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Lean Readiness Level of the Azerbaijan Construction Industry

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Abstract

This paper identifies and measures the Lean readiness of the Azerbaijan construction industry. A survey questionnaire was utilised to evaluate the Lean readiness of this industry by measuring its quality practices and to test three hypotheses. The Lean readiness framework developed by Al-Najem et al. (2013) was taken as a basis for this study; however, there can also be seen some adaptations made from the framework developed by Diekmann et al. (2003). The questionnaire was sent to 57 Azerbaijan construction companies, from where 20 responses were obtained. The results derived from the questionnaire showed that the Azerbaijan construction industry is not ready to implement the Lean methodology. It also found that there remains a lack of trust between employee and employer relations. Lastly, it is evident that the size of the companies does not play any considerable role on Lean readiness of construction companies and does not make any sense for choosing construction prerequisites. This study can be beneficial for those Azerbaijan construction companies that are interested in the implementation of Lean construction, or which are interested to increase their level of competitiveness.

Keywords: Lean, Lean Readiness, Construction Industry, Azerbaijan.

1. Introduction

With its complex mixture of employees, materials, plant, new technologies and with covering a wide range of activities, the construction industry is one of the most difficult industries to understand (Capon, 1990). However, despite its complicated structure, the construction industry creates one of the most profitable areas of any country's economy (Nuriyev, 2011). Thus, approximately 7.5% of all Azerbaijan economy consists of profits gained from this industry (Khalilzadeh, 2015). Nonetheless, in spite of its essential position in the country's economy, the construction industry with its many prerequisites, e.g. preparation of construction areas, unnecessary payments, which appear

during the process, and other factors, affect the efficiency of the construction process in Azerbaijan (Nuriyev, 2011). In that case, all these and other factors need to be examined to improve their performance.

By the late 20th century, Lean philosophy, initially applied in the manufacturing industry only, started to gain popularity into other industries (Bertelsen and Koskela, 2004; Dieste et al., 2019; Nadeem et al., 2017; Seifullina et al., 2018). In this line, the application of Lean tools, principles and techniques has also been attempted and examined in the construction industry (Ferng and Price, 2005). For example, Muhammad et al., (2013) reviewed the Lean construction components and determined that these might perfectly match with the Malaysian construction sector as well as decrease the amount of waste it generates. Furthermore, Huang et al., (2014), after making a comprehensive analysis between the manufacturing and construction industries, developed a conceptual model for Lean construction. Salem et al., (2006) contrasted the differences between the construction and production industries, claiming that even though many Lean construction tools are still in a developing stage, their immediate effect to the bottom line of projects increases their popularity among construction companies. However, considering the fact that the basis of Lean construction is made from the Lean manufacturing concept and that there is a significant number of articles which claim the unsuccessful implementation of Lean tools, principles and techniques (Achanga et al., 2006; Bhasin, 2013). In this case it would be necessary to measure the Lean readiness level before starting to implement this methodology.

Despite the fact that there seems to be no evidence of research to measure the Lean conformance level in the Azerbaijan construction industry, various authors (i.e. Common et al., 2000; Diekmann et al., 2003; Johansen and Walter, 2007; Senaratne and Wijesiri, 2008; Tezel and Nielsen, 2013) have conducted similar researches in their own countries. For example, Senaratne and Wijesiri (2008) conducted a survey using a questionnaire, utilising the Delphi Method for collecting practical data, in order to test the Lean suitability and acceptability level of the Sri-Lankan construction industry. Common et al. (2000) also pointed out the necessity to measure the penetration level of Lean ideas, concepts and tools into the UK construction industry. Furthermore, Johansen and Walter (2007) determined the recent awareness of Lean principles, techniques and trends in Lean development in the German construction industry. Tezel and Nielsen (2013)(Tezel and Nielsen, 2013) also carried out an analysis to explore the current understandings of the Lean concept and tools among construction contractors in Turkey. A similarity between the last two researches is that both of them measured Lean readiness by adapting a framework coined by Diekmann et al. (2003).

Considering the fast development of the Azerbaijan construction industry (Naghiyev and Huseynov, 2013) and that no research has been conducted to understand its ability to successfully implement and sustain Lean principles, methods and tools, this paper measures the Lean readiness level (LRL) of this industry by adapting a Lean readiness measurement framework developed by Al-Najem et al. (2013).

1.1 Research Aim

The aim of this research is to measure the Lean Readiness Level of the Azerbaijan construction industry by assessing their quality practices that can support the application of Lean construction. In order to achieve the aim of study following objectives were defined

1. Choose an existing framework to be adapted for and serve as the foundation for this research.
2. Develop a research instrument (i.e. questionnaire) to investigate the Lean construction and the related quality practices in the Azerbaijan construction industry.
3. To measure the Lean conformance level of the Azerbaijan construction industry.
4. To make an analysis of quality methods and Lean readiness level of the Azerbaijan construction industry.

2. Methodology

This research is both analytical and exploratory as it evaluates the Lean readiness level of the Azerbaijan construction industry, by analysing the collected data mainly quantitively using statistical techniques (Gill and Johnson, 2010). To collect data, a research instrument (i.e. questionnaire) was designed. The research uses a deductive approach as three hypotheses are set and the collected data is tested against them using inferential and descriptive statistics analysis.

2.1 Questionnaire Design and Data Collection

The questionnaire is the best tool to collect responses from different respondents, allowing them to respond at the time/location of their convenience (Saunders et al., 2012). In order to get valid and reliable data from a reasonable number of respondents, the design of the questionnaire is crucial (Saunders et al., 2012). An online questionnaire, using both the closed questions was developed in both the English and Azerbaijani language, for the ease of

understanding as not all respondents are fluent in English. The questionnaire had two major sections, to obtain background information regarding the respondent's company and to learn about quality practices of the organisation. The first section of the questionnaire was regarding the annual turnover, number of employee and company areas of operation. It provided information to test the 3 hypotheses of this research. The questions in the second section are mainly adapted from Al-Najem et al. (2013) and a few from Diekmann et al. (2003) to examine the organisations' current quality practices related to Lean construction.

A total of 45 closed-ended statements were developed in accordance to the six aspects namely: Process, Planning and Control, Customer Relations, Supplier Relations, Human Resource, and Top Management and Leadership. These statements collected opinion and behavioural data measured on the five-point Likert scale. The questions related to the first 2 aspects were describing frequency consisting of: never, very rarely, sometimes, frequently and always. The questions related to the remaining 4 aspects were describing agreement scales and consisted options of strongly disagree, disagree, neutral, agree, and strongly agree. Figure 1 presents the flow and design of the questionnaire. Furthermore, to collect additional comments regarding the subject, open-ended questions were plotted.

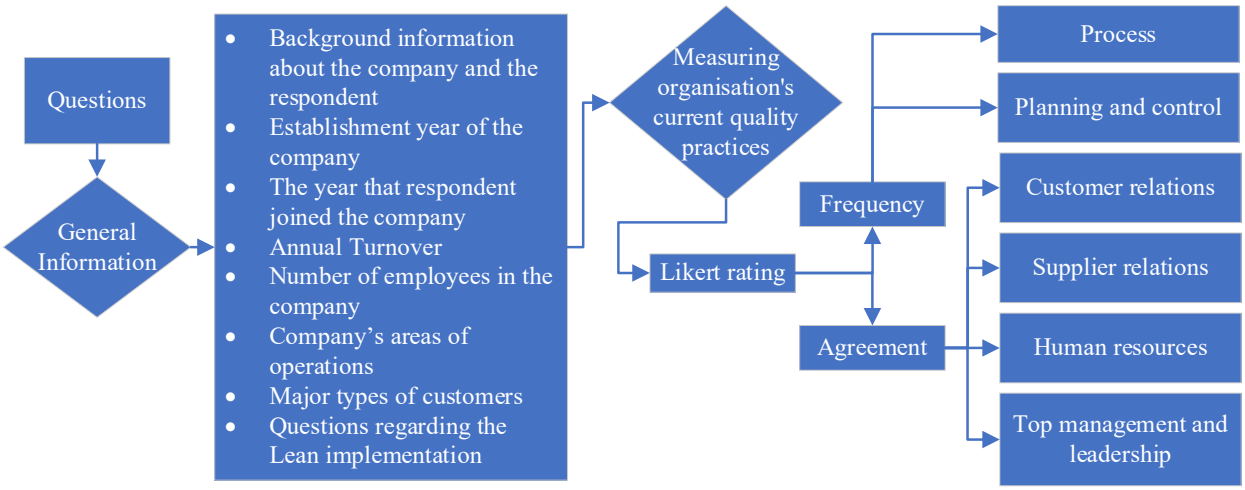

Figure 1. Design and flow of the questionnaire

Since reliability and validity in quantitative data is concerned with the stability of measure and construct of the questionnaire to represent the issue at hand, respectively (Bryman and Bell, 2007), the questionnaire was pilot tested with 2 Azerbaijan construction industry members. Few amendments were made based on feedback received. The questionnaire was distributed through email to 57 managerial level staff of the construction companies in Azerbaijan of which only 20 responded, representing a 35% response rate. The reason for seeking out input from the managerial staff was based on scholarly research (Diekmann et al., 2003; Johansen and Walter, 2007; Tezel and Nielsen, 2013) as they are more aware of the whole operating system of organisation rather than blue collared employees.

2.2 Data Analysis Method

Primary data was collected through an online questionnaire using Survey Monkey and the analysed in two stages. First, descriptive statistical analysis indicating the frequency of occurrence was conducted using the Microsoft Excel software. In second stage, inferential statistical analysis was conducted (using SPSS software) to measure the LRL of the Azerbaijan construction industry. Furthermore, for comparison between the variance of the dependent and independent variable t-test was conducted followed by Levene's F-test to examine the correlation between variances.

3. Analysis Results

3.1 Organisations' Profiles

As mentioned earlier only managerial level of the construction industry in Azerbaijan was considered most appropriate for this study. The profile of the respondents and their proportion to the total data is described in Table 1. Figure 2(a) describes the number of employees in these companies. Only 8 respondents' companies have less than 100 employees, whereas others have more than a hundred. Companies with less than 100 employees are considered as SMEs. Figure 2(b) illustrates the area of specialisation of respondents' companies. Majority of these are operating in residential and commercial buildings. Furthermore, respondents were asked about their preference of customer type to work with,

being local or outside their locality. Most respondents cautiously referred to local customers, whereas the other 45% of companies do not have any issues with the customers' location.

Table 1. Profile of Research Participants

Job Title	**%**	**Job Title**	**%**
General Manager	10%	Project Manager	5%
Assistant of General Manager	15%	Financial Director	5%
Construction Manager	20%	Deputy General Director	5%
Commercial Director	5%	Operations Coordinator	5%
Business Development Manager	5%	Quality Manager	5%
Contract Manager	5%	Director of Department	5%
Marketing and Investment Manager	5%	Tender Specialist	5%

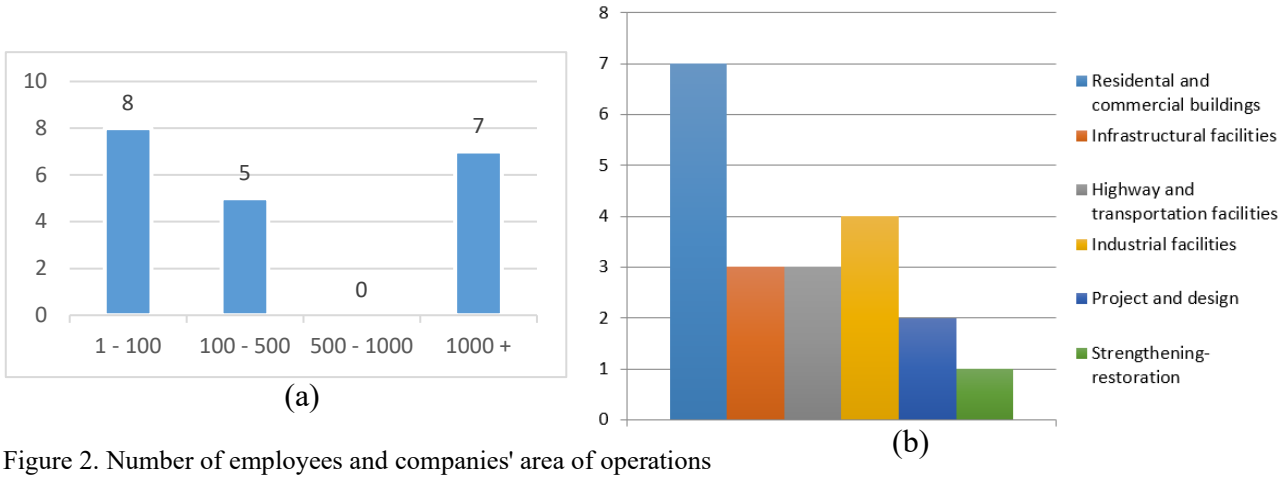

Figure 2. Number of employees and companies' area of operations

When asked about Lean implementation in their business practices, 16 out of 20 companies (78.95%) have never implemented/adopted Lean. However, only 4 companies (21.05% of all respondents) have implemented Lean but they further pointed to the fact that they have only partially implemented Lean methodology into their organisations.

3.2 Results for Lean Readiness Level

The second part of questionnaire assesses the LRL of Azerbaijan construction industry while exploring the answers to the research question, "*Does the Azerbaijan construction industry have an extensive quality system that can support the implementation and sustainment of Lean construction?"* This section of the questionnaire consisted of statements regarding quality practices of the organisations, and the five-point Likert scale was utilised for ranking the response. Figure 3 presents the distribution of mean scores of the six quality practices as portrayed by the 20 respondents.

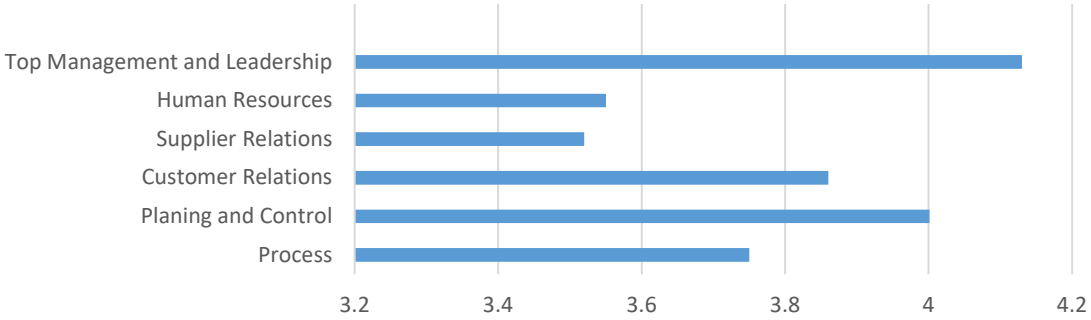

Figure 3. Distribution of the responses as mean scores

Senaratne and Wijesiri (2008), while measuring LRL of Sri-Lankan construction industry, identifies that companies that exceed a mean score of 3.00 can be considered as ready to apply Lean methodology. However, given the differentiation of this study in terms of data collection procedure and approach, it was considered best to identify a more reliable mean score. Given the similarity of procedure of research conducted by Al-Najem et al. (2013) in the manufacturing sector, the minimum mean score of 4.00 was defined as an indicator for LRL for this study as well.

Taking into consideration all 20 responses, the highest LRL was obtained from aspect of top management and leadership, with a mean score of 4.13, followed by planning and control with a mean score of 4.001 (see Figure 3). Despite these 2 high mean scores one of the main aspects, supplier relation, had the lowest score. The mean score for this aspect remains steadily in the average 3.53. Another important aspect, human resource, also gained a low mean score of 3.55. Process (3.75) and customer relations (3.86) with slight differences in the scores stand in the middle between two highest and two lowest aspects. Considering quality practices of all six aspects, the average mean score for Azerbaijan construction industry is 3.8 which is less than minimum mean score 4. Thus, it indicates that the Azerbaijan construction industry is still not ready to apply Lean methodology.

3.3 Hypothesis Testing

To test the three-hypothesis developed earlier, inferential statistical analysis was conducted. This testing helped to capture the real bottlenecks that hinder the Lean readiness of Azerbaijan construction industry. In order to analyse the first hypothesis, data from statements regarding quality aspect have been analysed. For the second hypothesis, the data gained regarding quality practices in other five aspects have been taken into consideration, whereas the third hypothesis is more focused on the aspect regarding supplier relations. As a starting point, the mean scores of two variables are compared, afterwards, independent sample t-test is launched to evaluate whether the mean value of the test variable differs considerably from the mean value of the other variable. In order to analyse the homogeneity of variances, Levene's F test has been conducted. Moreover, the significance level with 95% of confidence interval has been conducted at 0.05 (α- level= 0.05). In this sense the first hypothesis can be seen as follows: *H_1: Azerbaijani SME, in order to increase their level of competitiveness, pay more emphasis on improving on-site production, whereas large companies put more emphasis on a one-of-a-kind prerequisite.*

The SME group (*N*=8) was associated with an on-site production volume *M*=3.58 (*SD=.38*), whereas the volume *M*=3.86 (*SD*=26) for SME has been conducted for the one of a kind group (see Table 2). By comparison, the large companies (*N*=12) was associated with numerically bigger on-site volume *M*=3.74 (*SD*=72), in contrast, the volume *M*=3.78 (*SD*=69) gained from large companies for one of a kind group was associated numerically small number than SMEs. In order to test the hypothesis shown above, an independent t-test was performed.

Table 2. Descriptive statistics results and Assumption of Normality for Hypothesis 1

	Company size	N	Mean	Std. Dev.	Std. Error Mean
On site production	SME	8	3.58325	.381116	.134745
	Large	12	3.74008	.722008	.208426
One-of-a-kind	SME	8	3.86513	.268709	.095003
	Large	12	3.78150	.692803	.199995

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
	.071	.512	-1.078	.992
	-.126	.512	-.267	.992

As can be seen in Table 2, in both cases SMEs and large companies were adequately normal for the purposes of conducting t-test. According to the rule developed by Schmider et al. (2015), if skewness is smaller than the absolute value of 2 (skewness $< |2|$) and kurtosis smaller than the absolute value of 9 (kurtosis $< |9|$) the robustness of normal distribution can be confirmed. Furthermore, in order to come with a single number that can be seen whether it falls within the defined range or not, it requires simply dividing the statistic score with the score of standard error.

Furthermore, the assumption of homogeneity of variances was tested via Levene's F test (see Table 3). In both cases the assumption of homogeneity has not met the requirements, whereas both Sig (.009) for on-site production and Sig (.011) are smaller than the level of significance (α-level= 0.05). In this sense, the null hypothesis (H_0) for homogeneity is rejected while claiming that there is a significant difference between two independent groups in both cases. Thus, for evaluating the difference between two groups the bottom line of the table (equal variance is not considered) is going to be used for analysing the hypothesis.

While taking into consideration the column Sig (2-tailed) p-value in both cases are higher (see Table 3) than the previously determined significance level (α-level= 0.05). Thus, for the mean score, the Null hypothesis (H_0) is

accepted while rejecting the Alternative hypothesis (H_1). Additionally, the null hypothesis can be seen as follows: *H_0: Azerbaijani SMEs, in order to increase their level of competitiveness, do not put more emphasis on improving on-site production, whereas large companies do not put more emphasis on one of a kind prerequisite either.*

Table 3. Independent t-test for Hypothesis 1

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
On-site production	Equal variance assumed	8.633	.009	-.561	18	.582	-.156833	.279529	-.744102	.430436
	Equal variance not assumed			-.632	17.353	.536	-.156833	.248188	-.679655	.365988
One-of-a kind	Equal variance assumed	8.144	.011	.323	18	.750	.083625	.258762	-.460014	.627264
	Equal variance not assumed			.378	15.300	.711	.083625	.221413	-.387500	.554750

Finally, the first hypothesis can be assumed as rejected, indicating that company size does not play a considerable role while putting more emphasis either to on-site production or one of a kind prerequisite for increasing company's performance. Thus, it can be pointed out with 95% confidence that none of the Azerbaijani construction companies has any significant difference from each other, from the point of emphasising the prerequisites to increase the level of competitiveness. The same approach was used to analyse Hypothesis 2 (H_2).

H_2: Small and medium-size companies in Azerbaijan differ considerably from large companies in terms of their quality practices.

The standard deviations and mean scores of five quality practices can be seen in Table 4 indicates that the mean scores of large companies regarding planning and control, human resource and top management and leadership are higher than mean scores gained from SMEs. However, the mean scores gained from SMEs for the process and customer relations are slightly higher than large companies. Thus, independent t-test needs to evaluate whether there is a major difference between large companies and SMEs with reference to quality practices.

Table 4. Descriptive statistics, and skewness and kurtosis for the assumption of normality of the second hypothesis

	Company size	N	Mean	Std. Dev.	Std. Error Mean
Process	SME	8	3.822916667	.4305715563	.1522300336
	Large	12	3.756944444	.8183951508	.2362503303
Planning and Control	SME	8	3.100	.8685	.3071
	Large	12	3.367	1.1781	.3401
Customer Relations	SME	8	4.125000000	.3421454253	.1209666752
	Large	12	3.680555556	.6979708444	.2014868275
Human Resource	SME	8	3.538	.6632	.2345
	Large	12	3.650	.6842	.1975
Top management and Leadership	SME	8	4.125	.3536	.1250
	Large	12	4.267	.5929	.1712

Skewness	Kurtosis
-0.41	-0.248
0.13	-0.01
-0.31	-0.084
-0.72	-0.98
0.35	-0.01

First of all, the null hypothesis (H_0) is created as, *"small and medium-size companies in Azerbaijan do not differ considerably from large companies in terms of quality practices"*. Consequently, H_1 becomes an alternative hypothesis. Secondly in order to meet the requirement of the second assumption the same process as for the first hypothesis, to test the normality of assumption was conducted. Based on results shown in Table 4 the normality assumption for the second hypothesis can be confirmed.

Thirdly, to meet the requirements of the last assumption, the Levene's F test of homogeneity of variance was conducted. To begin, a null hypothesis (H_0) for distribution is created, which assumes that *"there is no significant difference between two groups regarding all quality aspects"*. Table 5 shows that homogeneity of variance is satisfied in all quality aspects, except top management and leadership. Thus, the null hypothesis is accepted while assuming that variances are equal for the process, planning and control, customer relations, human resource, whereas only for top management and leadership variance of homogeneity is rejected as variances are not equally assumed.

Finally, the scores in the first line of the column Sig (2-tailed) considered as a (*p-value*) has been taken for measuring the null hypothesis (H_0) for mean scores. The null hypotheses for the mean score is follows: *H_0: Small and medium-size companies in Azerbaijan do not differ considerably from large companies in terms of their quality practices.*

Table 5. Independent t-test results for the second hypothesis

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Process	Equal variance assumed	4.109	.058	.208	18	.837	.0659722222	.3166889595	-.599366593	.7313110372
	Equal variance not assumed			.235	17.335	.817	.0659722222	.2810483975	-.526117096	.6580615403
Planning and control	Equal variance assumed	1.795	.197	-.547	18	.591	-.2667	.4877	-1.2912	.7579
	Equal variance not assumed			-.582	17.730	.568	-.2667	.4582	-1.2304	.6970
Customer relations	Equal variance assumed	4.072	.059	1.662	18	.114	.4444444444	.2674087059	-.117360399	1.006249288
	Equal variance not assumed			1.891	16.907	.076	.4444444444	.2350103788	-.051591659	.9404805477
Human resource	Equal variance assumed	.090	.767	-.365	18	.720	-.1125	.3086	-.7609	.5359
	Equal variance not assumed			-.367	15.495	.719	-.1125	.3066	-.7642	.5392
Top management and leadership	Equal variance assumed	8.261	.010	-.605	18	.553	.1417	.2343	-.6338	.3505
	Equal variance not assumed			-.668	17.873	.512	.1417	-.2119	-.5872	.3038

Since the top management and leadership aspect have failed the null hypothesis for homogeneity, all the information in the second line (equal variances not assumed) especially information in the column Sig (2-tailed) were compared with a significance level (α-level= 0.05). The independent sample t-test did not succeed in showing any significant difference between Azerbaijani SMEs and large companies in terms of the use of quality practices. Thus, the null hypothesis (H_0) for mean scores has been accepted while rejecting the alternative hypothesis (H_2).

H_3: Relations between suppliers and large construction companies are better managed rather than small and medium construction companies.

To analyse the third hypothesis, a descriptive statistical analysis was performed. As seen in Table 6, two main groups were compared for the difference between mean scores. The mean value for SME (*N=8*) regarding supplier relations was found to be *M=3.6 (SD= .38)* and for large companies (*N=12*) it was *M=3.7 (SD= .52)*. In order to test the relations between suppliers and Azerbaijani construction companies, the independent t-test was performed.

Table 6. Descriptive statistics results, and skewness and kurtosis for the assumption of normality of the third hypothesis

	Company size	N	Mean	Std. Dev.	Std. Error Mean
Supplier relations	SME	8	3.59375	.376485	.133108
	Large	12	3.69792	.523478	.151115

Skewness	Kurtosis
0.86	-0.084

As previously, before testing the homogeneity of variance, normality assumption was tested. Table 6 confirms that both skewness and kurtosis meets the requirements of the robustness of normal distribution as per the rule developed by Schmider et al. (2015). Levene's F test satisfied the requirements of homogeneity, whereas the value of Sig (.287) is bigger than the significance level (α-level=0.05). Thus, with equal variances assumed, there is no significant difference in supplier relation scores *t (18)=-.484, p=-.63* (2-tailed), in scores for SMEs (*M= 3.6, SD=.38)* and the large companies *(M= 3.7, SD= .52)*. The magnitude of difference between mean scores was -.104 with a 95% confidence interval of -.56 to -.34. Thus, it means that the null hypothesis (H_0) is accepted while rejecting the third hypothesis (H_3). The results of the independent sample t-test perceive that despite numerical differences between the mean scores of SMEs and large companies, the company size does not play a main role in supplier's relations.

Table 7. Independent sample t-test results for the third hypothesis

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Supplier Relations	Equal variances assumed	1.204	.287	-.484	18	.634	-.104167	.215341	-.556581	.348248
	Equal variances not assumed			-.517	17.827	.611	-.104167	.201379	-.527542	.319209

4. Discussion of Results

The descriptive analysis suggests that Azerbaijan construction industry is not ready to apply Lean methodology. Therefore, it's best to analyse all quality practices while comparing them with the findings of other scholarly written articles. **Planning and Control** gained the lowest score among other quality constructs (*M=3.26*). Under this, the problem-solving statements scored the lowest (*M=2.75 and M=3.35*), indicating that the companies do not stress on structured and defined problem-solving techniques such as Fishbone diagram or 5 Whys, nor are they aware/committed to the importance of waste reduction in their processes. Moreover, since most companies (55%) prefer local rather than foreign customers, this decreases and/or keep the benchmarking level stagnant. Competing in the overseas market and evaluating companies' strengths and weaknesses will open new prospects for development.

The practices related to **Supplier Relations** gained the second-lowest score among other quality constructs (*M=3.5*), however, the literature suggests that building cooperative relations with suppliers is one of the critical success factors for companies (Bankvall et al., 2010) and lead to successful Lean implementation (Andersson et al., 2006). Under this category, statements regarding the number of suppliers and quality of suppliers scored 3.3 and 3.4, respectively, indicating that Azerbaijan construction companies are not willing to establish long-term relations with their suppliers. This kind of unwillingness can be sourced from several factors such as suppliers of this industry do not have enough capacity to fulfil its customers' (contractors') needs or there are some big suppliers which hold the majority of market share while decreasing the level of competitiveness which consequently decrease the quality of products, etc.

Scholars strongly emphasise that **Human Resource** creates a foundation for all quality management systems (Achanga et al., 2006; Andersson et al., 2006), however, the analysis revealed the third-lowest score in this aspect (*M=3.55*). Statements regarding participation, involvement and training scored the lowest. Scholars claim that involving employees into the Lean implementation process through increasing their level of literacy and organising special training for them can be seen as one of the most necessary and critical success factors for any organization (Alhuraish et al., 2017). An interesting insight occurred with the highest score for a statement related to skilled people (*M=3.95*). This implies that construction companies are aware of the importance of employees' skills, however, they are not committed to either listen to the voice of their employees or apply their idea into the process.

The **Process** is the fourth-lowest scored aspect among quality practices (*M=3.75*). Statements regarding 5S, optimisation of production system and Total Preventive Maintenance (TPM) were scored the lowest score among other statements. These are one of the first steps in the Lean implementation process (Nadeem et al., 2019).

The score related to **Customer Relations** aspect was fairly high (*M=3.86*) indicating that the Azerbaijan construction companies try to increase and improve their customer relations. However, the statement related to the customer awareness scored low (*M= 3.5*), indicating the lack of awareness of customers' needs. Hence, this factor leads to a perception that construction companies do not have a proper ability to design, schedule and make the customer to buy their product; which considerably does not meet with the requirements of "*Pull*" concept (Womack and Jones, 1994).

Finally, **Top Management and Leadership** is the only construct which scored a slightly more than minimum average mean level *M=4.* Nadeem et al. (2019) and Vienažindienė and Čiarnienė (2013) stress the importance of leadership is a first and most important factor in the Lean implementation process.

5.1 Analysis and Discussion on Findings for Hypothesis

Hypothesis 1 (H_1): Azerbaijani SMEs in order to increase their level of competitiveness pay more emphasis on improving on-site production, whereas large companies put more emphasis on a one-of-a-kind prerequisite.

The main aim of this hypothesis was to find out whether Azerbaijan construction companies pay more emphasis to on-site production or one-of-a-kind prerequisite in order to increase their level of competitiveness. A study by Tezel and Nielsen (2013) in Turkish construction industry highlights that large companies are more confident with the fulfilment of customer requirements rather than SMEs, hence large companies put more focus on one-of-a-kind prerequisite. On the other hand, a study by Johansen and Walter (2007) measuring the LRL of the German construction industry differ from the results of this study. German construction companies put more emphasis on on-site production while considering that an increase in on-site production will also affect the development of one-of-a-kind prerequisite, which is arguably from the authors' point of view. It is also noteworthy that the Azerbaijan government pays significant attention to the development of the construction industry as it is one of the key income areas for the

country's GDP. Naghiev and Huseynov (2013) claim that in last 20 years, 474 million dollars were allocated to improve the material-technical base of the construction industry. Thus, it can be perceived that the governmental factor plays a major role in this industry. In this case, equal development of both prerequisites can be controlled by Azerbaijani regulations.

The rejection of H1, briefly discovers that Azerbaijan construction companies despite their size pay equal attention to both prerequisites. However, while comparing results gained from this study with the other studies, it is seen that construction companies from Germany and Turkey differ on-site production from one-of-a-kind based on the size of the companies. Hence, for further research, it is suggested to have more respondent numbers, as well as emphasise more on relations between the Azerbaijani government and its construction companies.

Hypothesis 2 (H_2): Small and medium-size companies in Azerbaijan differ considerably from large companies in terms of their quality practices.

While comparing the results of this study with other similar studies, some discrepancies are revealed. For example Raghavan et al. (2014) argues that the existence of too many SME's can create big challenges for Lean application in the Indian construction industry. Tezel and Nielsen (2013) stated that large companies, because of their size, can struggle with involvement of employees in the Lean application process; however, large companies have high Lean conformance mean score level and they can easily implement Lean methodology because of facts like economy of scale, complex projects, skilled workforce, etc. Additionally, both large construction companies and SMEs in Turkey have the lowest level of fulfilment culture/people principle, which makes it a more common issue both for Azerbaijan and Turkish construction companies. Johansen and Walter (2007) try to link the country's technology development level with their Lean conformance level claiming that less technology-driven countries have implemented Lean approach successfully rather than countries where technology plays a major role in the construction industry. Al-Najem et al. (2013) whose approach has been chosen as a framework for measuring the LRL of Azerbaijan construction industry, also claims that company size does not play a considerable role in the application of Lean quality practices. However, Al-Najem et al. (2013) developed this claim after making an analysis in the Kuwaiti manufacturing industry. Thus, in order to check whether the company size plays a considerable role or not, it is suggested to make an additional analysis considering the framework used in Tezel and Nielsen (2013) research.

Hypothesis 3 (H_3): Relations between suppliers and large construction companies are better managed rather than small and medium construction companies.

A total of eight statements regarding the supply relations construct collected responses from 20 respondents. Descriptive analysis revealed that Azerbaijan large construction companies have a slight high mean score (M=3.7) regarding supplier relations construct than SMEs (M=*3.6*). While comparing these findings with the literature it can be seen that SMEs are usually involved in the projects that has less time spans and a smaller budget Dallasega et al. (2015), therefore these companies are less willing to create a long-term supply relations or improve supply-chain performance (Andrew et al., 2001). Thus, it seems that companies in the construction industry currently are less willing to develop subcontracting sector (Miller et al., 2002). Additionally, Andrew et al. (2001), from his analysis of supplier relations in United Kingdom construction industry, claims that issues such as trust between large companies and small/medium supplier is a barrier to the development of supplier relations. As a final comment for the third hypothesis, it is recommended to make an analysis of how the size of suppliers affects the relations between construction companies in Azerbaijan.

5. Conclusion and Future Research Directions

This research analysed the Lean Readiness Level of Azerbaijan construction industry. No such study is found even though the construction industry in Azerbaijan is a major contributor to GDP. A careful review of the literature regarding the assessment of Lean readiness guided towards the assessment of quality practices to be the key indicators. This study adapted the earlier published framework by Al-Najem et al. (2013) to analysis 6 quality aspects namely in the area of Process, Planning and Control, Customer Relations, Supplier Relations, Human Resources, and Top Management and Leadership. Data collected from 20 companies were analysed through both descriptive and inferential statistical analysis. Data analysis revealed that Azerbaijan construction industry only meets the required score in the aspect of top leadership and management, however, in other 5 aspects, it does not meet the minimum required score. More precisely, underestimating employee knowledge and abilities, not letting them contribute to the company's development process were the most significant reasons which underpin the existence of lack of trust

between employee and employer relations. Furthermore, three hypotheses were developed and tested through both inferential and descriptive statistical analysis to support the research aim. It was found that the size of the company does not have any influence on the quality practices. Moreover, Azerbaijan construction companies do not distinguish on-site production from one-of-a-kind prerequisite for increasing their level of competitiveness. While measuring the Lean thinking level in Azerbaijan construction industry it also suggested to start with applying some simple Lean tools such as 5S, 5 Why's and similar tools that can be easily utilised but can make a significant impact on operations.

6.1 Practical Implications

This study can be beneficial for the Azerbaijan construction companies that are interested in the implementation of Lean construction or who are interested to increase their level of competitiveness. The literature review, more precisely sections related to critical success factors and other quality management concepts, can also be very useful for those companies. Additionally, answers gained from survey results can also be a starting point to plan and improve their operations through the adoption of the Lean approach.

6.2 Theoretical Implications

This study points to the fact that existing frameworks to measure Lean readiness in the construction industry are lacking. It further adapts the framework developed by Al-Najem et al. (2013) as it best fits with the purpose of this study. Therefore, it will be right to say that this study will create a basis for further developments. Additionally, the results gained from the analysis of three hypotheses contradict with the survey results of other scholarly written papers/articles. This further emphasises the need for further development of research in this area.

6.3 Limitations of the study

Like most researches, this research has its limitations. One of the major limitations is the small number of respondents and that is mainly due to the lack of association/central network of the construction industry in Azerbaijan. Existence of such network would have facilitated this research by reaching out and collecting more data, as Tezel and Nielsen (2013) did through Turkish association of contractors. Thus, these research participants were approached individually, placing a time and resource constraint. Secondly, the unwillingness of companies is another limitation as only 20 out of 57 companies responded.

6.4 Future Research

Further research is highly recommended to further validate the outcomes of this study as well as to enrich the knowledge of existing weaknesses and by proposing solutions so the construction industry in Azerbaijan and in other similar economies could benefit.

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