Determinants of the Skilled Labour Demand and Supply in Building Construction Industry of Western Province in Sri Lanka

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Abstract		Original Research Article

The construction industry is primarily labour intensive and heavily relies upon the skills of its workforce and the success of any construction output is directly impacted by the skilled labourers. With high turnover rates, maintaining a proper balance between skilled labour demand and supply is crucial for retaining desired labour requirement within the Sri Lankan construction industry. Consequently, considering the aforementioned requirement, this research aims to analyse the present situation of the skilled labourers in building construction industry in Sri Lanka. Such a study would benefit the construction industry by identifying the imbalances between demand and supply of specific construction skills to facilitates proper planning and implementing strategies to address the skill mismatch with the timely need to the present context of Sri Lankan construction industry which is experiencing a speedy growth after the ethnic war. Succeeding a comprehensive literature synthesis, a survey was carried out by taking the views from the project managers in construction industry. Views were obtained by structured questionnaire where Likert Scale was used to measure the influence of each factor and to reflect the main objectives of the study. Descriptive, significance and correlation analysis were conducted by the aid of SPSS tool for interpretation of results. The current skills and competency levels of labourers are not sufficient to fulfill the demand of the industry except for bricklaying and plastering. The future supply of the skills also indicated an unbalanced level in expected demand and expected supply of skills. The research findings can be used by all project managers of the construction industry in order to predict the supply and demand of labour requirement. The research represents the current supply and demand of labour requirement. The future supply and demand are predicted according to the project managers' opinions along with possible strategies to retain skilled labour. The findings of the research positively assist on addressing issues of current labour supply and demand in construction industry. Subsequently it contributes to enable pathways for future research and strategic policy making in a positive manner.

Keywords: Building construction industry, skilled labour, labour demand and supply, labour retention.

INTRODUCTION

The construction industry plays a vital role in overall economic development by providing necessary infrastructure facilities for all the sectors of the economy. It can be regarded as a mechanism of generating the employment opportunities to millions of unskilled, semi-skilled and skilled work forces. It also plays a key role in generating income in both formal and informal sector and earning foreign exchange through the trade in construction material and engineering services. Being a labour intensive industry, the behaviour of the manpower highly reflects on the performance, user friendliness of the construction process and the organization where they engaged in [1]. The construction process involves a large number of stakeholders through various processes and different phases of the work. The output of the construction projects may be buildings, irrigation, drainage and water supplies, civil engineering projects, roads, harbors and air ports, power plants etc.

Labour resources are the most precious resource in the construction industry. Forde and Mackenzie [2] examine that, most of the employees in the construction sector were found on a range of contracts forms with particular employer including direct employment relationships, subcontracting arrangements, self- employment and agency labour. However, Pathirage [3] has classified the labour in the construction industry according to the nature of work as professional, technical, crafts and machine operators. The workload fluctuation is inherent in the construction

industry and as a result, either a shortage or a surplus of manpower can be seen [4] and this imbalance has been identified throughout the world even in developed countries. Dainty *et al*. [5] views that, insufficiency of skilled labour workforce in the industry can generate poor quality and delays in completion time of the projects. If the project delays, it will create impact to the overall project duration. In the construction industry, delays can be identified as one of the most recurring problems, and the main reason to extend the project time. This extension of the initially agreed project duration will add extra overheads that will increase the total cost of the project. This paper aims to assist interested parties in the construction industry to understand and realize the importance of labour resource issues and the need for long-term planning of labour resource requirements, so allowing them to train and retrain people to address the predicted skill shortages.

Overviews of the Sri Lankan Construction Industry
According to LMD voice of business [6], the contribution of the construction industry to the Sri Lanka's Gross Domestic Product (GDP) in the fourth quarter of 2016 achieved a record all time high of RS. 200,970 million. This was almost a threefold improvement from what it contributed just six years ago

back in 2010. In fact, even its proportional contribution to Sri Lanka's GDP saw a year over year increase, from just 6.6% contribution in 2009 to 8.7% in 2013 and an impressive 9.6% in 2014. Finally, in the second quarter of 2017, the industry has reported a growth of 9.3% when compared to 2016. Sri Lankan construction industry is presently experiencing an upward trend with significant development in infrastructure building after the end of ethnic war in 2009 [7]. The Annual Report of Central Bank of Sri Lanka [8], highlights the expansion of the industry sector as 13.3% in 2015 with the continuous increase in construction activities.

According to the Annual report of Central Bank of Sri Lanka [9], the expanded growth of the construction sub sector recorded a growth of 16.3% during the year 2016 compared to the notable growth of 26.4% during 2015. Sri Lankan construction industry contributes nearly 9.2% to the GDP and 73% of the Gross Domestic Fixed Capital Formation (GDFCF) at present [7]. Further, ICRA contented the expected growth of the industry over 9% of GDP to acquire a trigger construction boom with the introduction of new scheme targets. Construction industry provides about 8.7% employment opportunities in the national economy [10]. Figure 1 below illustrates the growth of the construction industry during 2012 - 2016.
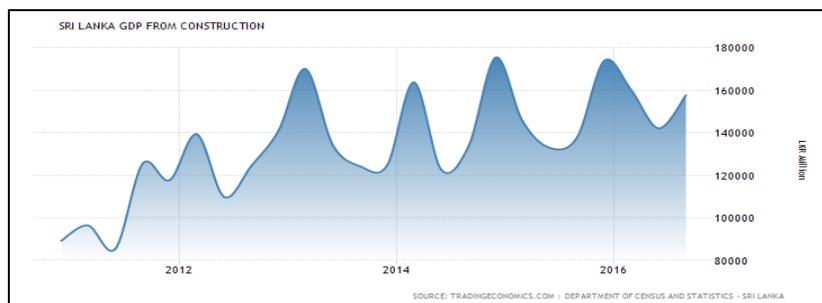
Fig-1: Growth of Sri Lankan construction industry [9]

Figure 1 shows that, there is a continuous growth in the Sri Lankan construction industry. However, there are many challenges faced by the industry by its nature. Figure 2 indicates that high cost

of construction materials, low supply of high grade steel, lack of funds, frequent changes in regulations, land acquisition delays and lack of skilled workers as the key issues of construction industry.
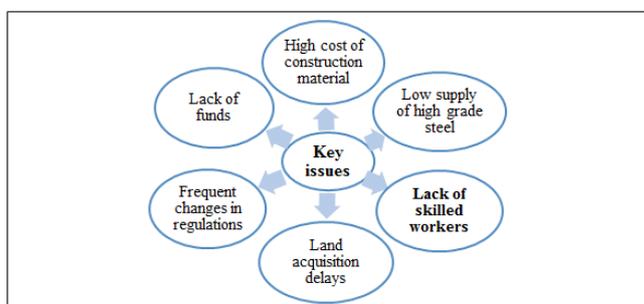
Fig-2: Key issues of Sri Lankan construction industry
Source: Investment and Credited Rating Agency Report [7]

Research Problem
According to the Investment and Credited Rating Agency (ICRA) report [7], lack of skilled labour

is one of the major issues in the construction industry. Wong *et al*. [11] has examined that, skilled workforce has a significant impact on the construction process of

the industry. The success of a construction organization mainly depends on its ability to recruit required labour at proper time, effective management and utilization of its human resources and retaining the skilled labour with the organization for a longer period of time. Ineffective management of labour leads to a high rate of labour turnover which has a significant economic impact on the construction firms. Loss of several valuable skilled labour in the construction project can lead to instability of the entire organization. However, recruitment and retention of skilled labour are becoming real challenge in the construction industry.

In most of the countries including developed countries have conducted researches to address the skilled workforce deficiency to forecast the labour demand with the intension of uplifting their growth rate from a better figure. As a result of recognizing the value of this particular area, few researches have investigated on the skill gap among the labourers. Although there are many researchers conducted in relation to skill labour, most of them are addressing the skill levels required in the industry. Hence, there is still prevailing a gap on defining the likely situation of skill labour demand and supply in the industry. Therefore, this research is intended to fill the gap by investigating current skill labour requirement and future demand and supply in the Sri Lankan construction industry.

With the high intensive labour market and prevailing financial constraints, the construction industry faces a great difficulty in retaining skilled labour to the industry. Due to the diversified job market in the society, people tend to consider different employment opportunities in various sectors. Hence current availability of skilled labour is not sufficient to fulfill the construction industry requirements which results in less inflow of skilled labourers to the industry. Furthermore, the construction organizations are struggling to retain skilled labourers by providing competitive salary scales and other fringe benefits. However, well trained and experienced skilled labourers tend to leave the industry searching for more beneficial employment opportunities in the dynamic and demanding labour market. Therefore, the main

research problem in this study includes *why it is difficult to retain skilled labourers and what factors are affecting for the demand and supply of skilled labour in the building construction industry in Sri Lanka.*

Research Objectives
The general objective of the study is to investigate the determinants of the demand and supply of the skilled labour in the Sri Lankan building construction industry and the specific objectives of the study includes,
- To identify most significant skilled labour categories in the construction industry.
- To examine the present and future skilled labour demand and supply in the construction industry
- To examine the factors influencing recruitment and retention of skilled labour in construction industry.

Literature on Skilled Labour in Construction Industry
Labour resource is one of the paramount factors to all the industries particularly to the construction sector as it places heavy reliance upon the skills of workforce [12]. The construction workers work on all construction sites, doing a wide range of tasks from very simple and easy tasks to extremely difficult and hazardous tasks. Although many of the tasks they do, they require some training and experience. Most of the jobs usually require little skill and can be learned quickly.

A large group of people including professional staff, labourers, suppliers, crafts and manufactures involved in the construction industry [13] and variety of skills for the specialized professionals to operational level labourers are required in the construction activities [14]. Skilled labor is a segment of the workforce with specialized know-how, training and experience to carry out more-complex physical or mental tasks than routine job functions. Skilled labour is a critical factor in the process of making a quality product [15]. According to Paul [4], skills lead to improve technological standards within the organizations.

According to the Investment and Credited Rating Agency report [7], construction workers by area of expertise in year 2013 are shown in figure 3.
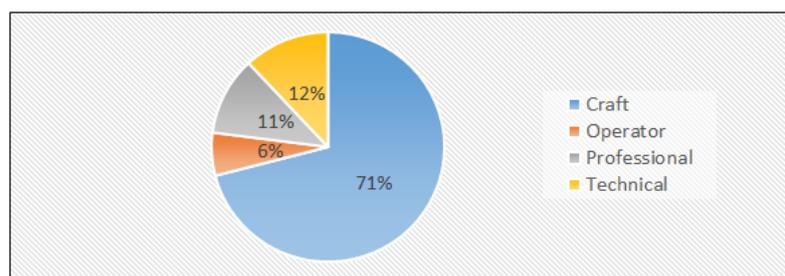
Fig-3: Construction workers by area of expertise in year 2013
Source: Investment and Credited Rating Agency [7]

According to the figure 3, the construction workers in Sri Lanka consists of 71% craft workers, 6% operators, 11% professionals and 12% technical staff. Generally, Sri Lankan construction industry places reliance upon workforce who is trained and educated through informal unsystematic ways and further the high propensity of using self-employed labourers [16].

According to Jayawrdane *et al.* [17], the workforce in the domestic construction industry is less educated. The remarkable diversity of employee educational background is a unique characteristic of the industry. Most of the professional level employees, Technicians, Architects, Engineers and Quantity Surveyors enter the industry with formal education and trainings and operators engage after undergoing short period courses while some people with informal training qualifications enter into the industry as helpers and labourers and acquire skills and upgrade the position through experience [14].

Construction projects require a unique combination of labour and material inputs, performed and coordinated on-site. According to Eccles [18] construction projects require a large number of labour specialties such as masons, carpenters, plumbers, pipefitters, electricians, painters, roofers, sheet metal workers, glaziers, and laborers. Normally, most of the masons engaged in bricklaying, plastering, painting and related tasks while electricians, plumbers and carpenters are attached to specific works. Coordination of the different trades over the project is a complex task and these specialists involved on the project at any time and frequently one work cannot proceed until one work has been completed.

Cyclical nature of the construction demand [20] highly influence on the fluctuations of the labour market. Likewise, the structure of the local labour market is progressively changing in terms of demand and supply since 1977 [20]. Accordingly, forecasting labour demand is a crucial factor for manpower planning and development of a country in terms of quantitative and qualitative aspects [21].

Trainings for construction labourers are mainly carried out by public and private training institutions in Sri Lanka [17]. National Apprentice and Industrial Training Authority (NAITA), Vocational Training Authority (VTA), Department of Technical Education and Training (DTET), Institute of Construction Training and Development (ICTAD) and Chamber of Construction Industry (CCI) of Sri Lanka are common training institutions in the local context.

Two schemes have been established in order to define skill levels of construction labourers in Sri Lankan training institutes. National Trade Test (NTT) and National Vocational Qualifications System (NVQ) are the tests used to measure the skills of local crafts. National Trade Test (NTT) offers major skill trades in three skill grades including semi- skilled, skilled and highly skilled in order to measure and evaluate the theoretical and practical knowledge of the workers and issue "Certificate of proficiency" for the worker who hold required skill level.

National Vocational Qualifications System (NVQ) is designed to create a workforce who can compete with foreign labour market through well recognized and standardized education system in technically and professionally. This system measures the workers competency in different vocational skills which incline with local and international necessities. The National Vocational Qualification Framework of Sri Lanka (NVQSL) supports to fulfill the NVQ purposes. NVQ level 1-4 allows for trainees to upgrade competencies from unskilled stage to reach full or master craftsman stage through the acquisition of competencies required at each level by National Competency Standards. A range of labour regulation inclined with the qualifications requirements of the skilled workforce tends to attach employers to the training courses [19]. Gann and Senker [22] view that; introduction of new technology is a strategy to overcome shortage of traditional craft skill. Agapiou [12] views that, future skill requirements of craft workers will be determined by changes in management practice and technology.

Wage level is another determinant influenced on the manpower demand. It is also a well-known psychological factor which is directly connected to the labour factor of the construction industry. Dainty *et al.* [19] identified flying of wages as a factor of skill shortage in the labour market. Gibbons and Machin [23], examine that the cost and time of commuting to work can also affect both labour market participation as well as wages

Labour migration is a common phenomenon of the industry over the last few years. Low level of salary, political instability and low recognition of the industry are few factors influenced most of the labourers to migrate. According to Anderson and Rogaly [24], migration of labour force resulted in labour shortage of the industry while the demand for the labour force increased gradually in the market.

Construction labour market is considered as market with non-standardized occupational levels mainly due to the self-employment within the industry. Even though, there are significant issues faced by the industry level labourers due to the different occupational patterns. Amongst, skill shortage is a global issue which disclosed by the many parts of the world [14]. Age composition also affect for the labour market. Dustmann, Fabbri and Preston [25] examine

that young and old workers differ in type and level of skills. Overall, performance in many mental tasks declines with age and this decline appears to have decline in physical performance. Therefore, the composition and age level distribution of the population in a country is having a considerable impact of the supply of labour and labour turn over. According to Anderson and Rogaly [24] employee turnover can have a negative impact on any industry, but the effects are even more harmful for construction companies and contractors. Uwakweh and Maloney [26] stressed that employee turnover has long been, and will continue to be, a significant concern in the construction industry. Organizations that can retain skilled employees have a stronger competitive advantage.

RESEARCH METHODOLOGY

The knowledge discussed in this research is based on natural phenomena and their properties and relations. Therefore, the research philosophy follows positivism. The information for this research was derived from the construction industry's experience, interpreted through reasoning and logic. Since the objectives of the research are quantifiable and can be measured statistically, quantitative approach was applied as the research approach to realize the objectives of survey and it facilitates using large number of respondents for data collection. The Research hypothesis were made using the theoretical assumptions and they permitted to evaluate the assumptions critically. The framework of this research makes a basis to the hypothesis and the choice of research methods.

The population of this study includes the project managers of construction companies in Sri Lanka. Since the population is large at scale, a sample of 100 project managers was selected from the Western Province to represent C1 graded construction companies and the primary data was collected through interviewer administered structured questionnaire. Probability sampling technique was applied to select the sample in order to give all the individuals in the population equal chances of being selected. Though 100 project managers responded, in order to maintain the accuracy and reliability, the researchers have removed 14 completed questionnaires as the researchers could not keep trust on their accuracy. Therefore, the exact sample size of the study is 86, believed to be adequate for this study.

Data analysis was conducted in order to interpret the collected data and it is very crucial since it illustrates a decision to the study. SPSS version 20 was applied to analyze the data. Mean weighted rating was applied to identify the significant trades of skills, current demand and supply of skilled labourers and likely demand and supply of skilled labourers. Cronbach's alpha was used to measure of reliability and internal consistency.

Several actions were taken in order to increase the validity, reliability and accuracy of the research. 100 project managers were involved to the questionnaire. Since considerably high amount of experienced project managers replied to the questionnaires, it increased the validity and reliability of the collected data. The researcher has done face to face interviews for most of the project managers. Face-to-face interviews help with more accurate screening. The respondent provided true and accurate answers and was unable to provide false information during screening questions. Furthermore, the researcher could ask follow-up questions, probe for additional information, and circle back to key questions later on in the interview to generate a rich understanding. In order to increase the validity of the research, the researcher has changed only one variable at a time and the dependent variable was measured accurately.

The determinants of skilled labour demand and supply was analyzed through the statistical one sample t-test. Further, significant strategies were identified with the use of this test. Statistical one sample t-test was used to check the significant positive relationship of determinants of labour supply and determinants of labour demand to retention of labour. Pearson's correlation coefficient was used to measure the relationship between the independent variables and dependent variable which are designed in Likert's scale.

Research Hypothesis

For the purpose of answering the research questions and addressing the research objectives four hypothesis were developed based on the identified variables and general assumptions related to labour demand and supply and its effects on labour retention.

The following hypothesis were made for this research,

H_1 There is a significant positive relationship between existing trades of skills and retention of skilled labour.

H_2 There is a significant positive relationship between determinants of labour demand and retention of skilled labour.

H_3 There is a significant positive relationship between determinates of labour supply and retention of labour supply.

H_4 There is an overall significant positive relationship between recruitment of labour and retention of labour.

RESEARCH MODEL

The research model was developed based on the literature on the determinants identified as affecting for the demand and supply of the skilled labour in the construction industry is Sri Lanka. It is important to

note that, apart from the factors which include in this research model, there are many other factors affecting for the skilled labour demand and supply and the retention of skilled labour in the industry. Such factors also have been taken in to investigation of the present situation of the labour market of the construction industry and the demand and supply of skilled labour and retaining them within the industry.
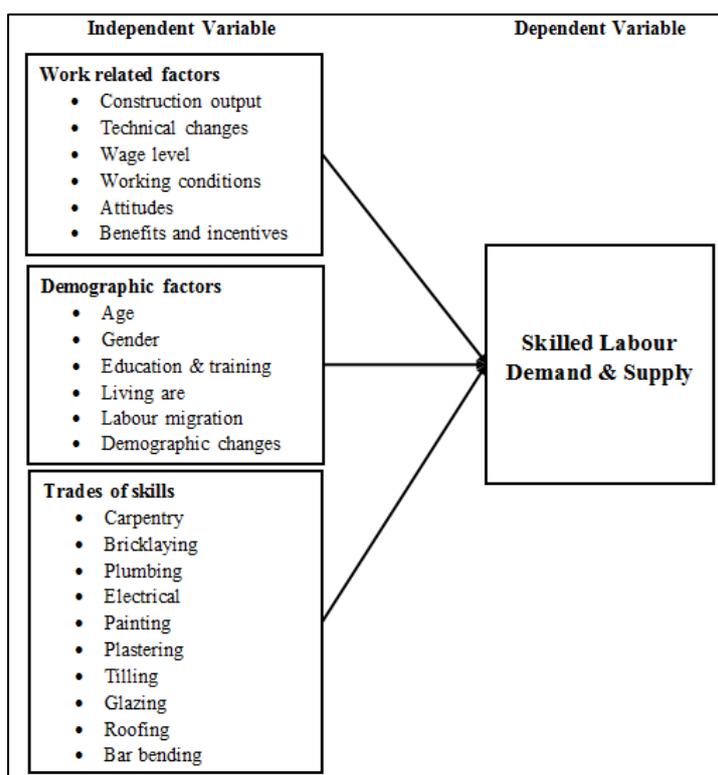

Independent Variable

Work related factors
- Construction output
- Technical changes
- Wage level
- Working conditions
- Attitudes
- Benefits and incentives

Demographic factors
- Age
- Gender
- Education & training
- Living are
- Labour migration
- Demographic changes

Trades of skills
- Carpentry
- Bricklaying
- Plumbing
- Electrical
- Painting
- Plastering
- Tilling
- Glazing
- Roofing
- Bar bending

Dependent Variable

Skilled Labour Demand & Supply

Fig-4: Research Model

DATA ANALYSIS

Experience of the respondents
Figure 5 shows the work experience of the respondents.
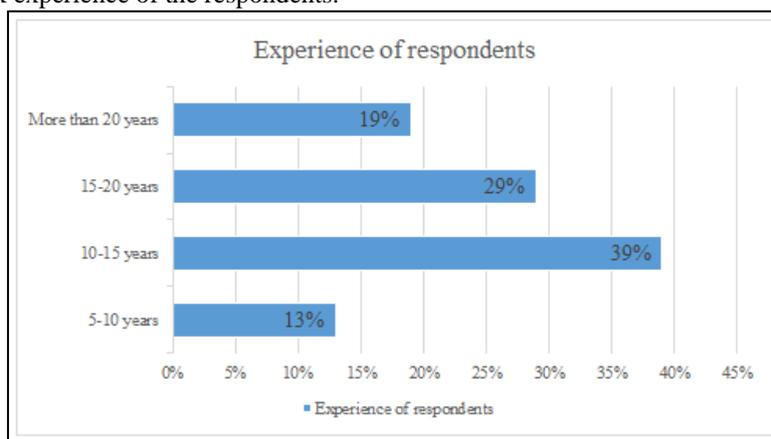
Fig-5: Experience of respondent

Figure 5 shows that the researcher has concentrated on well experienced project managers those who are having more than 5 years' work experience in order to collect most validate and reliable data. Further, 87% of the respondents have more than 10 years' experience.

**Most significant labour categories in building construction industry**
The identified skills of trades of the building construction industry were analyzed to prioritize the significant trades calculating the mean values and frequency of the skills with regard to the given Likert scale of 1-5 labeled ranking from not significant to high significant respectively.

Table-1: Reliability test to identify the significant skill trades

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.833	0.806	10

According to the table 1, results of cronbach's alpha test, the alpha value is 0.833, which means the answers collected from the questionnaire have relatively high internal consistency.

The mean values of the trades were compared with frequency of the occurrence in order to obtain the results of the analysis to identify the significance of skill trades. Figure 6 illustrates the significant skill trades in the building construction industry.
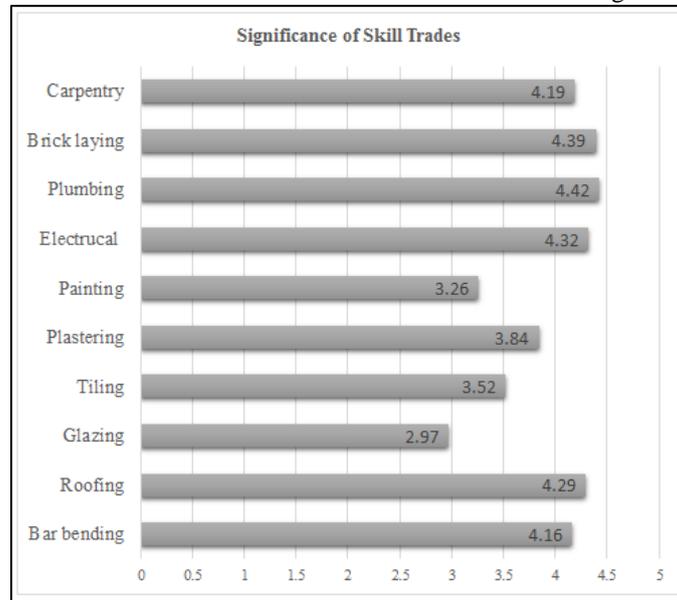
Fig-6: Mean values of the significance of skill trades

Figure 4 shows that, carpentry, bricklaying, electrical and roofing workers are the most significant types of skilled labourers in the building construction industry.

Determinants of skilled labour demand

Respondents' perceptions on the determinants of the demand for skilled labour were considered using the mean values and then the preference of the entire population was checked through one sample t –test. Cronbach's alpha was used to test the results for the data consistency and the result of the reliability test is shown in table 2.

Table-2: Reliability to identify the determinants of the skilled labour demand

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.842	0.839	10

According to the table 2, the alpha value is 0.842, which means that the answers collected from the questionnaire have relatively high internal consistency and fair enough for further analysis.

Respondents' perceptions on the determinants of demand for skilled labour were considered using the mean values and then the preference of the entire population was checked through one sample t –test. The mean of the hypothesized population is considered as 3, which was defined in the questionnaire as "average impact" determinant on skilled labour demand. Hence, the mean values above the 3 are considered as the impacted determinant on skilled labour demand in Sri Lankan construction industry. The degree of freedom

was taken as 85 (86-1) and 0.05 was considered as the significance level.

The null hypothesis was formulated as

H_0: $\mu \geq \mu_0$ (3) considered the factor has a significant impact on skilled labour demand
H_α: $\mu < \mu_0$ (3) Considered the factor has no significant impact on skilled labour demand

The p values of the determinants were considered to accept or reject the null hypothesis and this cut-off point is called the significance level and set at 0.05 in in this analysis. When P value < α (0.05) it can be said that there is an enough evidence to reject H_0. Figure 4 represents the data distribution and the rejected region in t test.
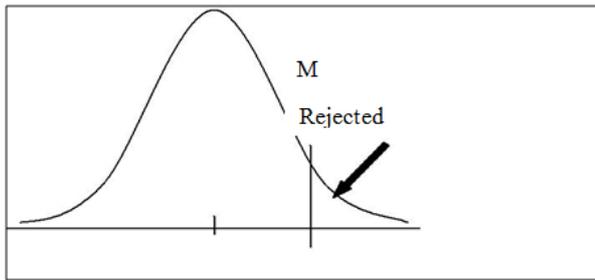
Fig-7

If the calculated P value of a determinant is less than α, the null hypothesis (Hₒ) would be rejected and the alternative hypothesis is accepted. The determinants which had not shown the mean impact level greater than 3 by 95% of confident would be identified as low impact determinants of the skilled labour demand. The obtained P values and means are illustrated in the table 3.

Table-3: Determinants to the skilled labour demand

Determinant of demand	t - value	Significance / p - value	Mean Difference	Mean	Rank
Construction output	10.977	0.000	1.419	4.419	1
Technical changes	6.748	0.000	0.935	3.935	3
Labour productivity	7.660	0.000	0.935	3.935	4
Economic growth	2.373	0.012	0.452	3.452	5
Labour regulations	1.488	0.074	0.226	3.226	6
Labour migration	-1.293	0.103	-0.194	2.806	9
Wage level	-2.718	0.005	-0.452	2.548	10
Factor price terms	-0.779	0.221	-0.129	2.871	7
Demographic changes	-1.000	0.163	-0.161	2.839	8
Government policies	9.505	0.000	1.302	4.032	2

P values obtained for the most significant determinants of demand on skilled labour from the t-test shows both lesser and higher p values than α (0.05). However, the evidence proved with lesser p values in construction output, technical changes, labour productivity, economic growth; wage level and government policies cannot be considered as enough evidence to reject the null hypothesis (H₀). It meant that all the aforementioned determinants have impact level greater than 3. Consequently, these determinants of demand can be considered as most impacted determinants of the demand of skilled labour in Sri Lankan construction industry.

The majority of respondents identified construction output as the most impacted determinant on the skilled labour demand and it is obvious that construction output has a favorable high impact on the demand of skilled labour in quantity with considered to the labour statics in last 2 years. This is followed by government policies, technical changes, labour productivity and economic stability as other determinants of skilled labour demand. Although economic stability has an indirect relationship with the

demand of skilled labour, it has a high impact on the labour demand.

Labour regulation was listed as an impacted determinant on skilled labour demand for Sri Lankan construction industry with a marginal mean value of 3.226. However, the respondents did not favour the wage level (2.548 mean value), factor price terms (2.871 mean value), labour migration (2.806 mean value) and demographic changes (2.839 mean values) as high impacted determinants on skilled labour demand. Out of those labour migration was ranked as the least impacted determinant on skilled labour demand in Sri Lankan construction industry.

Determinants of skilled labour supply
Respondents' perceptions on the determinants of the supply of skilled labour were considered using the mean values and then the preference of the entire population was checked through one sample t –test. Cronbach's alpha was used to test the results for the data consistency and the result of the reliability test is shown in table 4.

Table-4: Reliability to identify the determinants of the skilled labour supply

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.855	0.827	9

According to the table 4, results of cronbach's alpha test, the alpha value is 0.855, which means the answers of the respondents have relatively high internal consistency and fair enough for further analysis.

In order to get the respondents opinions on the major impacted determinants of the skilled labour supply, mean values of the responses were considered and as the aforementioned t test was carried out to check the entire population preference. The mean of the

hypothesized population is considered as 3, which was defined in the questionnaire as "average impact" determinant on skilled labour supply. Hence, the mean values above 3 were considered as the impacted determinations on skilled labour supply in Sri Lankan construction industry. The degree of freedom was taken as 85 (86-1) and 0.05 was considered as the significance level.

The null hypothesis was formulated as

$H_o : \mu \geq \mu 0$ (3) Considered factor has a significant impact on skilled labour supply

$H\alpha : \mu < \mu 0$ (3) Considered factor has no significant impact on skilled labour supply

The obtained P values and means of the determinants are illustrated in the Table 5.

Table-5: Impact of the determinants to the skilled labour supply

Determinants of supply	t - value	Significance P value (1 tailed)	Mean difference	Mean	Rank
Population and its composition	1.556	0.065	0.290	3.290	6
Wage rate	6.776	0.000	0.968	3.968	1
Working conditions	2.555	0.008	0.387	3.387	4
Attitudes	2.402	0.011	0.323	3.323	5
Cost of education and training	4.879	0.000	0.774	3.774	2
Migration and immigration	0.571	0.286	0.097	3.097	8
Geographical and occupational mobility	-0.779	0.221	-0.129	2.871	9
Benefits and incentives	1.366	0.091	0.226	3.226	7
Quality of human capital	2.087	0.023	0.419	3.419	3

P values obtained for the most significant determinants of supply on skilled labour from the t-test shows both lesser and higher p values than α (0.05). However, the evidence proved with lesser p values in wage rate, working conditions, attitudes, cost of education and training, and quality of human capital cannot be considered as enough evidence to reject the null hypothesis (H_0). It meant that all the aforementioned determinants have impact level greater than 3. Therefore, these determinants of supply can be considered as most impacted determinants of the supply of skilled labour in Sri Lankan construction industry.

Wage rate was identified as the most favorable determinant on skilled labour supply with the mean value of 3.968. This implies that the increment in number of skill laboueres will highly impacted with the remuneration provided to them. Cost of education and training, quality of human capital, working conditions and attitudes were ranked as other important determinants of skilled labour supply. Compared with the other industries (Manufacturing, hotel and tourism and wholesale and retail) educational and training cost is very less for the craftsman. Most of the skill workforce of the industry is having self-employment.

However, the respondents have marginally favoured on the determinants of population and its composition (3.290 mean values), benefits and incentives (3.226mean value) and migration and immigration (3.097 mean value). The relatively poor response to the geographical and occupational mobility indicates that the employment level does not rapidly change with the location. The skilled labouers of the construction industry was mostly engaged as contract basis for the projects, the demographic changes do not highly impact on supply of labour. However, the construction workload around Colombo region has shown a growth in the labour pool in western province.

Present demand and supply of skilled labour in the construction industry.

Table 6 shows the results for the data consistency test (Cronbach's alpha).

Table-6: Reliability test of major determinants of skilled labour demand and supply

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.761	0.728	10

According to the table 6, results of cronbach's alpha test value is 0.761, which means the answers collected from the questionnaire have relatively high internal consistency and unbiased enough for further analysis.

Figure 5 represents the mean values of the respondents' opinions on the current level of demand and supply and the frequencies of the responses for current level of demand and supply of skilled labour in the construction industry. The mean values vary between -2 to +2. Mean value -2 means there is a huge demand but there is no single labour supply. Mean value +2 means there is a huge supply but there is no demand for single labour. Mean value equal to 0 means there is no gap between demand and supply.
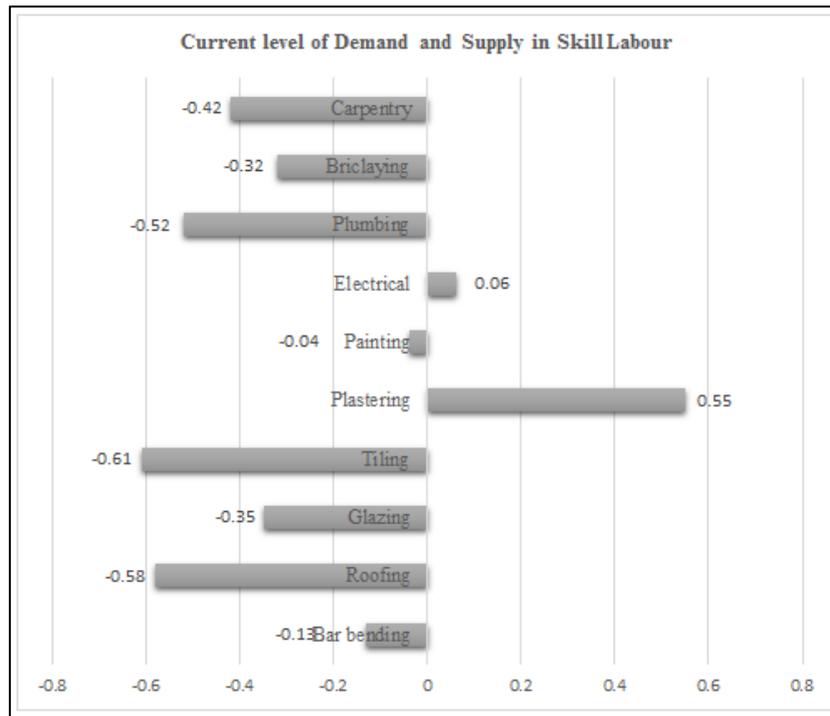
Fig-8: Current level of the demand and supply of skilled labour

Figure 8 clearly shows that most of the significant labour types such as tiling, plumbing, carpeting, roofing and brick laying etc. have a skilled labour gap in supply and demand showing that for those categories of labour, the demand is higher supply. Plastering and electrical works do not have such over demand for skilled labour.

Likely demand and supply of skilled labour in the construction industry

The analyzed responses of for the likely demand and supply of each trade of skills were considered under the middle value (median) of the responses which indicate the middle response of the project manager.

Table-7: Likely demand and supply of skilled labour in the construction industry

Trades of skills	Responses for likely demand	Responses for likely Supply	Comparison of likely demand and supply
Carpentry	Average likely demand	Low likely supply	Demand > Supply
Brick laying	Average likely demand	Average likely supply	Demand > Supply
Plumbing	High likely demand	Average likely supply	Demand > Supply
Electrical	High likely demand	Average likely supply	Demand > Supply
Painting	High likely demand	Average likely supply	Demand > Supply
Plastering	High likely demand	High likely supply	Demand > Supply
Tiling	High likely demand	Average likely supply	Demand > Supply
Glazing	High likely demand	Average likely supply	Demand > Supply
Roofing	High likely demand	Average likely supply	Demand > Supply
Bar bending	High likely demand	Average likely supply	Demand > Supply
Truss Working	High likely demand	Average likely supply	Demand > Supply
Cladding	High likely demand	Average likely supply	Demand > Supply
Iron working	Average likely demand	Low likely supply	Demand > Supply
Welding	High likely demand	Average likely supply	Demand > Supply
Landscaping	High likely demand	Low likely supply	Demand > Supply
Pile working	Very high likely demand	Average likely supply	Demand > Supply

Table 7 shows the gap between likely demand and likely supply of skilled labour according to the opinions of the respondents. However, likely demand and likely supply of bricklaying and plastering interpret the equilibrium level of demand and supply of skilled labour which considered to the median values of the opinions of the respondents. Pile working and landscaping reveals a sizeable divergence between

likely demand and supply. The significant difference between demand and supply has been caused by unavailability of training schemes and most of these trades are new to the Sri Lankan construction industry except carpentry, electricity, masonry, welding, painting and plumbing.

Hypothesis testing

The following hypotheses were tested using Pearson's correlation coefficient and the summary of the result is shown in the table 8

H_1 There is a significant positive relationship between existing trades of skills and retention of skilled labour.

H_2 There is a significant positive relationship between determinants of labour demand and retention of skilled labour.

H_3 there is a significant positive relationship between determinates of labour supply and retention of labour supply.

H_4 There is an overall significant positive relationship between recruitment of labour and retention of labour.

Table-8: Relationship between types of labour, determinants of labour demand, labour supply and labour retention

		DLD	DLS	LR	TL
DLD	Pearson Correlation	1	0.866**	0.736**	
	Sig. (2 – tailed)		0.002	0.007	-
	N	86	86	86	
DLS	Pearson Correlation	0.866**	1	-0.796***	
	Sig. (2 – tailed)	0.002		0.009	-
	N	86	86	86	
LR	Pearson Correlation	0.736**	-0.796**	1	-0.751***
	Sig. (2 – tailed)	0.007	0.009		0.006
	N	86	86	86	86
TL	Pearson Correlation			-0.751***	1
	Sig. (2 – tailed)	-	-	0.006	
	N			86	86

**Correlation is significant at the 0.01 level (2 – tailed)

Here the researcher has used the shorten form as follows for the ease of use in SPSS
DLD – Determinants of labour demand
DLS – Determinants of labour supply
LR – Labour retention
TL – Types of labour

According to table 8, it can be identified that there is a negative relationship between types of labour and labour retention. It is because the value shown in the table for correlation coefficient is highly negative. The types of labour supply variable shown in the table has a -0.751 correlation with labour retention. The value of this coefficient correlation (-0.796) falls under the coefficient range from +/- 0.71 to +/- 0.9, the relationship between types of labour and retention of labour therefore considered as high negatively relationship.

Secondly, according to table 8, it can be identified that there is a positive correlation between determinants of labour demand and labour retention. It is because the value shown in the table for correlation coefficient is highly positive. The determinants of labour demand variable shown in the table has a 0.736 correlation with the labour retention. The value of this coefficient correlation (0.736) falls under the coefficient range from +/- 0.71 to +/- 0.9, the relationship between determinants of labour demand and labour retention is

therefore considered as high. Hence, when the determinants of labour demand increases, labourers will retain in the industry.

Finally, according to table 8, it can be identified that there is a positive correlation between determinants of labour supply and labour retention. It is because the value shown in the table for correlation coefficient is highly negative. The determinants of labour supply variable shown in the table has a -0.796 correlation with the labour retention. The value of this coefficient correlation (-0.796) falls under the coefficient range from +/- 0.71 to +/- 0.9, the relationship between determinants of labour supply and labour retention is therefore considered as negatively high. Hence, when the determinants of labour supply increases, labourers will not retain in the industry.

CONCLUSION

The requirement for skilled labour has been immensely increased with the increment of construction output occurred due to the end of ethnic war. Thereafter the construction industry's contribution to the economy increased continuously in a rapid manner. For most of the skilled trades the demand is higher than the supply of skilled labour. According to this study it can be concluded that still the industry is facing lack of skilled labour and according to professionals in the next decade

the gap between labour demand and supply may remain same.

The recruitment and retention of labour can be identified via the predicted future demand and the supply of labour. Since the industry has turned its attention to concepts like green buildings, in the future, apart from the significant labour, there will be a good positive demand for landscaping, piling works and finishing works of buildings. But still there is a high significance to traditional skilled labour.

According to the results, it can be concluded that construction output, labour productivity, wage level, technical changes, economic growth, labour regulation, and labour migration can be considered as most impacted determinants of the demand of skilled labour which affect to retention of skilled labour in Sri Lankan construction industry. Relationship between determinants of labour supply and labour retention considered as negatively high. Hence, when the determinants of labour supply increases, labourers will not retain in the industry. The relationship between determinants of labour supply and labour retention considered as highly negative. Hence, when the determinants of labour supply increases, labour will not retain in the industry. Wage rate, cost of education, training, working conditions, demographic characteristics, benefits and incentives, quality of human capital and attitudes are considered as most impacted determinants of the supply which affects the retention of skilled labour in Sri Lankan construction industry.

The study concluded that the retention of skilled labour depends on types of skilled labours, labour demand and labour supply. The skilled labour empowerment, training and career development, employee compensation, performance appraisal and labourer's commitment affects the retention of the skilled labour. The study further concluded that training and career development were adapted to a great extent by the state corporations and that they offered sponsored training and career development programs and those employees were satisfied with the training and career development offered to them by the organization.

According to the study it can be concluded that greater economic stability, introduction of new technologies, establishment of training institutions and long-term training schemes are the most significant strategies which should followed by the government. Benefits and incentives, wage increments, positive working environment, manpower planning and motivation and encourage the team work are the most significant strategies which construction contractors should follow in order to retain the skilled labour.

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