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Benchmarking Performance Measurement of Egypt's Construction Industry

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Abstract

This paper reviews the importance of benchmarking project management performance using key performance indicators (KPI) to evaluate and to improve construction project management performance. A suitable research framework is established to measure project management performance.The paper provided benchmarking of the Egyptian market by applying KPIs measurements on three tier 1 contractors located in Egypt. The results confirm using benchmarking is essential to be applied because it helps construction companies to recognize its strength and weakness and carry out unremitting enhancement and improvement. The research methodology is applicable to be used on other countries with some modifications.

Keywords: Construction Industry; Benchmark; Performance Measurements; Key performance indicator (KPI); Managing projects; Egypt.

1. Introduction

The construction Industry represents almost 5% of the Egyptian GDP and employs about 8% of the Egyptian working force. The main problem facing the construction industry of Egypt is the lack of standard control tools to measure the project performance and to measure the overall company performance. Also compare the company performance with the mean of the local market.The UK has introduced Key Performance Indicators (KPI's) as a measuring tool for benchmarking and UK government supports KPI program to be spread across the country via number of offices. The purpose of the program is to reach a way of measuring project performance which is part of the organization performance assessment and this developed by identifying criteria.The purpose of this study is to set benchmarking for construction industry in Egypt, which is very important practice for large contractors in the local market to evaluate and develop the project management performance (PMP).

Literature Review

Benchmarking expresses the new method of resolving problems against the current method, where this new method is undertaken to show how it performs as it has been used by other earlier (Syuhaida, 2009). Construction Best Practice Program (CBPP) identify benchmarking as a systematic process of measuring and comparing the performance of the companies against each other, and using lessons learned and previous experience from the best to build targeted development. Benchmarking is used for two basic reasons; they are attempting to determine where they stand against key competitors, or they are learning and integrate successful ideas from the best companies (Acord, 2000).Benchmarking is defined as "a process used in management and mainly strategic management, in which organizations evaluate different aspects of their processes in relation to best practice, usually within the

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same sector". Benchmarking demonstrates the new technique of resolving problems against the existing technique, where this new technique is carried out to show how it performs as it has been used by others beforehand (Ismail and Yusof, 2009).Benchmarking types are divided into two sections; Informal and formal. The informal benchmarking is usually unintentionally implemented by the users while the formal benchmarking is developed based on a well planning.

Research methods

The research main objective is to set benchmarking for the construction industry for the Egyptian market, which helps the companies to measure their management performance relative to the other companies working on the same conditions and type of work. Research limitations are Projects' location and type; projects located on Cairo, Egypt and projects type are administrative and commercial buildings.

Research approach consist of four main stages; stage one is to select the key performance indicators (KPI) that affecting construction industry. Stage two contains applying KPIs measurement on projects. Stage three contains calculation of average KPIs for each company. Stage four contains develop of benchmarking for project management performance in Egypt.

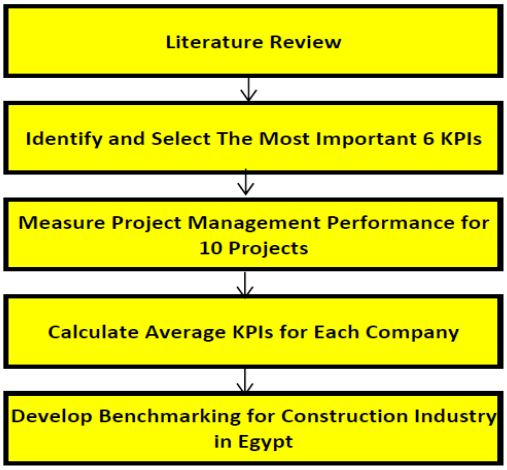

Figure no.1: Research Frame work

Stage 1: Select KPIs

On our research, we covered the implementation of KPI for assessing status of project performance. KPIs are collected from different countries and main twelve factors selected through ten professional engineers specialized on Egyptian construction industry for more than twenty years' experience. A questionnaire is prepared to assist the more important six KPIs, more than 150 engineers with minimum 8 years' experience participate on this survey. ANOVA test was applied on the collected data based on significance equal to 0.05, the selected KPIs are construction cost performance, construction time performance, quality management, safety management, cash flow indicators and customer satisfaction on product.

Stage 2: Apply KPIs on Projects

In this section; ten project constructed by three tier one contractors in Egypt will be studied. Contractor no.1 has four projects, Contractor no.2 has three projects, and Contractor no.3 has three projects.

1. **Company no.1**

The company is one of the leading Egyptian construction and real estate group in the Region; Egypt and Middle East, employs more than 11,000 people, founded the company in the 1930s. Four projects are selected within research limitations. Table no. 1 shows KPIs results for each project of company no.1.

Table 1: KPIs results for Company no.1

Sr.	KPI Name		Project 1	Project 2	Project 3	Project 4
1	Construction Cost Performance	=	90.0%	84.0%	88.0%	86.0%
2	Construction Time Performance	=	84.6%	100.7%	87.2%	90.6%
3	Quality Management	=	74.1%	90.0%	87.2%	90.2%
4	Safety Management	=	80.0%	90.0%	85.0%	84.0%
5	Cash Flow Indicators	=	93.1%	95.0%	91.0%	92.8%
6	Customer Satisfaction on Product	=	85.0%	90.0%	85.0%	85.0%

1. **Company no.2**

Company no.2 is an Egyptian Company employs more than 4,000 people, founded the company in 1991, ranked as one of the top 5 leading construction companies in the Egyptian Market. Data are collected for projects of commercial building sector which have three ongoing projects. Table no. 2 shows KPIs results for each project of company no.2.

Table 2: KPIs results for Company no.2

Sr.	KPI Name		Project 1	Project 2	Project 3
1	Construction Cost Performance	=	80.0%	90.0%	80.0%
2	Construction Time Performance	=	95.0%	81.7%	94.0%
3	Quality Management	=	98.9%	96.5%	97.1%
4	Safety Management	=	84.0%	88.0%	85.2%
5	Cash Flow Indicators	=	88.2%	91.4%	90.6%
6	Customer Satisfaction on Product	=	80.0%	90.0%	85.0%

1. Company no.3

Company no.3 is an Arab Company founded in 1989 and established Egypt branch on 2009, and it has a big branch in United Kingdom. The company is a vertically integrated construction group that is best known for delivering turnkey special projects especially that needs high quality standers. Data are collected for projects of commercial building sector which have three ongoing

projects. Table no. 3 shows KPIs results for each project of company no.3.

Table Error! No text of specified style in document.**.3: KPIs results for Company no.3**

Sr.	KPI Name		Project 1	Project 2	Project 3
1	Construction Cost Performance	=	84.1%	97.2%	98.8%
2	Construction Time Performance	=	95.8%	94.1%	93.3%
3	Quality Management	=	97.7%	98.6%	97.9%
4	Safety Management	=	86.8%	90.5%	88.7%
5	Cash Flow Indicators	=	84.5%	99.1%	95.3%
6	Customer Satisfaction on Product	=	85.0%	95.0%	90.0%

Stage 3: Determining averages KPIs for Each Company

To establish benchmark for Egyptian market, we need to determine company's average percentage for each KPIs by calculating average percentage of company's projects, then after that determine benchmark percentage KPIs for the three companies by calculating average percentage of the three companies.

1. Company no.1

Table 4 represents average percentage of KPIs calculated from four projects constructed by company no.1.

Table Error! No text of specified style in document.**: KPIs results for Company no.1**

Sr.	KPI Name	Project 1	Project 2	Project 3	Project 4	Average
1	Construction Cost Performance	90%	84%	88%	86%	**87%**
2	Construction Time Performance	85%	101%	87%	91%	**91%**
3	Quality Management	74%	90%	87%	90%	**85%**
4	Safety Management	80%	90%	85%	84%	**85%**
5	Cash Flow Indicators	93%	95%	91%	93%	**93%**
6	Customer Satisfaction on Product	85%	90%	85%	85%	**86%**

Figure 2 shows average percentage of construction cost performance KPI calculated from four projects constructed by company no.1, company's construction cost performance is laying between 84% and 90% with average 87%.

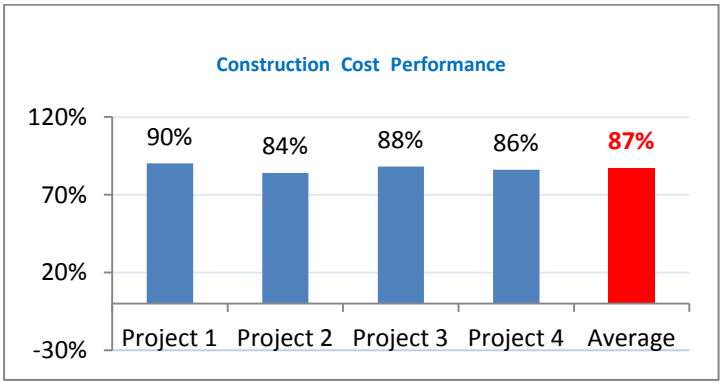

Figure 2: Average % for Construction Cost Performance - Company 1

Figure 3 illustrates average percentage of construction Time performance KPI calculated from four projects constructed by company no.1, company's construction time performance is laying between 85% and 101% with average 91%.

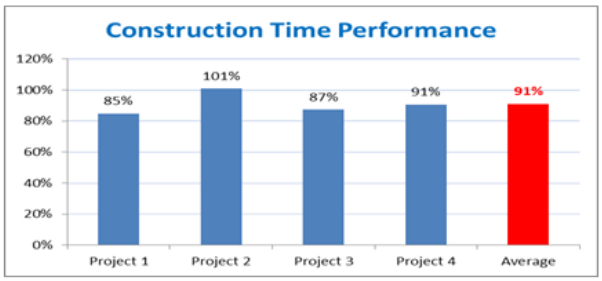

Figure 3: Average % for Construction Time Performance - Company 1

Figure 4 shows average percentage of quality management KPI calculated from four projects constructed by company no.1, company's quality management performance is laying between 74% and 90% with average 85%.

Figure Error! No text of specified style in document.**: Average % for Quality Management Performance - Company 1**

Figure 5 demonstrates average percentage of safety management KPI calculated from four projects constructed by company no.1, company's safety management performance is laying between 80% and 90% with average 85%.

Figure 5: Average % for Safety Management Performance - Company 1

Figure 6 shows average percentage of cash flow KPI calculated from four projects constructed by company no.1, company's cash flow performance is laying between 91% and 95% with average 93%.

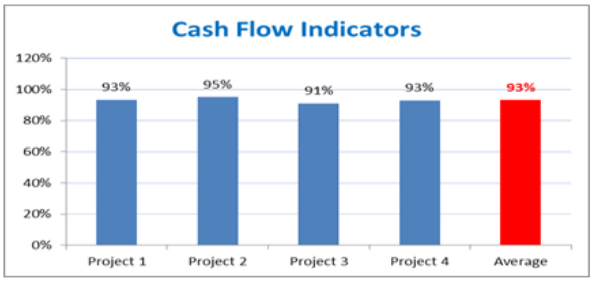

Figure 6: Average % for Cash Flow Performance - Company 1

Figure 7 demonstrates average percentage of customer satisfaction on product KPI calculated from four projects constructed by company no.1, company's customer satisfaction on product performance is laying between 85% and 90% with average 86%.

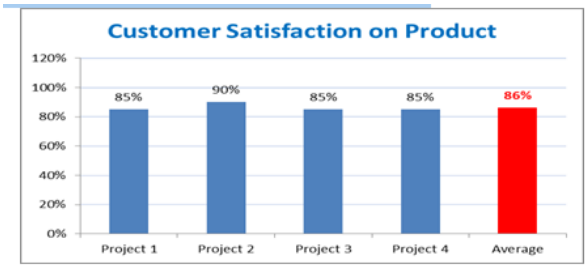

Figure 7: Average % for Customer Satisfaction on Product Performance - Company 1

Figure 8 summarizes averages of main KPIs for company no.1. Company 1; average construction cost performance KPI is 87%, average construction time performance KPI is 91%, average quality management performance KPI is 85%, average safety management performance KPI is 85%, average cash flow indicators performance KPI is 93%, and average customer satisfaction on product performance KPI is 86%.

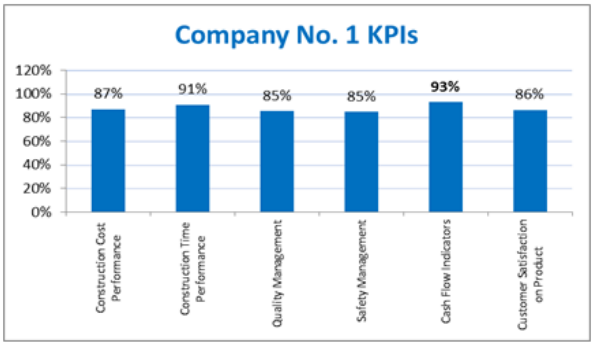

Figure 8: KPI Average % for Company 1

1. Company no.2

Table 5 represents average percentage of KPIs calculated from three projects constructed by company no.1.

Table 5: KPIs results for Company no.2

Sr.	KPI Name	Project 1	Project 2	Project 3	Average
1	Construction Cost Performance	80%	90%	80%	**83%**
2	Construction Time Performance	95%	82%	94%	**90%**
3	Quality Management	99%	96%	97%	**98%**
4	Safety Management	84%	88%	85%	**86%**
5	Cash Flow Indicators	88%	91%	91%	**90%**
6	Customer Satisfaction on Product	80%	90%	85%	**85%**

Figure 9 shows average percentage of construction cost performance KPI calculated from three projects constructed by company no.2, company's construction cost performance is laying between 80% and 90% with average 83%.

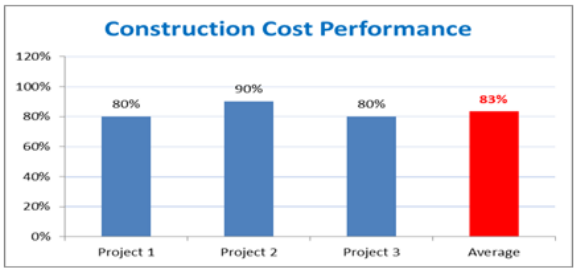

Figure 9: Average % for Construction Cost Performance - Company 2

Figure 10 illustrates average percentage of construction Time performance KPI calculated from three projects constructed by company no.2, company's construction time performance is laying between 82% and 95% with average 90%.

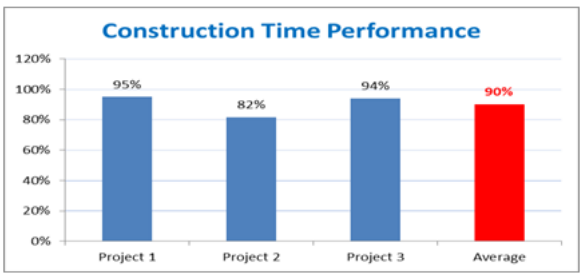

Figure 10: Average % for Construction Time Performance - Company 2

Figure 11 shows average percentage of quality management KPI calculated from three projects constructed by company no.2, company's quality management performance is laying between 96% and 99% with average 98%.

Figure 11: Average % for Quality Management Performance - Company 2

Figure 12 demonstrates average percentage of safety management KPI calculated from three projects constructed by company no.2, company's safety management performance is laying between 84% and 88% with average 86%.

Figure 12: Average % for Safety Management Performance - Company 1

Figure 13 shows average percentage of cash flow KPI calculated from three projects constructed by company no.2, company's cash flow performance is laying between 88% and 91% with average 90%.

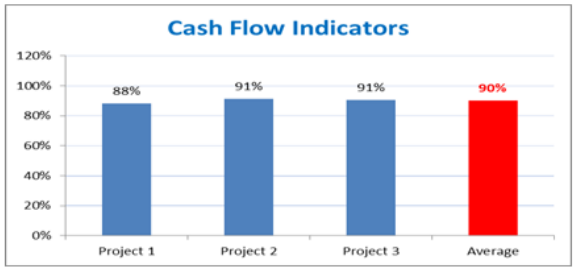

Figure 13: Average % for Cash Flow Performance - Company 2

Figure 14 demonstrates average percentage of customer satisfaction on product KPI calculated from three projects constructed by company no.2, company's customer satisfaction on product performance is laying between 80% and 90% with average 85%.

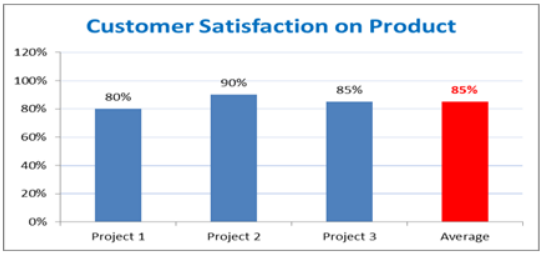

Figure 14: Average % for Customer Satisfaction on Product Performance - Company 2

Figure 15 summarizes averages of main KPIs for company no.2. Company 2; average construction cost performance KPI is 83%, average construction time performance KPI is 90%, average quality management performance KPI is 98%, average safety management performance KPI is 86%, average cash flow indicators performance KPI is 90%, and average customer satisfaction on product performance KPI is 85%.

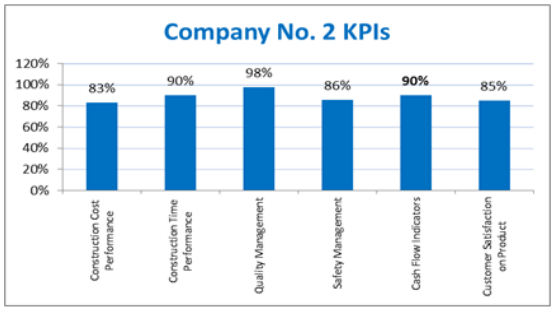

Figure 15: KPI Average % for Company 2

1. Company no.3

Table 6 represents average percentage of KPIs calculated from three projects constructed by company no.3.

Table 6: KPIs results for Company no.3

Sr.	KPI Name	Project 1	Project 2	Project 3	Average
1	Construction Cost Performance	84%	97%	99%	**93%**
2	Construction Time Performance	96%	94%	93%	**94%**
3	Quality Management	98%	99%	98%	**98%**
4	Safety Management	87%	91%	89%	**89%**
5	Cash Flow Indicators	84%	99%	95%	**93%**
6	Customer Satisfaction on Product	85%	95%	90%	**90%**

Figure 16 shows average percentage of construction cost performance KPI calculated from three projects constructed by company no.3, company's construction cost performance is laying between 84% and 99% with average 93%.

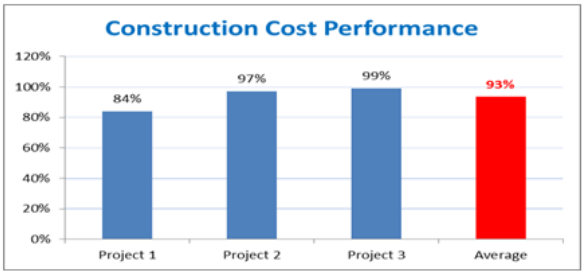

Figure 16: Average % for Construction Cost Performance - Company 3

Figure 17 illustrates average percentage of construction Time performance KPI calculated from three projects constructed by company no.3, company's construction time performance is laying between 93% and 96% with average 94%.

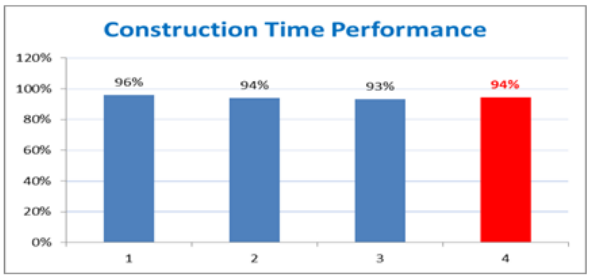

Figure 17: Average % for Construction Time Performance - Company 3

Figure 18 shows average percentage of quality management KPI calculated from three projects constructed by company no.3, company's quality management performance is laying between 98% and 99% with average 98%.

Figure 18: Average % for Quality Management Performance - Company 3

Figure 19 demonstrates average percentage of safety management KPI calculated from three projects constructed by company no.3, company's safety management performance is laying between 87% and 91% with average 89%.

Figure19: Average % for Safety Management Performance - Company 3

Figure 20 shows average percentage of cash flow KPI calculated from three projects constructed by company no.3, company's cash flow performance is laying between 84% and 99% with average 93%.

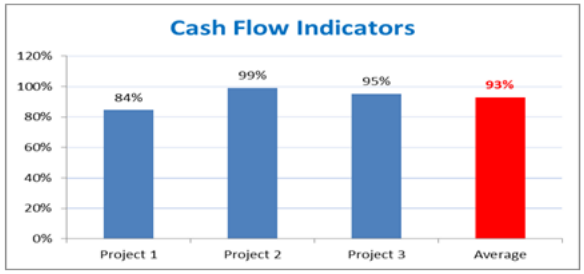

Figure 20: Average % for Cash Flow Performance - Company 3

Figure 21 demonstrates average percentage of customer satisfaction on product KPI calculated from three projects constructed by company no.3, company's customer satisfaction on product performance is laying between 85% and 95% with average 90%.

Figure 21: Average % for Customer Satisfaction on Product Performance - Company 3

Figure 22 summarizes averages of main KPIs for company no.3. Company 3; average construction cost performance KPI is 93%, average construction time performance KPI is 94%, average quality management performance KPI is 98%, average safety management performance KPI is 89%, average cash flow indicators performance KPI is 93%, and average customer satisfaction on product performance KPI is 90%.

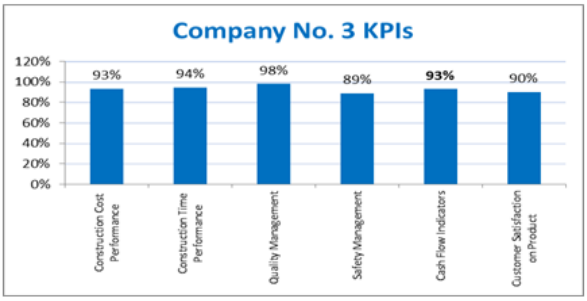

Figure 22: KPI Average % for Company 3

Stage 4: Determining benchmarking for Egyptian Market

On this section; KPI percentage for each indicators will be calculated and determined based on the previous section. KPI individually will be discussed on the next points then overall benchmark will be created.

1. Construction Cost Performance Index

Figure 23 shows construction cost performance KPI for construction industry in the Egyptian market as an average performance of the three companies. KPI value is 88% as an average between 83% and 93%.

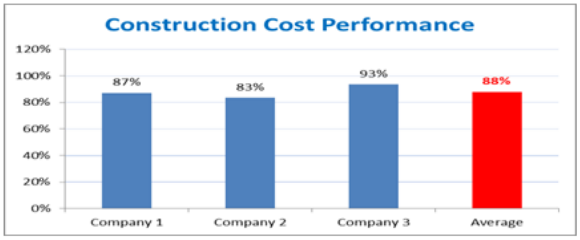

Figure 23: Construction Cost Performance Index

2. Construction Time Performance Index

Figure 24 shows construction time performance KPI for construction industry in the Egyptian market as an

average performance of the three companies. KPI value is 92% as an average between 90% and 94%.

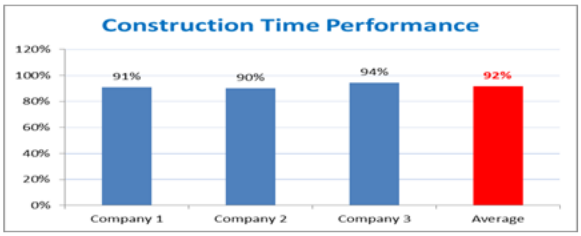

Figure 24: Construction Time Performance Index

3. Quality Management Performance Index

Figure 25 shows quality management performance KPI for construction industry in the Egyptian market as an average performance of the three companies. KPI value is 94% as an average between 85% and 98%

Figure 25: Quality Management Performance Index

4. Safety Management Performance Index

Figure 26 shows safety management performance KPI for construction industry in the Egyptian market as an average performance of the three companies. KPI value is 86% as an average between 85% and 89%.

Figure 26: Safety Management Performance Index

5. Cash Flow Indicators Performance Index

Figure 27 shows quality management performance KPI for construction industry in the Egyptian market as an average performance of the three companies. KPI value is 92% as an average between 90% and 93%.

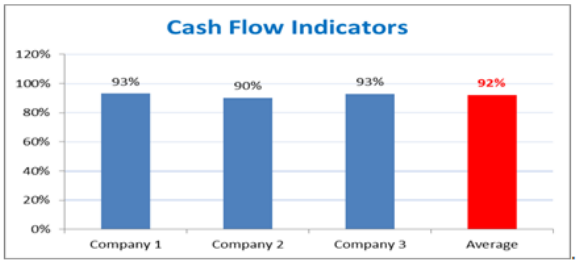

Figure27: Cash Flow Performance Index

6. Customer Satisfaction on Product Performance Index

Figure 28 shows Customer satisfaction on product performance KPI for construction industry in the Egyptian market as an average performance of the three companies. KPI value is 87% as an average between 85% and 90%

Figure 28: Customer Satisfaction on Product Performance Index

Results and Conclusion

The main goal and purpose of this paper is to study project management performance in Egypt by set benchmarking for project management performance.
Qualitative and quantitative methods are used to select main KPIs. Quantitative measures used to select KPIs from literature review then Qualitative analysis using SPSS software to ranking KPIs based on questionnaire replies to select top six KPIs.Three construction companies tier 1 share projects data that achieve research requirements, KPIs equations are implemented on ten projects to develop individual KPIs for each company then create benchmarking for the Egyptian market. The benchmarking results demonstrated on Figure 29.

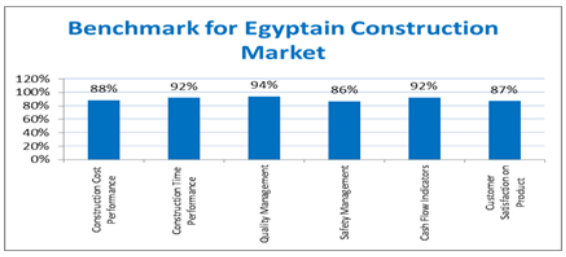

Figure 29: Customer Satisfaction on Product Performance Index

Results are very useful for Egyptian market and the used methodology in this research can be used on other countries by taking in consideration the differences between market environments.

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