPont model is calculated using Equation 4 or Equation 5:

$$\begin{aligned} \text{DuPont model} &= (\text{Profit} / \text{Revenue}) * \\ &(\text{Revenue} / \text{Total Assets}) * (\text{Assets} / \text{Net Worth}) \end{aligned} \quad (4)$$

Or

$$\text{DuPont model} = (\text{profit margin}) * (\text{asset turnover}) * (\text{leverage}) \quad (5)$$

In setting the requirement for the *Working Capital*, *Asset Turnover* and *DuPont Model*, a financial analysis was performed based on past historical data in order to validate the minimum required values. For *Asset Turnover* and *DuPont Model*, ratios were calculated for each individual field and grade. *Working Capital* was determined based on a 1 to 10 ratio with the grade limits. An example of these values is given in Table 9.

Table 9

Example of Proposed Financial Criteria

Grades	S	1	2	3	4	5	6
Financial limits	UNLIMITED	<990	<420	<140	<42	<14	<4.2
Working Capital (M SR)	>99	>42	>14	>4.2	>1.4	>0.42	-
Asset Turnover (%)	> 2.77	>2.77	>2.74	>2.64	>2.32	>1.39	-
DuPont Model (%)	>0.74	>0.74	>0.73	>0.7	>0.62	>0.37	-

MODIFICATION OF THE EQUIPMENT CRITERION

The main objective of the *Equipment* criterion was identified as a means to ensure the contractor has the proper tools available to complete the grade level projects within his classification (MOMRA, 2009). In order to simplify the process, it is proposed that the *Equipment* criterion be removed.

Companies are not able to hold equipment at all times due to the amount of capital it takes to maintain it when not in use. Thus, measuring contractors based on their equipment assets is counterproductive to increasing productivity and as a criterion, because the ownership of equipment may actually mean the contractor has poor financial management skills depending on the situation. Instead, the CCS should measure the ability to increase equipment upon demand, which can be measured through other criteria, such as *Financial* and *Projects* criteria.

Based on the literature reviewed in Chapter 5, only 4 out of the 8 other countries with accessible CCS information use *Equipment* as a criterion, and those countries ranked

lower than Saudi Arabia in the Overall Best Countries (U.S. News, 2017) list. Major reasons why owning equipment is no longer necessary is due to the facts that:

1. Most equipment can be rented, which is more economical for contractors, and with enough assets and capital this can be done. Additionally, if the contractor decides to purchase equipment, doing so is also dependent on their assets and capital.

Therefore, the financials of a company are a better indicator of their equipment capacity.

2. There is no documented evidence to show the exact quantity of equipment necessary to perform a job. As each company operates differently, the necessary equipment may vary. However, to ensure the contractor has the means to access relevant equipment needed to complete a project, the assessment of previous projects of similar size (*Projects* criterion) can be used.

MODIFICATION OF THE CLIENT SURVEY CRITERION

In the existing CCS, the client surveys are used for two purposes, one as a way to verify project information and the other as criteria to measure the performance and quality of a contractor (MOMRA, 2009). Performance and quality of a contractor are evaluated by the clients through a 7-question survey and 5-mark scale (weak, acceptable, good, very good, and excellent). Based upon the survey results, the contractor is awarded an amount of points through a mathematical formula that contributes to his final classification score (MOMRA, 2014).

The seven existing client survey questions are:

1. Project management (planning, organization, and follow up).
2. Work quality and compliance with the project specifications.

3. Compliance with the time schedule.
4. Project staff quality (competence, experience, qualifications).
5. Availability of the necessary equipment and systems and extent of their efficiency.
6. Application of the security and safety procedures.
7. Job Saudization (to replace foreign employees with Saudis) and provision of the training programs.

When analyzing the CCS, the study determined that the main objective of the client survey should be to assess client satisfaction with the contractor's overall performance of the project. To better accomplish that objective, the following modifications were made to simplify the client survey, minimize subjectivity, and increase overall improvement of the client survey:

1. Each project's client survey is required to have a minimum customer satisfaction score of 7 or 8 out of 10 to be included in the project criteria. If the survey is found to be inaccurate or has a Client Satisfaction Score below 7 or 8, it will not be included towards the contractor's project criteria. The reason for this is because of the human tendency to produce much lower ratings than are deserved when there is dissatisfaction with the target of the rating.
2. Two survey questions were removed and one question was added so the survey will contain 6 questions instead of 7. Questions 5 and 7 (See list above) were eliminated as they were identified as subjective, difficult to determine for a client, and/or redundant due to other criteria. A question of overall customer satisfaction was added to the survey; this question has been proven to be successful in performance assessments in many other systems (Kashiwagi, 2014).

3. The customer survey rating scale was adjusted from a 5-mark scale to a 1 to 10 scale (1 being poor performance, 5 being neutral and 10 being high performance. The Client Satisfaction Score is determined by an average of the 6 survey questions (see Table 10).

Table 10

Example of Proposed Client Satisfaction Survey Questions

#	Client Survey Questions	Rating
1	Overall Client Satisfaction	7.00
2	Project management (planning, organization and follow up).	10.00
3	Work quality & compliance with the specifications	5.00
4	Compliance with the time schedule	5.00
5	Project staff level (competence, experience, qualifications)	10.00
6	Application of the security & safety procedures	10.00
Client Satisfaction Score:		7.83

Additionally, to increase transparency and reduce ambiguity of the CCS criteria, the title “Client Survey” should be more explicit about its purpose to and changed to “Client Satisfaction Survey.”

MODIFICATION OF PROJECTS CRITERIA

The main objective of the *Projects* criteria was identified as the ability to ensure contractors can perform within a grade level of projects based on past performance and financial capacity (MOMRA, 2009). In the upgraded system, the author recommends:

1. Removal of the criteria *Monthly Load*, *Yearly Load*, and *Continuity* due to redundancy and due to other worldwide CCSs criteria. Some worldwide systems (Qatar, Australia and UAE) only focus on one or two areas, project value and requirements, to ensure the project value is within a specific range that correlates to the targeted grade level.
2. Removal of the criteria *High Value Projects* and *Project Value*. This was replaced with the *Number of Projects* criterion which sums the number of projects whose value is greater than half of maximum project value of the grade level below the targeted grade. For example, if the grade limit for Grade 2 is 420M SR and the target is Grade 1, the projects included must have a value greater than 210M SR ($420\text{M SR} / 2$).

Other worldwide CCSs use similar methods:

- a. UAE—Projects counted must have a value that is greater than a set minimum requirement (“Contractors Classification”, n.d.).
- b. Australia—Requires at least one project to be within the value of the targeted grade range (“Prequalification for Transport and Building Structure”, n.d.).
- c. Qatar—Has criteria for total projects submitted, sum of projects’ values, and average project value where there is a maximum number of projects that can be submitted to evaluate each criterion (“[Contractor Classification System]”, 2015). For example, a contractor may only submit up to 10 projects where the number of projects submitted is the first criterion. The second criterion is the sum of those 10 projects’ values. The third criterion is the average of those projects’ values.

The projects included in the evaluation are those projects which are acceptable by the modified *Client Satisfaction Survey* criterion rules (survey is accurate and Client Satisfaction Score above 7 or 8).

To ensure contractors are able to deliver successful projects, the requested history of past projects range was modified from 15 years for government projects and 7 years for private projects to 4 years for both government and private projects, which was also suggested by the designer of the current system (MOMRA, 2009. p. 28). The shortened validity of projects will require contractors to provide projects which are more recent and that reflect current capability. Four years is understandable compared with worldwide classification systems from Qatar, Australia, and UAE, which request projects within the past 4 to 6 years for their projects.

As a summary, the modified *Projects* criteria have been reduced to one criterion: *Number of Projects*. The contractor must hand in a minimum number of projects that have a project value greater than half of maximum project value of the grade level below the targeted grade. For example, (see Table 11) if the grade limit for Grade 2 is 420M SR and the target is Grade 1, the contractor must have 1 project(s) that is greater than 210M SR ($420\text{M SR} / 2$).

Table 11

Example of Criteria Values for the Execution and Construction Works: Infrastructure

Grades	S	1	2	3	4	5	6
Financial limits	UNLIMITED	<990	<420	<140	<42	<14	<4.2
Number of Projects	1	1	1	1	1	1	-
Minimum Value of Project*	> 495	> 210	> 70	> 21	> 7	> 2.1	-
Client Survey Rating per Project (Points)	> 8	> 8	> 7	> 7	> 7	> 7	-

* In Million Saudi Riyals

MODIFICATION OF SITE VISITS AND HEAD OFFICE VISITS CRITERIA

The main objective of the site visits was identified as ensuring the documentation and information submitted by the contractor to the classification agency was accurate and complete (MOMRA, 2009). In the current system, the site and office visits are also being used as a way to assess and rate the quality of the contractor (MOMRA, 2015). To improve the ability to meet the objectives of the visits, the modifications made for the upgraded CCS include:

1. Site and office visits are not removed completely, but removed as rated criteria and used solely to verify information submitted by the contractor. Any information that is found to be inaccurate will not count towards meeting any of the classification requirements.

2. Minimization of the number of site and office visits. The number of visits should be minimized as the budget of MOMRA may not be sufficient to perform visits on every contractor throughout the entire year. To minimize visits, the requirement of visits will be prioritized and determined by the potential risk a contractor brings to MOMRA. This risk will be determined by a contractor's history of submitting correct information, type of projects submitted and the type of classification being requested.

The factors that led to the modifications include:

1. Visits were identified as redundant as most of the information to be verified should have already been checked through other means of the process. Bank statements are verified by a third-party auditor, *Projects* criteria are checked through third party clients, and contractors' basic information is checked by a third-party licensing agency.
2. Visits are costly to the organization and have proven to be unsustainable due to high costs. Site and office visits annually take 31.8 % of MOMRA employees' workloads (MOMRA, 2015). By implementing modifications, it was estimated to have a 28.4% decrease in visits, a 22.7% decrease in employee visit workload, and an 8.5% decrease in annual costs (MOMRA, personal interview, 2015).
3. Visits make the duration of the process longer and make the process subjective as there is no way to measure performance. (MOMRA, 2015, p. 4)
4. Visits may not be an effective control measure. Site visits are only an assessment of one project. The method of performing office visits represents a kind of audit;

however, a large quantity of information is checked in a single visit. (MOMRA, 2015, p. 15)

The modified factors that determine a contractor's requirement to have a site and office visit are determined by past history of submissions, project type, and classification request (See Figure 6):

1. History of submissions: A contractor is determined to be low risk if he provides correct documentation and high risk if he provides incorrect documentation upon applying for classification. Contractors who are identified as a potential high risk can return to being identified as a low risk after two classification requests with correct documentation.
2. Project type: There are two types of project groups; one is projects submitted for government / quasi-governmental / public organizations with the role of the main contractor. The second is civil projects for individuals / government / quasi-governmental / public organizations with the role of the subcontractor / partner.
3. Classification Request: There are six cases of classification requests. In Case A, the contractor is completely new to the CCS. In Case B, the contractor is renewing classification and remaining at the same grade level as his previous classification request. In Case C, the contractor is renewing classification and raising his grade level from a previous classification by one or two grade levels. In Case D, the contractor is renewing his classification and raising his grade level from the previous classification by three or four grade levels. In Case H, the contractor is already Grade 1 or 2 and is becoming classified in an additional field in Grade 1 or 2. In Case J, the

contractor is already Grade 3, 4 or 5 and is becoming classified in an additional field in Grade 3, 4 or 5.

Case	Description	Documentation History	Contractor Role in Project	
			Main Contractor	Subcontractor / Partner
A	New to CCS	N/A	Mandatory	Mandatory
B	Grade renewal	Correct	25%	25%
		Incorrect	Mandatory	Mandatory
C	Promotion to Grades 2 or 1	Correct	25%	Mandatory
		Incorrect	Mandatory	Mandatory
D	Promotion to Grades 5, 4, or 3	Correct	25%	25%
		Incorrect	Mandatory	Mandatory
H	Adding a field for Grades 2 or 1	Correct	25%	Mandatory
		Incorrect	Mandatory	Mandatory
J	Adding a field for Grades 5, 4, or 3	Correct	25%	25%
		Incorrect	Mandatory	Mandatory

Figure 6. Site and Office Visit Cases. This chart shows the chance of a site and office for the listed cases and conditionals when a contractor interacts with the proposed CCS.

PROPOSED METHOD TO EVALUATE THE CCS CRITERIA

In this study, it is suggested that the points system be replaced with minimum requirements due to the following reasons:

1. Most of the worldwide CCSs use minimum requirements in the evaluation of a contractor to determine the contractor grade (See Table in 7 Chapter 5).
2. The minimum requirements will increase the transparency of the system, so the contractors can know which grade they deserve before they apply to the CCS.
3. The minimum requirements will ensure that the contractors meet all the CCS criteria, instead of potentially having high scores in some criteria which renders other criteria scores useless.

ADDITIONAL CRITERIA TO THE EXISTING CCS

After an analysis of the current conditions in the worldwide classification systems, it is proposed that new criteria be added, which are:

1. Health and Safety, and Environment.
2. Project Management.
3. Quality Management.
4. Sustainability.

One of MOMRA's strategic goals is to increase the performance and quality of the contractors (MOMRA, 2016a). These four criteria were added in an effort to accomplish this goal. However, unlike many other developed countries, the Kingdom of Saudi Arabia does not have regulatory third parties who enforce standards like health and safety, and environment, quality, or sustainability. For this reason, the study identified the need for MOMRA to utilize international standards that have been created by other

countries and organizations until the Kingdom of Saudi Arabia can develop national standard-setting bodies. This section outlines the criteria and sub-criteria, and provides an example of sub-criteria requirements for each classification grade. The actual sub-criteria requirements should be determined by MOMRA.

The *Health and Safety, and Environment* (HSE) criterion will be using the standards of OHSAS 18001. It exists to help all kinds of organizations put in place demonstrably sound health and safety policies and procedures. To demonstrate a contractor has sufficient health, safety, and environmental measures in place in order to qualify for a targeted classification grade they must:

1. Have an HSE system such as OHSAS 18001, ISO 14001, or equivalent; company HSE policy; company HSE plan; or no requirement.
2. Meet a minimum number of currently employed HSE system administrators. Each counted administrator must meet a minimum number of years of experience in the field.

Table 12 shows the *HSE* sub-criteria and provides an example of potential requirements for each classification grade.

Table 12

Health and Safety, and Environment Sub-criteria and Example Requirements

Criteria	Grades						
<u>Health and Safety, and Environment Tools</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>Sup</u>
ISO 14001, OHSAS 18001, or equivalent	-	-	-	-	-	✓	✓
Health, Safety and Environment Policy	-	-	✓	✓	✓	-	-
Health, Safety and Environment Plan	-	✓	-	-	-	-	-
<u>Health and Safety, and Environment Administrator</u>							
# of Qualified and experienced administrators	-	≥	≥	≥	≥	≥	≥1
Years of experience in the field per administrator	-	≥	≥	≥	≥	≥	≥1

The basis for the *Project Management* criterion is that effective project management is critical to the success of a project. For this reason, to ensure contractors have the proper education they will be required to have certified project managers and trainees through a recognized certification organization. In addition to having these certified professionals, a contractor is required to have the correct tools for proper project management. MOMRA will require that a contractor’s company uses project management tools. The *Project Management* sub-criteria require that a contractor must have the following to qualify for a targeted classification grade:

1. A Project Management Information System (PMIS) as defined by PMBOK 4th edition (Project Management Institute, 2009) (eg. Clarizen, Smartsheet), a company project management policy, or a company project management plan.

2. Sufficient project management professionals educated and certified by a recognized institute or methodology such as Project Management Professional (PMP) or Projects IN Controlled Environments 2 (PRINCE2).

Table 13 shows the *Project Management* sub-criteria and provides an example of potential requirements for each classification grade.

Table 13

Project Management Sub-criteria and Example Requirements

Criteria	Grades						
<u>Project Management Tools</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>Sup</u>
Project Management Information System (PMIS)	-	-	-	-	-	✓*	✓*
Project Management Policy	-	-	-	✓	✓	✓	✓
Project Management Plan	-	✓	✓	-	-	-	-
<u>Project Management Professional</u>							
# of employees with PMP/PRINCE2 certification or equivalent	-	-	≥2	≥3	≥4	≥8	≥13
Years of experience in the field per administrator	-	-	≥8	≥1	≥20	≥32	≥52
2							

*A PMIS is a tool used to assist in project management, and does not replace project management policies.

For the *Quality Management* criterion, it is ideal that contractors use the ISO 9001 standard. The ISO 9001 defines the criteria for a quality management system and is the only standard in the ISO 9000 family where someone can earn a certification, though certification is not a requirement. It can be used in any organization, large or small,

regardless of its field of activity. The *Quality Management* sub-criteria require that a contractor must have the following to qualify for a targeted classification grade:

1. A quality management system which adheres to ISO 9001, company quality policy, or company quality plan.
2. Meet a minimum number of currently employed and qualified administrators who are responsible for the system. Each counted administrator must meet a minimum number of years of experience in the field.

Table 14 shows the *Quality Management* sub-criteria and provides an example of potential requirements for each classification grade.

Table 14

Quality Management Sub-criteria and Example Requirements

Criteria	Grades						
<u>Quality Management Tools</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>Sup</u>
ISO 9001	-	-	-	-	-	✓	✓
Quality Policy	-	-	✓	✓	✓	-	-
Quality Plan	-	✓	-	-	-	-	-
<u>Quality Management Administrator</u>							
# of qualified administrator	-	-	≥1	≥1	≥1	≥1	≥1
Years of experience in the field per administrator	-	-	≥2	≥3	≥5	≥8	≥1

The inclusion of the *Sustainability* criterion, and the concept of sustainable development is key to the development of the Kingdom of Saudi Arabia’s movement of

modernization. The *Sustainability* sub-criteria require that a contractor must have the following to qualify for a targeted classification grade:

1. Implementation of number of projects greater than or equal to a minimum which are registered in either the American Institute of Green Homes (USGBC), the Building Research Establishment Environmental Assessment Methodology (BREEAM), or an equivalent sustainability body.
2. Meet a minimum number of qualified staff who are certified in either Leadership in Energy and Environmental Design (LEED) or BREEAM, or have received courses in sustainability. Each counted staff member must also meet a minimum number of years of experience and be registered through the Saudi Council of Engineers.
3. Provided an annual sustainability report.
4. Provided a report on their contribution to corporate social responsibility.

Table 15 shows the *Sustainability* sub-criteria and provides an example of potential requirements for each classification grade.

Table 15

Sustainability Sub-criteria and Example Requirements

Criteria	Grades						
	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>Sup</u>
Annual sustainability report	-	-	-	-	✓	✓	✓
Corporate social responsibility report	-	-	-	✓	✓	✓	✓
# of projects registered to USGBC, BREEAM, or equivalent	-	-	-	-	≥1	≥2	≥3
<u>Sustainability Staff</u>							
# of qualified staff	-	-	≥1	≥1	≥1	≥1	≥2
Years of experience in the field per staff member	-	-	≥2	≥3	≥5	≥8	≥1

TESTING RESULTS USING CSS MODIFICATIONS

A test was done using the modified financial criteria proposed in this chapter on 5751 classified contractors from different fields and grades. With the minimum criteria as shown in Table 16 the results of the test showed that only 14% of the 5751 contractors are financially capable in their respective CCS grades. Table 16 shows that out of 495 Grade 1 contractors, only 4 were financially capable according to Grade 1 requirements. The results reflected the lack of transparency and accuracy of the CCS on determining the contractor's' financial capabilities. The results support the survey results which showed a majority perception of CCS being inaccurate in assessing contractor capabilities. Though this test does not reveal a definitive improvement using the modifications, it shows that the modifications may resolve the some of the potential issues found in the existing CCS.

Table 16

Modified Financial Criteria Test

Grade	Number of Contractors	Financial Criteria			
		<u>Working Capital</u>	<u>Asset Turnover</u>	<u>DuPont Model</u>	<u>All Financial</u>
1	495	302	16	77	4
2	556	298	47	120	14
3	974	492	153	253	32
4	2791	1768	1237	1338	557
	935	394	712	633	218
Total	5751	3254	2165	2421	825
Passed		57%	38%	42%	14%

SUMMARY AND CONCLUSION

In this chapter some area of the CCS has been modified based on the results from the case study analysis and the review of CCSs worldwide. All the modifications to criteria were crafted through several meetings with the MOMRA strategic planning team. The types of modifications are as follows:

- Additional Grades

- Modifications of Criteria
- Proposed Method to Evaluate the CCS Criteria
- Additional Criteria to the Existing CCS

A test was performed using the modified financial criteria on more than 5000 classified contractors. The results of the test showed that only 14% of the 5751 contractors are financially capable in their respective CCS grades. This result supports the perception that the current CCS does not accurately assess contractor capabilities.

CHAPTER 7: INTEGRATION MODEL IN CCS PROCESS

In Chapter 5, a review of other performance measurement best practices worldwide found that the existing models had multiple issues which this study believes disqualifies most of those models from being integrated into the CCS. For instance, many of those models were developed theoretically instead of empirically (Alsulamy, 2015). Additionally, in 2008, the International Council for Building (CIB) Working Commission W117 sanctioned a group (TG61) to perform a study using a worldwide literature research to detect innovative approaches in construction that used performance measurement systems to increase performance of projects (Egbu, Carey, Sullivan, & Kashiwagi, 2008). The study filtered through more than 15 million articles and reviewed more than 4,500 papers and identified that no model except the Performance Information Procurement System/ Performance Information Risk Management System (PIPS/PIRMS) had published documentations showing an increase in construction performance on multiple tests. PIPS\PIRMS has proven that, when the information is used and performance is measured, the performance increases and provides timely and accurate performance information incorporated with the reduction of risks of insufficient decision making through using expertise (Kashiwagi, Sullivan, & Kashiwagi, 2009b; Kashiwagi, Kashiwagi, Sullivan, & Kashiwagi, 2015). While PIPS/PIRMS is not a panacea for the problems in the SCI, its proven results mean that it may improve the performance of the SCI and contractor evaluation using the CCS, and this study will use it in developing the proposed CCS model. Additionally, the opinion presented in this study is that, rather than attempting to implement a new CCS component that addresses all the performance issues in the SCI, the new model should be a framework that can be continuously

improved as more information becomes available. A key element to this is the addition of a component which continually collects contractor performance data and motivates continuous improvement of contractors, as none currently exists. Because the full implementation of PIPS is outside the scope of this study, it is proposed in this chapter that a new component to be added to the CCS which uses PIRMS, and only one aspect of PIPS that is directly relevant to the CCS.

It is important to note that this proposed component should be seen as a foundation which can continually be built upon. The reason for this is that it is the opinion of this study that attempting to develop a component which theoretically addresses all issues would be based on too many assumptions of the complex construction process. Instead, the component should be developed incrementally and empirically using data collected through the proposed CCS model.

INFORMATION BASED CONTINUOUS IMPROVEMENT (IBCI) MODULE

In this chapter, a new component to be integrated into the CCS for measuring contractor performance, called the Information Based Continuous Improvement Module, will be discussed. This module was developed by adapting PIPS/PIRMS to fit within the proposed CCS model and to remain within the scope of responsibilities of the CCS and MOMRA.

The proposed module requires classified contractors to clarify the project plan before they are awarded a project. This phase is called the Clarification Period (CP). After the contract is awarded, the contractor will track the project cost and time deviations (risks) using PIRMS' Weekly Risk Report (WRR) system. The integration of

the PIPS\PIRMS' two main phases, the CP and WRR, into the classification system is shown in Figure 7.

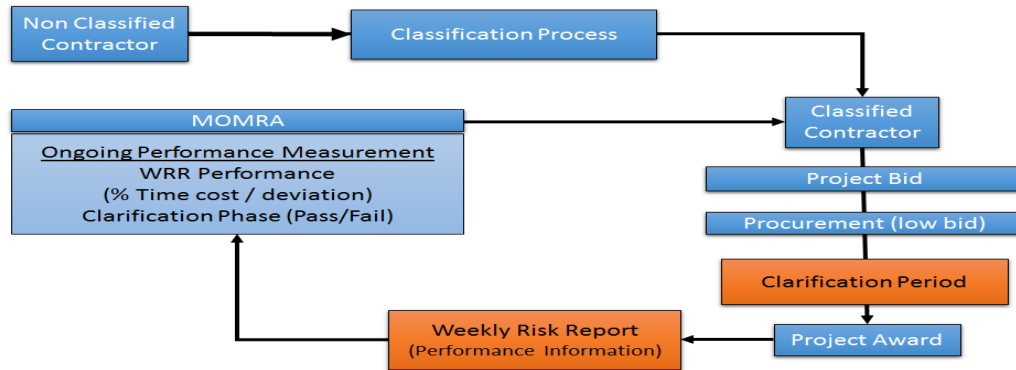


Figure 7. PIPS/PIRMS Integration in CCS Process.

CLARIFICATION PHASE

The purpose of the CP is for the contractor to verify all information and assumptions of the project, and to ensure the contractor is an expert, can deliver a high performing project, and that the project owner is satisfied with the contractor's plan and vision for the project. The CP requires the owner/client to do their due diligence by ensuring the contractor can pre-plan the project and understand the technical details of a project before being awarded the contract. During the CP, the contractor will provide the project owner with the following:

1. A detailed plan including a time and cost schedule, and a definition of the project scope.
2. A schedule of milestones which are represented by easily observable metrics.
3. Identification of risks that the contractor does not control, and a risk mitigation plan.

4. The creation of the Weekly Risk Report (WRR) on a spreadsheet which becomes a part of the contract.

One of the important aspects of the CP should address one of the common factors that influences contractor performance, supply-chain relationships. According to a study on the effects of supply-chain relationships on project performance, supply-chain relationships suffer when parties begin to blame each other when problems arise, and consequently the project performance begins to suffer (Meng, 2011). Because the CP identifies risks and allocates risk responsibility, this should reduce parties blaming each other which should help prevent supply-chain relationships from deteriorating. The CP also addresses the problem of contractors' deficiencies in planning due to not knowing how to plan or lack of desire to plan.

WEEKLY RISK REPORT

The WRR is a Microsoft Excel document containing the baseline plan of the contractor from the CP (schedule, cost, initially identified risks and associated mitigation plans), milestone achievements, and performance metrics. The WRR will also include deviations that are encountered post-CP, their associated mitigation plans, the cost of the deviation, the cause of the deviation, and the responsible party. Additionally, any performance indicators required by owners or the CCS such as safety can be added to the WRR performance measurement.

Throughout the entire length of the project, the contractor will maintain the WRR and distribute it to the client and MOMRA on a weekly basis. The client's project managers or consulting engineers would be responsible for ensuring that the contractor is continuously and accurately documenting the project progress through the WRR. This

assurance process is essential to make sure vendors are performing quality control management and risk management which can minimize deviations. This report will become a clear documentation of the project's quantitative and qualitative performance, and should increase transparency during the construction process.

The WRR system can track ongoing performance on projects throughout the contractor's entire four-year classification. The WRR system would measure the performance of all parties in projects thus providing objective and accurate performance information of the contractor capability. This information could be used to determine contractor's future classification status. Furthermore, the WRR will track all project information and performance for all projects performed by classified contractors.

DIRECTOR'S REPORT

Once the WRR is generated, the compilation of the WRRs will be compiled into a Director's Report (DR) by the client and MOMRA that summarizes all the provided performance information. The DRs provide MOMRA with information on the performance of the SCI, individual contractor performances, and will help identify major industry problems. Examples of the types of performance information that would be collected in WRRs and DRs are in the following resources (Sullivan, Kashiwagi, & Kashiwagi, 2005; Chong, Sullivan, Sullivan, & Kashiwagi, 2007; Sullivan, Kashiwagi, & Kashiwagi, 2009; Kashiwagi, *et al.*, 2009b; Kashiwagi, Malhotra, Luna, Kashiwagi, & Sullivan, 2009a). Without subjective decision making or intervention, the CCS will use the DR to more accurately determine the contractor's grade level based upon the CCS criteria evaluation and evaluation of the contractor performance information created by the IBCI module. The DR would allow MOMRA to ensure contractors are capable of

handling the capacity of projects defined by their classification grade and may grant an extension on capacity if proven to be capable. It would also allow MOMRA to identify and regulate contractors who are unable to handle their current workload and decrease their capacity if needed.

CONTROLS OF THE RECURSIVE (SELF REGULATING) CLASSIFICATION SYSTEM

Once a contractor is entered into the CCS and receives their entry classification grade level, they then will be able to self-regulate their movement between grade levels based upon project performance. As shown in Figure 8, a contractor will have his future grade level determined upon documentation of his ability to create a plan (CP) and implement the plan (WRR) with low deviation in terms of time and cost. This environment will provide the motivation for contractors to improve and deliver high performance.

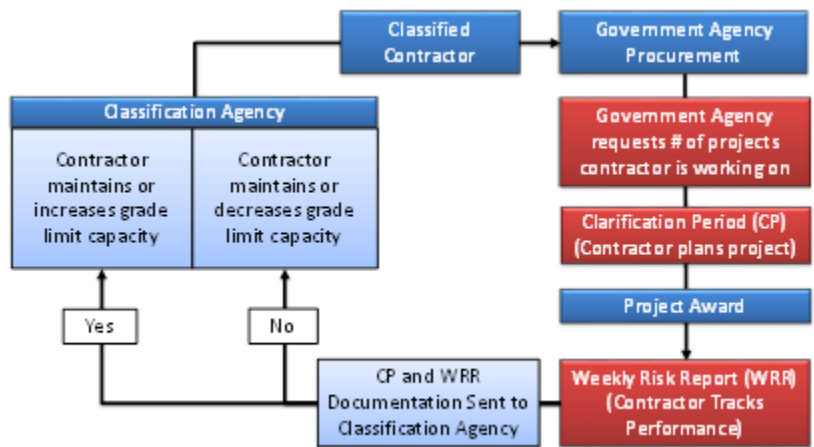


Figure 8. Recursive Classification Process.

GRADE SUBLEVELS

Individual grades are divided into five different sublevels (except Grade S) from 1 to 5, and a special status P (including Grade S); 1 representing the lowest sublevel, 5 representing the highest contractor capacity within the current grade, and P representing a special “probation” status. The sublevels are denoted with their respective grade as *[grade level].[sublevel]*. For example, the sublevels within Grade 3 would be denoted as 3.1, 3.2, 3.3, 3.4, 3.5, and 3.P. (See Figure 9).

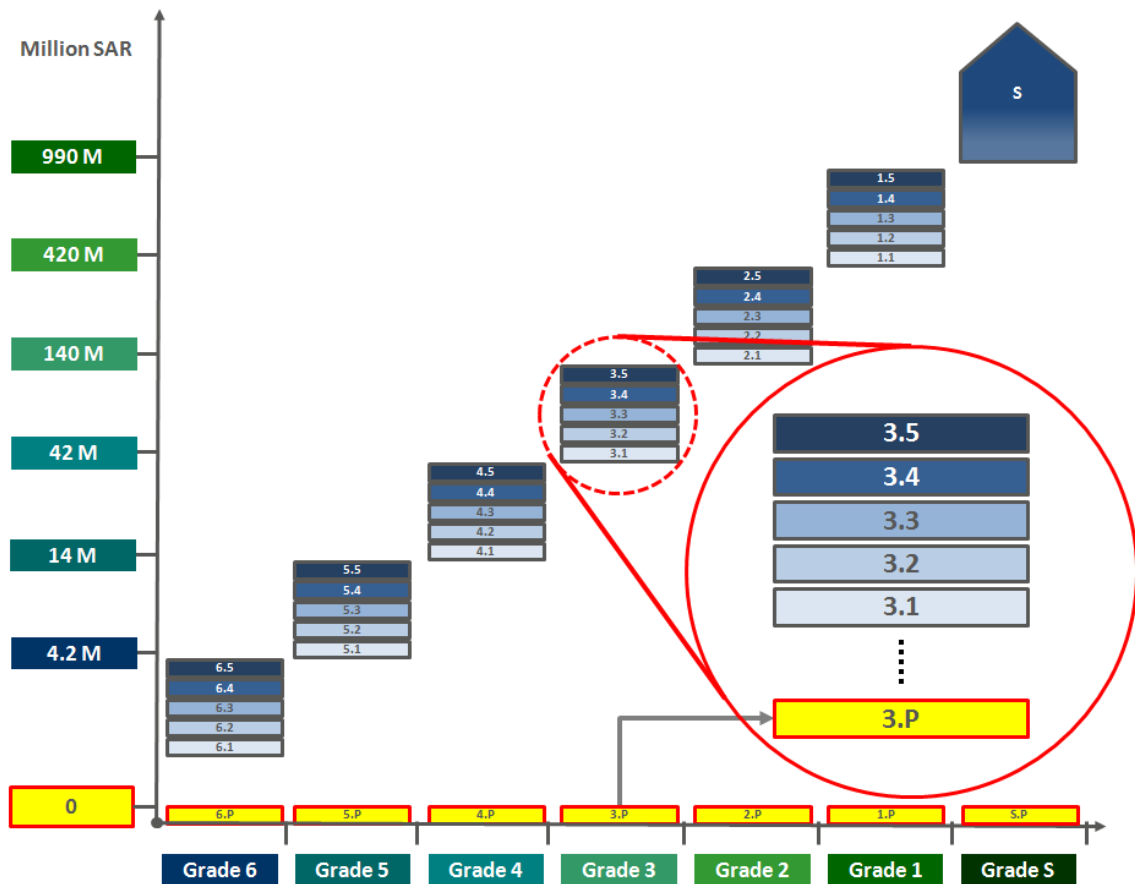


Figure 9. Sublevels per Grade with Roads Field MPVs.

Each sublevel (except probation status) will represent an increment of the difference between the grade level’s maximum project value (MPV) for a field, and the

previous grade level's MPV for the same field as shown in Equation 6, where G is a grade, V_{Gmax} is the grade's MPV in an arbitrary construction field (eg. roads, buildings).

$$I(G_{current}) = [V_{Gmax}(G_{current}) - V_{Gmax}(G_{previous})] / 5 \quad (6)$$

Using the previous formula, the Equation 7 is used to get the sublevel MPV formula $V_{SLmax}(S)$ where S is the sublevel, and the result of the formula is rounded to two significant figures for consistency and simplicity.

$$V_{SLmax}(S) = \text{round}_{2sigfig}(S \cdot I(G_{current}) + V_{Gmax}(G_{previous})) \quad (7)$$

For example, suppose we are measuring Grade 2 ($G_{current}$) sublevel 3 (S), denoted as 2.3, in the field of roads. The MPV a contractor can perform in the field of roads for Grade 2 is 420 Million SR ($V_{Gmax}(G_{current})$). The MPV a contractor can perform in the field of roads for the previous grade, Grade 3, is 140 Million SR ($V_{Gmax}(G_{previous})$). Then the increment for each sublevel in Grade 2 ($I(G_{current})$) is 420 Million SR - 140 Million SR / 5 = 56 Million SR. Then, for sublevel 3 in the field of roads, the MPV ($V_{SLmax}(S)$) is $(3 \cdot 56 \text{ Million SR}) + 140 \text{ Million SR} = 308 \text{ Million SR}$. This value is then rounded to two significant figures which gives 310 Million SR. Figure 10 shows an example of the MPVs per sublevel for Grade 2 based on this formula and the special probation status.

Grade	Grade MVP	Grade code	Sublevel	Sublevel MPV
2	< 420 Million SR	2.5	5	< 420 M SR
		2.4	4	< 370 M SR
		2.3	3	< 310 M SR
		2.2	2	< 250 M SR
		2.1	1	< 200 M SR
		2.P	P	0 SR
3	< 140 Million SR	Requirements to maintain / promote sublevel All ongoing projects must have: 1. Clarification period of planning and risk mitigation 2. Track project performance through Weekly Risk Report 3. Time and cost deviation < 5% 4. Performance Metrics Probation Period: Failure to meet requirements of any of the four requirements above for <u>one project</u> .		

Figure 10. Example of Sublevel MPVs and Requirements. This figure illustrates the MPV a contractor can bid on for each sublevel in Grade 2 in the field of roads, and the requirements to maintain or increase a sublevel.

MAINTAINING AND PROMOTING GRADES/SUBLEVELS

For a contractor to increase in their sublevel (See Figure 11), they must meet the following requirements for all ongoing projects:

1. Perform a clarification period of planning and risk mitigation.
2. Track project performance through the Weekly Risk Report system.
3. Have a time and cost deviation < 5% (Caused by the contractor).
4. Have zero safety violations reported due to negligence.

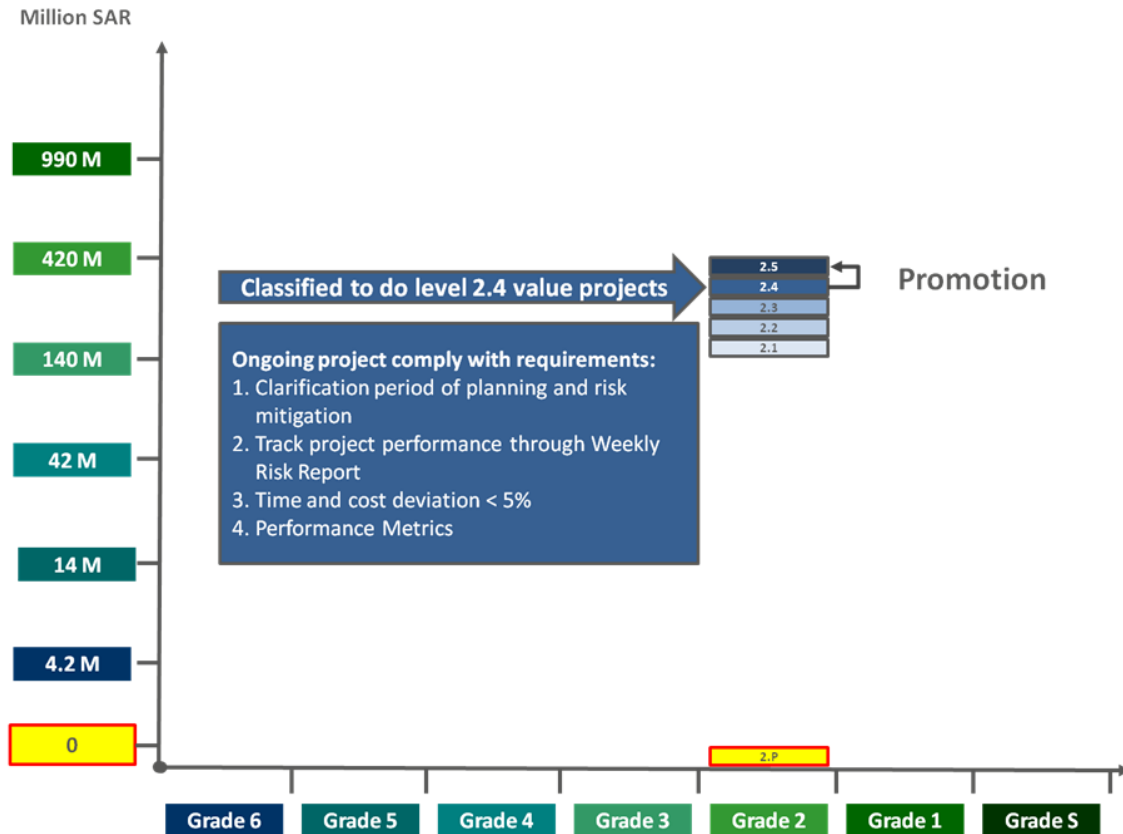


Figure 11. Example of Promotion of Sublevel. This figure illustrates a contractor that is a Grade 2 with a sublevel of 4 (2.4) is currently meeting all the ongoing project criteria and therefore is promoted to a sublevel of 5 (2.5).

When a contractor reaches the highest sublevel of 5, they can increase their grade (See Figure 12) if they meet the following requirements:

1. Perform a clarification period of planning and risk mitigation.
2. Track project performance through the Weekly Risk Report system.
3. Have a time and cost deviation < 5% (Caused by the contractor).
4. Have zero safety violations reported due to negligence.
5. Meet the financial criteria in the advancing grade (Working capital, asset turnover, and DuPont model).

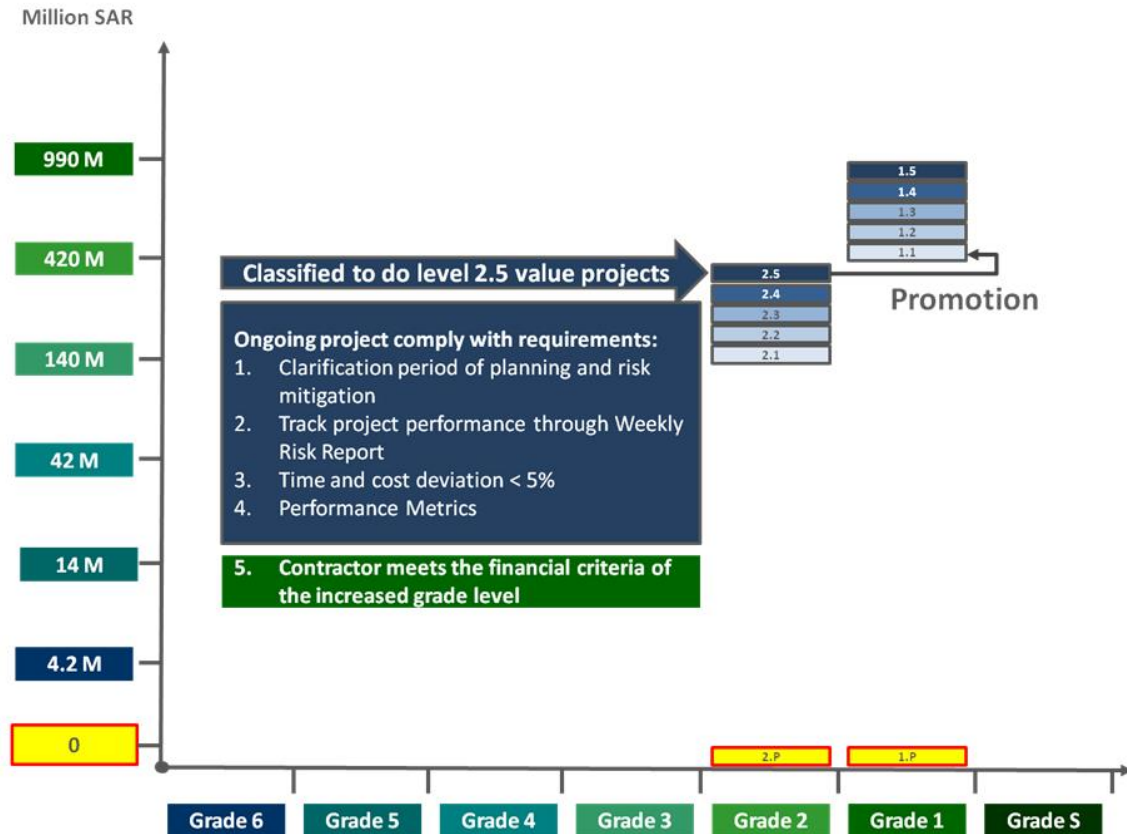


Figure 12. Example of Promotion of Grade. This figure illustrates a contractor in Grade 2, sublevel 5 (2.5) who meets all the requirements for grade promotion. The contractor is then promoted to Grade 1, sublevel 1 (1.1).

PROBATION STATUS

When a contractor fails to show they are capable to perform in their current grade, they are immediately flagged as a potential risk. To show inability to perform, a contractor must meet one of the following violations on an ongoing project:

1. Fail to perform a proper clarification period of planning and risk mitigation.
2. Fail to track project performance through the Weekly Risk Report system.
3. Have a time and cost deviation > 5%.
4. Be reported on a safety violation due to negligence.

The client’s project managers or engineers must validate that the contractor meets one of the above criteria, and report it to MOMRA. If the contractor is reported for failing to show capability to perform on **ONE** ongoing project, they are put on probation status denoted as *.P (See Figure 13). If a contractor fails to show capability to perform on **TWO** ongoing projects they are demoted a grade (See Figure 14). While in probation status, a contractor cannot participate in any *future* biddings to motivate the contractor to focus on addressing the issues. Note that this does not affect **current bidding processes** the contractor is a part of to prevent competitive misconduct.

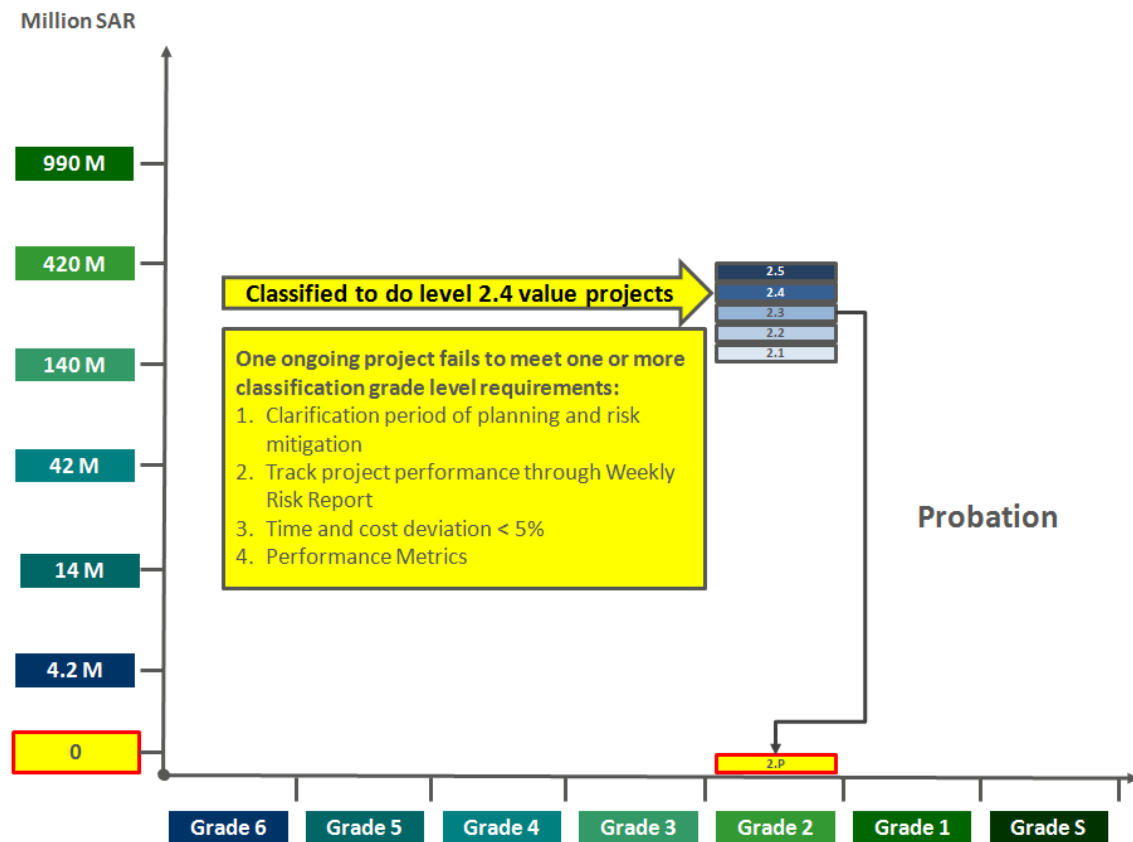


Figure 13. Example of Entering Probation Status. This figure illustrates a contractor in Grade 2, sublevel 4 (2.4) who is failing to meet one of the ongoing project criteria. The contractor is flagged and moved to Grade 2 probation status (2.P).

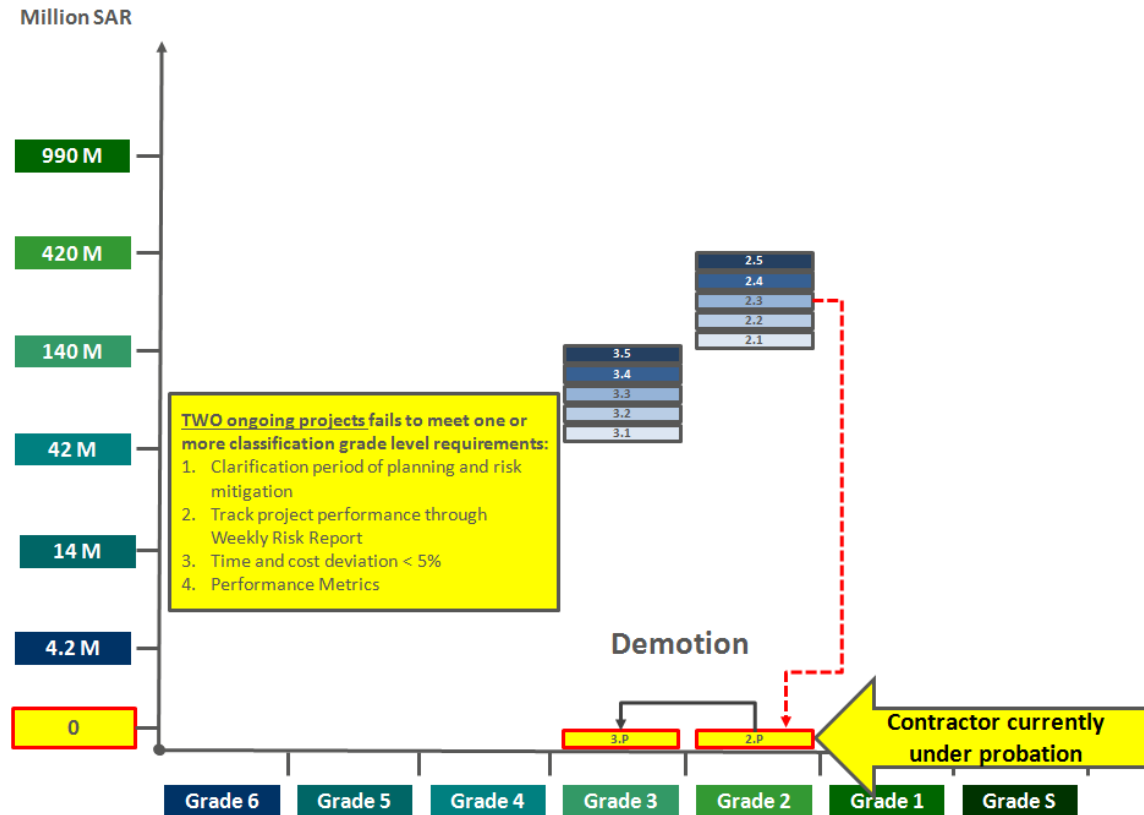


Figure 14. Example of Grade Demotion. This figure illustrates a contractor of Grade 2 probation status (2.P). This contractor has been reported to MOMRA for failing to meet one of the grade project requirements for a **second** project. The contractor is then demoted to Grade 3 probation status (3.P).

Once a contractor completes or corrects the non-performing projects, they will move out of probation status, their grade is set to their probation status grade, and their sublevel is determined by the following:

- If the contractor **did not receive** a grade demotion, then the contractor retains their previous sublevel (See Figure 15).
- If the contractor **did receive** a grade demotion, then the contractor's sublevel is set to 5, the highest sublevel for the demoted grade (See Figure 16).

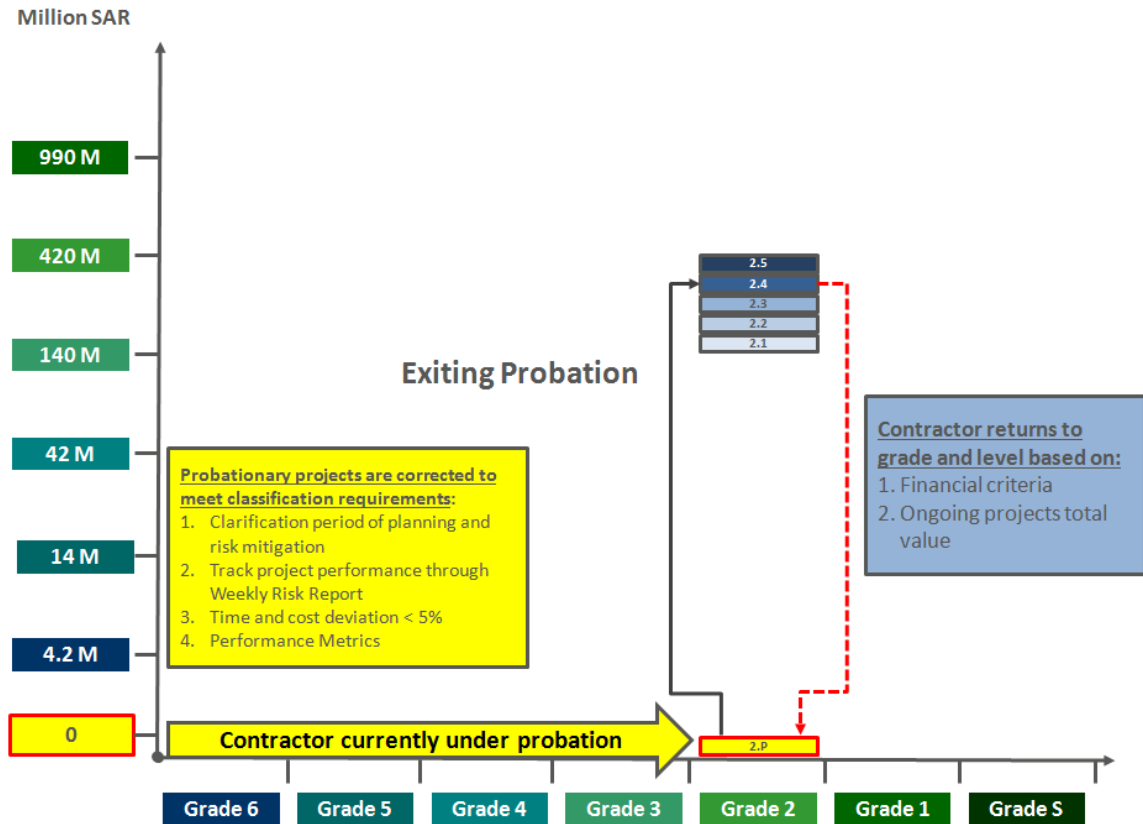


Figure 15. Movement Out of Probation Status with No Grade Demotion. This figure illustrates a contractor in Grade 2 probation status (2.P). The contractor now has all their ongoing projects meeting the grade’s project requirements. Because the contractor was not demoted to a lower grade while in probation status, the contractor retains their sublevel when they exit probation status (2.4).

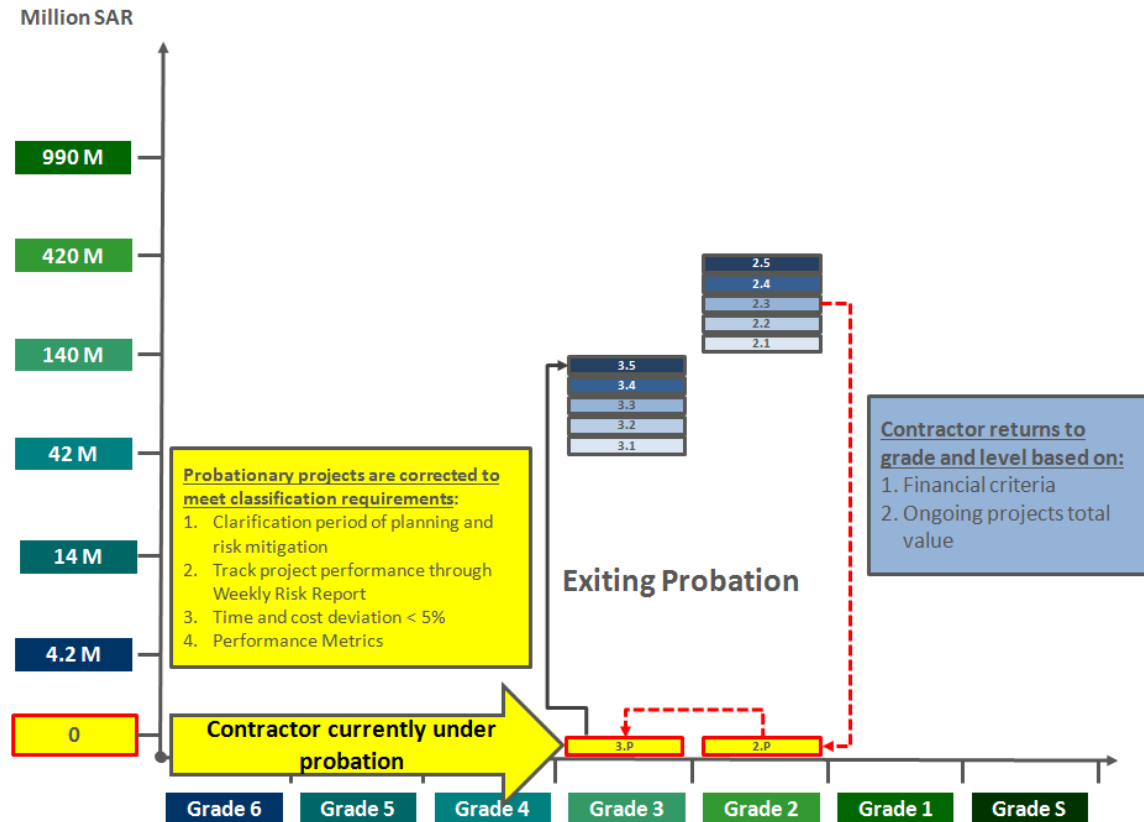


Figure 16. Movement Out of Probation Status with Grade Demotion. This figure illustrates a contractor in Grade 3 probation status (3.P) who was demoted from Grade 2 probation status (2.P). The contractor now has all their ongoing projects meeting the grade’s project requirements. Because the contractor was demoted, the contractor’s sublevel is set to the maximum sublevel of 5 when they exit probation status (3.5)

SUMMARY AND CONCLUSION

This new integration model in the CCS process is considered a paradigm shift in the Saudi construction industry as it would transform the classification agency and its system into a quality assurance group instead of an inspection and regulatory group. The WRR becomes a running record of the construction projects and provides accurate information of contractors’ performance (cost and time project deviations) and it defines the source of the deviations which can more accurately offer an objective indication of contractors’ performance. MOMRA will have performance information on all projects

performed by classified contractors. This performance information can be used to determine contractor's future classification status. Because contractors will document the performance on projects, it will increase the accuracy of the information and provide information to MOMRA to minimize decision making on a contractor's ability to perform and the classification grade which will motivate contractor performance. Transparency is created by the CCS becoming a recursive based system in which the classified contractors dictate their own movement in the CCS using their latest performance information. Additionally, whenever metrics are kept, and transparency is created, contractors are motivated to improve their performance.

CHAPTER 8: CONCLUSION

The Saudi Arabian construction industry (SCI) is perceived as performing poorly, and the Kingdom of Saudi Arabia has insufficient records of actual project performance. The Kingdom of Saudi Arabia created the Saudi Vision 2030 in 2016, with the purpose of increasing performance and transparency, and decreasing corruption across all industrial sectors. The government uses a Contractor Classification System (CSS) to ensure contractors are sufficiently qualified for the projects they receive. The Ministry of Municipal and Rural Affairs (MOMRA) oversees the CCS, and desires to improve the CCS to contribute to the SCI performance improvement.

SUMMARY OF THE STUDY FINDINGS

This goal of this study was to assist MOMRA by assessing and offering improvements to the CCS. To evaluate the perception of the SCI and the CCS, the study began with a survey of 510 randomly selected individuals who were involved in the SCI at the time of this study. The results of the survey showed the following:

- More than 90% of those surveyed agree that the construction projects in Saudi Arabia experienced delay and more than 50% of the total projects are delayed by more than 40% of the original schedule of the projects.
- More than 70% agree that the construction projects in Saudi Arabia experienced cost overrun and more than 30% of the total projects are cost overrun by around more than 20% of the original budget of the projects.
- More than 70% agree that the Saudi construction projects experiences low client satisfaction, safety issues, and quality issues.

- The CCS is perceived to have low satisfaction in terms of the performance of the classified contractors, the classification criteria, the transparency of the system, and the accuracy of the assessment of contractors' capabilities.

After the results of the survey were reviewed, a case study was performed which described the current CCS, and analyzed potential problem areas. The case study analysis outlined three main observations. First, the CCS does not have a continuous and accurate method of measuring the actual performance of classified contractors. Second, the CCS does not have a process to motivate contractors to improve their performance. Third, due to the current CCS process complexity and lack of transparency, MOMRA does not know if the existing CCS is accurate in assessing contractor capability and performance. Because of this, it is difficult to predict and understand what is required to become classified within a grade level and field.

The case study was followed by a review of literature of other CCSs worldwide. The review compared the Kingdom of Saudi Arabia's CCS with these other CCSs. The results of the comparison showed two major findings about the other worldwide systems. First, these systems are more up-to-date, simple, and transparent. Second, these systems are disconnected from contractors' performances. Additionally, a review of literature on worldwide performance measurement models (PMM) and performance benchmarking models (PBM) was conducted. The results found that none of the commonly used systems were appropriate for implementation in the CCS, especially since most of these models were developed theoretically rather than empirically, and these models lack metrics on their effects on increasing construction performance. The only model that was

found to have metrics was the Performance Information Procurement System/
Performance Information Risk Management System (PIPS/PIRMS).

SUMMARY OF THE PROPOSED CCS MODIFICATIONS

After the case study and literature about other CCSs, PMMs, and PBMs worldwide was review, the study proposed a new model for the Kingdom of Saudi Arabia's CCS. The new model modifies the existing CCS in four ways. First is a change to the current 5 grade model, which adds a superclass grade (Grade S) for mega projects, and a 6th grade (Grade 6) for all currently unclassified contractors. Second is a modification to the following criteria which are used to assess contractors' capabilities for appropriate classification: financial, equipment, client, project, and visits. Third is the addition of new criteria to be used in assessing contractors' capabilities with the goal of increasing performance and quality of contractors. The new criteria to be added are as follows: quality management; project management; health, safety, and environment; and sustainability. Fourth is a new process for evaluating the CCS contractor capabilities assessment results which uses minimum requirements. This replaces the current process of evaluation which is based on a mathematical points system. A test was performed on 5751 contractors who were classified at the time of the study. The test used the modified financial criteria and the new evaluation process, and the results showed that only 14% of the 5751 contractors are financially capable in their respective CCS grades.

In addition to these modifications, a new component is integrated into the proposed model using a new approach for measuring contractor performance called the Information Based Continuous Improvement (IBCI) Module which adapts PIPS/PIRMS to the CCS. This component integrates a Clarification Period, and a Weekly Risk Report

(Performance Information) into the CCS process. The integration of these steps into the CCS process is considered a paradigm shift in the SCI as it would transform the MOMRA into a quality assurance group instead of an inspection and regulatory group. The Weekly Risk Report becomes a running record of the construction projects and provides accurate information of contractors' performance (cost and time project deviations). This performance information can be used to determine contractor's future classification status. The Weekly Risk Report also defines the source of the deviations which can more accurately offer an objective indication of contractors' performance. Because contractors will document the performance on projects, it will increase the accuracy of the information and provide information to MOMRA and minimize subjectivity in decision making on a contractor's ability to perform and the classification grade. This adds transparency to the CCS process.

Through this proposed new model, MOMRA will have a more accurate assessment of contractors' capabilities and have a record of actual performance information on all projects performed by classified contractors. With every project being tracked and performance information constantly being measured and inserted into contractors' classification records, contractors will be motivated to increase their performance. This motivation for improvement and more accurate assessment of contractor capabilities and performance will contribute to improvement of the SCI performance.

RECOMMENDATIONS

This study recommends MOMRA does the following with the results of this study and the proposed new CCS model:

1. Run a test using the full proposed model on a sampling of classified contractors who are classified in each of the current CCS grades.
2. Evaluate the results of the test and determine what additional modification should be made to the model.
3. Educate and train MOMRA staff and contractors on how to use the model.
4. Fully implement the model after all MOMRA staff are educated and/or trained, and continue to educate and train contractors as needed after the implementation has occurred.

FINAL THOUGHTS AND FUTURE STUDY TOPICS

The hope of this study was to begin the improvement of the CCS and, with the implementation of the proposed new CCS model, more research can be done using the information gathered through the CCS process. If this model is implemented, studies could be done on the impact the new model has on the SCI and MOMRA. Other studies can be performed on this model to improve other CCSs from countries that are experiencing performance issues in their construction industries.

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APPENDIX A
SURVEY

Section 1 – Questions related to the respondent’s experience.

1.1. What is your business?

1.2. What is the sector type you work for?

1.3. What is/are the size of project/s have you participated in?

1.4 How many years of experience do you have?

Section 2 – Questions related to the performance of project/s you have been involved in.

Please answer the following questions based upon the projects that you have personally participated in.

1. What is the percentage of projects that were uncompleted within the initial contracted timeframe with no schedule overrun?
2. What is the average schedule overrun of the delayed project/s?
3. What is the percentage of projects that were uncompleted within the initial contracted budget with no cost overrun?
4. What is the average cost overrun of the project(s) that exceeded their budget?

Section 3 – Questions related to the construction performance

Please answer the following questions based upon your perception of the construction industry in Saudi Arabia in general.

1. The construction projects in Saudi Arabia experience cost overrun.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

2. The construction projects in Saudi Arabia experience schedule overrun.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

3. The construction projects in Saudi Arabia experience low client satisfaction with the end project result.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

4. The construction projects in Saudi Arabia experience safety issues.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

5. The construction projects in Saudi Arabia experience quality issues.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

Section 4 – Questions Related to the Contractors Classification System

Please answer the following questions based upon your perception of the Contractor Classification System (CCS) in Saudi Arabia in general.

1. You are satisfied with level of performance of classified contractors.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

2. You are satisfied with the current contractor's classification system.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

3. The CCS dose not accurately classifies contractors for the projects they are capable to perform.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

4. The CCS criteria and method of classifying contractors is complex and difficult to understand.
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

5. The current CCS is not transparent
 Strongly disagree / Disagree / I don't know / Agree / Strongly Agree

APPENDIX B CONTRACTOR
CLASSIFICATION SYSTEM WORKFLOW

The internal MOMRA reports used to define the current CCS model were:

1. *Final Report, Volume 1 Current Situation* (MOMRA, 2009).
2. *First Stage Report* (MOMRA, 2014).
3. *Field & Office visits* (MOMRA, 2015).
4. *Technical and Administrative Classification Processes* (MOMRA, 2016b).

Major steps in the workflow (see Figure B-1):

1. A non-classified contractor fills out the classification forms, including their desired classification grade, and submits them to MOMRA.
2. MOMRA officials accept the forms and go through the evaluation/classification process.
3. The contractor is classified or denied classification.
4. The contractor who is successfully classified can bid on construction work related to his or her classification field and grade for 4 years.
5. After 4 years, the contractor must resubmit classification forms.

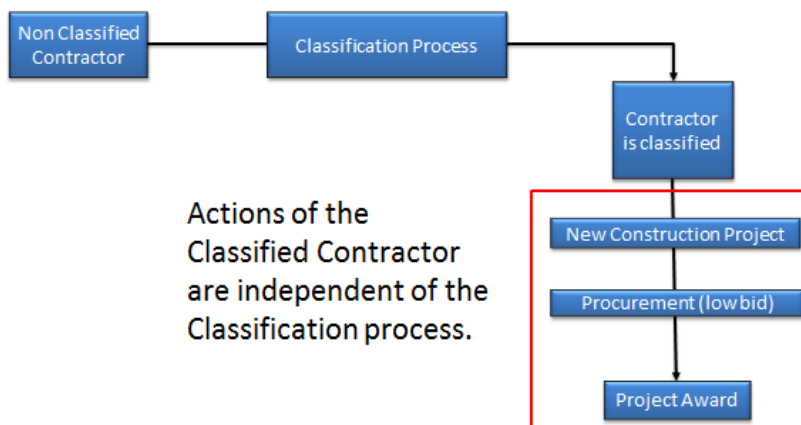


Figure B-1. Current CCS Process without Performance Assessment

OVERVIEW OF THE MODEL

A mathematical model is currently used in the CCS to evaluate contractors in one or more fields. The evaluation is done for 5 grades, where Grade 1 is the highest. There are 29 fields to be classified, 13 for Construction Works, 13 for Maintenance and Operation Works, and 3 for services. The criteria that determine the outcome of the CCS for a contractor who is seeking classification is divided into technical, financial, and legal categories.

In order to receive this information, MOMRA officials have created forms that all contractors must complete and submit to be eligible for classification. There are a total of 10 general forms to be filled out by the contractor, 4 forms to be filled out by MOMRA employees, and 1 form to be filled out by the contractor's clients. In this section a description of each of these sections of the model are given:

1. Classification Fields, Financial Grades, Financial Grade Limits.
2. Classification Criteria.
3. Classification Forms.
4. Classification Mathematical Model.

The current classification system operates within 29 fields and 5 grades. How the classification grades function is that if a contractor is classified in a certain field in Grades 2, 3, 4 or 5, he will be limited to a certain maximum financial value of a project he can carry out in his specific field. These fields and financial limits are given are shown in Figure 4 in Chapter 4.

Legal analysis. The legal analysis consists of pass/fail criteria which are used to determine whether the classification process can continue for the contractor. If the contractor passes the legal analysis, the technical and financial criteria analyses are used to determine if the contractor is eligible for his or her desired financial grade and field. The criteria are summarized in Table 4 in Chapter 4.

The main requirements in the legal analysis include items such as: (a) The address of the contractor's main office (Saudi contractor and non-Saudi), (b) Endorsement, (c) The names of the owners, partners, or major shareholders with their nationality and the proportion of capital held by the company, and (d) the field of classification being sought.

Financial and technical analyses. For each of the 29 fields, there exist a different number of criteria, modified slightly from the criteria shown in Table 4. The following criteria are identical for all 29 fields:

1. The Financial Analysis consisting of
 - a. The 3 criteria for Balance Sheet
 - b. The 4 criteria for Profit & Loss
 - c. The 4 criteria for financial ratios
2. The Project analysis consisting of 5 criteria
 - a. Project Value
 - b. Monthly Load
 - c. Yearly Load
 - d. High Value Projects
 - e. Continuity
3. The Visits analysis consisting of

- a. Site Visits
 - b. Head Office Visit
4. The other analysis consisting of the clients' surveys

Depending on the field, the following criteria will be modified:

1. Personnel criteria consisting of
 - a. Managers
 - b. Engineers
 - c. Technicians
 - d. Specialists
2. Equipment; depending on the nature of the field, this part consists of different types of equipment.

TECHNICAL CRITERIA DESCRIPTIONS

Personnel. Factors of quantity, practical experience, and academic qualifications are used to determine the capability of the following contractor personnel:

1. Managers: Determine the policies and objectives of the current and future relations towards the owners and customers.
2. Engineers: The presence of engineers is an indication that the contractor's performance is in accordance with the prevailing technical standards.
3. Technicians: Experienced assistant technicians reflect the efficiency and capability of the contractor.

Equipment. Equipment is a general indication of the ability of the contractor on the project implementation. Figure B-2 indicates which pieces of equipment are required for each classification field. Areas that have a “x” are required for that specific field. There are a few fields which are not required for Grades 4 and 5, as indicated by “4 * 5.”

Hardware	Buildings	Roads	Water and sanitation	Elec	Mech	Ind	Marine	Dams	Gardens	Parks	Wells
Crusher		x									
Concrete mixer	x	x						x	x		
Concrete pump	* 4. 5										
Mixer Truck	* 4. 5							x			
Tower crane	* 4. 5					x					
Mobile crane	* 4. 5		x	x	x	x	x	x	x	x	
Asphalt Mixer		x									
The uniqueness of Asphalt		x									
Roller rocker digger	x	x	x	x		x	x	x	x		
Bulldozer		x						x			
Download bulldozer	x	x	x	x		x	x	x	x		x
Abrasive smoothing		* 4. 5									
Trucks	x	x	x	x	x	x	x	x	x	x	x
Trolley tanker			x						x		
Wells digger											x
Bulldozer							x				
Boat							x				
Compressor					x	x			x	x	x
Electrical generator					x	x				x	x

Figure B-2. Equipment requirements. Note. Retrieved from Final Report, Volume 1 Current Situation. MOMRA, 2009. Internal report: unpublished.

Projects. The most important project indicators that reflect experience, capability and size include:

1. The cost of projects: Illustrate the extent of contractor capability in the developed area.
2. Monthly load: the highest load a contractor is capable of handling for one project.
3. Average highest annual load: Refers to the ability of the contractor to deal with the highest load of continuous work over a long period.
4. High-cost projects: Illustrate the handling of the implementation of large projects.

5. Continuity: An indication of the contractor's capability to perform work without interruption.

Reports. The *Reports* criterion includes three sub-criteria, Site Visits, Head Office Visit, and Client Surveys, which are described in this section.

Site Visits sub-criterion. A performance evaluation of a project is performed with an on-site visit to the project. This visit will allow agency representatives to get the real picture of the capability and effectiveness of the contractor. To do this visit, an agency employee fills out a special form that consists of four pages. During the visit, the agency employee will rate the contractor based on four main items:

1. General information about the project.
2. Regulation: An important indicator of the ability of the contractor's on-site management, good business performance, and the progress of the work.
3. The progress of work: Looking at the schedule for the project and the progress of the actual work.
4. Performance: Identify the quality of work performed and compliance with specifications.

The visit is rated on a scale of 100 marks with the following distribution of marks:

1. Regulation: Up to 50 marks.
2. The progress of work: Up to 30 marks.
3. Performance: Up to 20 marks.

For the areas of maintenance and operation, this visit is an evaluation of the actual work, and distributes marks as follows:

1. Regulation: Up to 70 marks.
2. Performance: Up to 30 marks.

Head Office Visit sub-criterion. The aim of the office visit is to check the validity of the financial, technical and administrative information that the contractor provided in his or her application for classification. Part of this is the verification of engineers and technicians employed by the contractor. Ratings of five key criteria are included. Each criterion has a maximum of 20 marks as follows:

1. Accounting systems and procedures.
2. Financial reports.
3. Cash control.
4. Delegation of powers, responsibilities, and internal control.
5. Account Management personnel evaluation.

Client Surveys sub-criterion. Client surveys show client confirmation of project data, work, and capability of the contractor to abide by the terms of the contract. The surveys also provide the clients' opinions of the quality of work, adherence to the terms of the contract, the organization and effectiveness of health and safety procedures, the cooperation of the contractor, and the progress of the work.

FINANCIAL CRITERIA DESCRIPTIONS

The financial criteria include the following:

1. Working capital (see Equation B-1): The ability to settle short-term debt shows contractor capability to reimburse others if necessary. It is the money which is produced by the company within one year after the repayment of short-term debt.

$$\text{Working capital} = \text{current assets} - \text{current liabilities} \quad (\text{B-1})$$

2. Liquidity ratios (trading) (see Equation B-2): These show the ability to repay short-term debt. This percentage reflects the number of times the current assets can cover current liabilities.

$$\text{Liquidity ratio} = (\text{Traded} / \text{Current Liabilities assets}) \times 100 \quad (\text{B-2})$$

Financial Ratios in which the use of the financial statements and balance sheet of the contractor for the last two years are the following:

1. Debt ratios (see Equation B-3): Measures the extent of reliance on debt financing investment compared with funding from the owners.

$$\text{Debt Ratios} = ((\text{Total liabilities} / \text{equity}), \text{the latest year for } x 2 (+) \quad (\text{B-3}) \\ (\text{total liabilities} / \text{equity}) \text{ for the previous year } x 1 (x 100)) / 3$$

2. Profitability ratios (see Equation B-4): Show the rate of return obtained by the owners as a result of their investments. This measures the company's ability to make a profit. It also evaluates the performance of the enterprise.

$$\text{Profitability ratios} = ((\text{Net profit} / \text{equity}), \text{the latest year for } x 2 (+) \quad (\text{B-4}) \\ (\text{net profit} / \text{equity}) \text{ for the previous year } x 1 (x 100)) / 3$$

3. Rates of efficiency and effectiveness (see Equation B-5): Demonstrates the ability to use the assets for the production of income. Measures the efficiency of the facility in the use of resources and the use of its assets to generate earnings.

$$\begin{aligned} \text{Rates of efficiency and effectiveness} = & \hspace{15em} \text{(B-5)} \\ & ((\text{Net profit} / \text{total assets}) \text{ last year} \times 2 + \\ & ((\text{net profit} / \text{total assets}) \text{ for the previous year} \times 1) \times 100) / 3 \end{aligned}$$

4. Total equity (see Equation B-6): Includes paid-up capital and the accumulation of undistributed profits. Measures the residual value for the owner of the facility rate after excluding the total assets and total liabilities.

$$\begin{aligned} \text{Total equity} = & ((\text{Total equity for the latest year} \times 2) + \hspace{15em} \text{(B-6)} \\ & (\text{Total equity for the previous year} \times 1)) / 3 \end{aligned}$$

5. Total assets (see Equation B-7): Assets illustrate the strength and effectiveness of contractor operations. Measures the value of assets' rate (fixed, and traded the other) in the facility to meet the obligations.

$$\begin{aligned} \text{Total assets} = & ((\text{Total assets for the last year} \times 2) + \hspace{15em} \text{(B-7)} \\ & (\text{total assets for the previous year} \times 1)) / 3 \end{aligned}$$

Financial Ratios evaluating the use of the financial statements and balance sheet of the contractor for the last three years are as follows:

1. Total revenue (see Equation B-8): The ability to obtain significant revenue necessary to continue. Revenue medium is the result of dividing the sum of the total revenue of the years in operation (sales, contracts, services and rents) by the total years in operation.

$$\begin{aligned} \text{Total revenue} = & (\text{Total revenue for the last year} \times 3 + & \text{(B-8)} \\ & \text{total revenue for the second year} \times 2 + \\ & \text{Total revenue for the first year} \times 1) / 6 \end{aligned}$$

2. Contract revenue (see Equation B-9): Show specialty contractor and the amount of revenue in the developed area for him. Dividing the output of contract revenue each year on the total years.

$$\begin{aligned} \text{Contract revenue} = & (\text{Contract revenue for the last year} \times 3 + & \text{(B-9)} \\ & \text{contract revenue for the second year} \times 2 + \\ & \text{contract revenue for the first year} \times 1) / 6 \end{aligned}$$

3. Net Income (see Equation B-10): Shows the increase in the net value of the facility as a result of operations during the fiscal year. Operating profit for the output operations after the addition of other income and deduction of Zakat (a tax) and other expenses.

$$\begin{aligned} \text{Net Income} = & ((\text{Net profit for the last year} \times 3) + & \text{(B-10)} \\ & (\text{Net profit for the second year} \times 2) + \\ & (\text{Net profit for the first year} \times 1)) / 6 \end{aligned}$$

4. Net Cash Income (see Equation B-11): Shows the net cash flow generated from operations all year. Generated cash flows of the main activities of the institution, which will be used to repay liabilities and funding for the short term or the long term.

$$\begin{aligned} \text{Net cash income} = & ((\text{Net cash income for the last year} \times 3) + & \text{(B-11)} \\ & (\text{net cash income for the second year} \times 2) + \\ & (\text{net cash income for the first year} \times 1)) / 6 \end{aligned}$$

CLASSIFICATION FORMS

There are 14 forms the contractor must fill in that must be accompanied by correct documentation. The correctly filled forms and supporting documentation contain all required information for a contractor to be classified within a selected field. The forms are summarized in Figure B-3.

<p style="text-align: center;">Technical Analyst 4 Forms</p> <ol style="list-style-type: none"> 1. F5: Statement of Principals 2. F6: Staff qualifications <ol style="list-style-type: none"> a. Summary b. Engineers c. Technicians / Specialist 3. F8: Project specific forms <ol style="list-style-type: none"> a. General information b. Stakeholder agreement 	<p style="text-align: center;">Financial Analyst 2 Forms</p> <ol style="list-style-type: none"> 1. F3: 3-year breakout (31 items) 2. F4: Statements of Revenue <ol style="list-style-type: none"> a. 3-year profit/loss (30 items) b. 3-year Project revenue 	<p style="text-align: center;">Legal Analyst 4 Forms</p> <ol style="list-style-type: none"> 1. F1: General information 2. F2: Company ownership 3. F7: Field classification 4. F10: Organizational structure
<p style="text-align: center;">MOMRA and Client 5 Forms</p> <p>A1. MOMRA Forms</p> <ol style="list-style-type: none"> (a) Head office visit (b) Site visit construction (c) Site visit maintenance & ops (d) Site visit catering <p>A2. Client Survey</p>		

Figure B-3. Classification forms

1. Form No. 1: Address, other branches, dates of Commercial Registration.
2. Form No. 2: Name of owners, partner or major shareholders with their percentages of capital. Form No. 2A: Name of owners, capital percentages, source and date.
3. Form No. 3: Financial statements (31 items) for the last three fiscal years (e.g. Assets, Liabilities).

4. Form No. 4: Statement of revenues (30 items) for the last three fiscal years (such as revenues and expenditure). Form No. 4A: Revenues for the last three fiscal years with nature of work (Construction Work or Maintenance & Operation Work), project names.
5. Form No. 5: Statements on Managers: Names, date of birth, area of qualification, certificate of qualification.
6. Form No. 6: List of employees: Total unskilled persons, Technicians, Engineers with Bachelor degree or higher; all separated into Saudis and Non-Saudis. Forms No. 6A and 6B: List of engineers and technicians with Name, graduation date, field of specialization, Iqama number or Passport number. A special part of these Forms is reserved to results of checks done by CCS controlling all statements.
7. Form No. 7: List of all fields where the contractor has to mark in which fields he wants to be classified.
8. Form No. 8: For each project, this form has to be filled in showing the value, the start, the duration, and the end of the project. A short description of the project is required.
9. Form No. 9: List of all equipment a contractor possesses.
10. Form No. 10: Organizational structure of the company.

The statements from these forms are used to calculate all criteria with the exception of Head Office Visit, Site Visits, and Client Surveys. For the latter there exist:

1. Four additional forms which are filled in by employees of MOMRA/CC. These forms are:
 - a. Form for Head Office Visit
 - b. Form for Site Visits Construction Works

- c. Form for Site Visits Maintenance & Operation Works
 - d. Form for Site Visits Services
2. There is one additional form, which is presented to clients to receive statements about their satisfaction and opinion of the contractor (Clients' Survey).

CLASSIFICATION MATHEMATICAL MODEL

For each field and each criterion, a number of points are allocated that add up to 100 points (see Figure B-4). The same criterion in different fields can have a different amount of points. For a few number of criteria, a certain amount of “additional points” is allocated. To determine a contractor’s number of points awarded, in each field and grade tables are used that are created based on an arithmetic mean of past historical data. These tables include the following:

1. A field
2. A criterion
3. A unit is allocated.
4. Number of points possible
5. Additional points if applicable
6. Min, Mean and Max Values (Bonus value when applicable) for each grade level.

Examples. For the financial criteria of Balance Sheet and Profit & Loss, this unit is “Millions of Saudi Riyals.” The financial ratio criteria are without dimension; the Unit is merely “Percent.” For the criterion Continuity of the Project Part, the Unit is “Years,” and for the visits and client survey, this Unit is “Marks.”

If the amount a contractor has for this criterion is less than the MIN value he will get zero points, if the amount is greater than the MAX value he will get all points. If the

value lies between MIN and MEAN, a linear interpolation is done and the contractor will get an amount of points lying between 0 and half of the attainable points. If the value lies between MEAN and MAX, a linear interpolation is done and the contractor will get an amount of points lying between half of the points and all of the attainable points.

For some criteria, a fourth value is given, the BONUS and a certain amount of additional points. If the value lies between MAX and BONUS a linear interpolation is done and the contractor will get an amount of points lying between the attainable points and the attainable points plus the additional points.

The Min, Max, Mean and Bonus numbers are calculated based on an arithmetic mean that is calculated from the current and past historical data of classified contractors. Three examples of this are given below. The first two examples have additional points. The third one does not have additional points.

After the points for the individual criteria are determined and points are given, the individual criteria points are summed up and classification is determined by the following rules:

1. Grade 1, 2, and 3 contractors must:
 - a. Reach at least 45 points in total.
 - b. Reach at least 7.5 points within the financial part.
 - c. Reach at least 7.5 points within the project part.
2. Grade 4 contractors must:
 - a. Reach at least 45 points in total

- b. He must have at least one project. Unless (a) for the field Dams, (b) classified in the field Roads with Grade 4 or better, (c) classified in at least one other field with Grade 1, Grade 2, or Grade 3, or (d) exception of service fields.
3. Grade 5: The contractor must reach at least a total of 40.5 points (no project is required).
4. A classified contractor in a certain Construction Work field receives same grade in the corresponding Maintenance field or Maintenance & Operation field.

Field: buildings					
Criterion: Total Assets					
Unit: SR Million					
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MIN	42.97	17.04	7.87	4.43	1.09
MEAN	139.14	55.11	22.4	12.45	2.19
MAX	365.37	149.77	61.19	25.58	6.94
BONUS	456.71	187.22	76.48	31.97	8.67
Points: 4.0					
Additional Points: 1.0					
Field: Marine Works					
Criterion: Engineers					
Unit: Number					
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MIN	12	6	2	1	0
MEAN	24	13	6	3	1
MAX	56	31	16	8	2
BONUS	84	46	24	12	4
Points: 5.0					
Additional Points: 2.0					
Field: City cleaning and Waste disposal					
Criterion: Head office visit					
Unit: Marks					
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
MIN	35	30	25	20	15
MEAN	55	50	45	40	35
MAX	75	70	65	60	55
Points: 5.0					

Figure B-4. Current CCS Assessment Point System. Note. Retrieved from Final Report, Volume 1 Current Situation. MOMRA, 2009. Internal report: unpublished.