



## Manpower Motivation Factors and Theories in the Egyptian Construction Projects

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### ABSTRACT

Motivation is a key factor that promotes construction productivity. In the construction domain, manpower plays a major role in the success of the projects, as it relies on their efficient performance. Therefore, it is an essential issue to study the factors that motivate manpower in construction projects. The objectives of this paper are to investigate the key manpower motivation factors in the Egyptian construction projects as well as identify which motivation theory fits the culture of the Egyptian manpower. From the literature review, 28 factors were identified, and these factors were reduced to 14 factors after brainstorming sessions with 15 experts with experience more than 15 year in the Egyptian construction projects. The 14 factors were grouped into four categories: management, development opportunities, financial, and work climate. They were, also classified into intrinsic and extrinsic factors. A questionnaire was designed and sent to 240 participants (consultant engineers, contractor engineers and labors) to collect data. The obtained responses were analyzed and the relative importance of all factors was determined. From data analysis, the results revealed that the five key factors affecting engineers and labor represented 40% and 38% of the total factors, respectively. Engineers and labors both have four key factors in common: good salary, bonuses, achievement, and recognition. But, the fifth factor is advancement and good supervision respectively. By taking into account the key motivation factors ranking, the Egyptian manpower is more relevant to Herzberg's motivation theory, and more related to extrinsic factors. This finding can be used to assess construction manpower's motivation, which will be helpful in the development of human resource policies and, as a result, enhance productivity.

### 1. Introduction

Workers' motivation has been proposed as one of the primary aspects that can enhance productivity in the construction sector [1]. Construction productivity was established as a critical factor affecting the project schedule and budget, so slight increasing in the productivity level increase the project profit [2]. Numerous studies have shown that motivation has an effective impact on worker productivity [3-4]. Motivation is one of the most essential factors affecting labor productivity [5-6]. Jaraks and Bitar

[7] stated that human power is the main factor affecting productivity. Motivating the manpower in the construction sector to achieve the outcome efficiently is difficult, as construction projects differ in their characteristics from one project to another in terms of project size, location and working conditions. Also, the manpower differs in its culture and capabilities [8]. Motivation topic has been investigated by several researchers. Some of them tried to identify the main motivation factors affecting construction employee in their countries. Other researchers attempted to apply their study on only one or two type of employees such

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as craftsmen (labors), supervisors, engineers and managers. None of them was aimed at targeting the manpower as whole. Also, with respect to motivation theories, the authors tried to investigate if the content of the chosen theory related to the motivation of construction employees. As an example, Venkatesan et al. [9] and Singh [4] studied Herzberg's theory on construction engineers in India and Hawaii respectively. As well as several theories as Herzberg's theory, Equity theory, Expectancy theory, and Maslow's theory applied on construction workers in different countries as illustrates in Table 1. It has been demonstrated that no study has applied motivation theories on construction manpower in Egypt. Recently, construction projects have occupied an influential role on the Egyptian economy, as many infrastructure, industrial and housing projects are being implemented. Providing a motivating system for company employees will affect their productivity, leading to the successful achievement of the desired goals. The objective of this research is to identify key manpower motivating factors (MMF) in the Egyptian construction projects and identifying which motivation theory represents the characteristics of the Egyptian manpower. This research was established as follows: 1) A review of motivation theories based on previous research in the construction industry; 2) A review of the motivation in the construction industry to identify a preliminary motivation factors; 3) Brainstorming discussions to review, standardize and finalize the effective motivation factors; 4) Collecting data regarding manpower motivation factors in Egypt through a questionnaire survey; 5) Analyze the data collected using Statistical Software Package SPSS version (26); 6) Rank the factors according to their relative importance weight and identify the key manpower motivation factors using trimmed mean method ; and 7) Identify which motivation theory represents the characteristics of the Egyptian manpower. This research will contribute to measure the motivation of the manpower in construction projects in Egypt, and this will help in improving construction productivity.

## 2. Definition of Motivation

Motivation directs the behavior of individuals to meet their needs and achieve the organization goals. In previous literature, several researchers contributed a definition of motivation. Ryan [10] defined motivation as the level of workers' requirements, desires, or urges to complete a certain task. Latham [11] defined motivation as: "A set of internal and external energetic forces." They added that motivation is either from an internal force within the individual with the aim of self-development or the achievement of a specific task or from an external force related to the effort exerted for a specific outcome, and the corresponding incentives or appreciation. Motivation is described as the physiological and psychological force that drives people to seek one or more objectives in order to meet their basic requirements [12]. Employee motivation offers them a goal to achieve in order to fulfill the tasks that have been assigned to them, as well as removing negative feelings that have been conveyed to them, as a result of work pressure.

## 3. Motivation Theories

Many theories were developed to determine the factors affecting the motivation of individuals. The theories were divided into two categories, 1) The content theory which focused on the needs of individuals such as Maslow's hierarchy theory, Herzberg dual factor theory and Alderfer's modified theory, and 2) The process theory related to directing the behaviour of individuals towards motivation such as Expectancy theory, Goal setting theory, Equity theory, and Reinforcement theory [13].

### 3.1 Content theories

These theories explain the actual motives of individuals and it investigates an individual's nature driving. Maslow's Hierarchy Theory [14] was developed based on human needs, where a hierarchy of these needs is proposed according to their importance. Five needs were arranged from highest to lowest and they are physiological, safety needs, social needs, esteem needs and self-actualization. Physiological needs include the basic needs of individuals such as rest, water, food, and sleep. Safety needs include protection from risks, security, and protection from pain and physical damage. Social needs related to relationships with colleagues and the need for a sense of belonging. Esteem needs are the need for recognition and appreciation from managers, while self-actualization needs are the need to develop the capabilities and skills to achieve satisfaction and desired goals of growth.

Alderfer [15] established his theory as a development of the Maslow's theory of the hierarchy of needs. Three needs of Existence, relatedness and growth were proposed. Existence, relates to safety and physiological needs; relatedness, concerns with relationships and communication needs; and growth, related to personal growth and development. Herzberg [16] developed a two-factor theory of satisfaction and dissatisfaction factors, Satisfaction factors express motivations, such as achievement, promotion, responsibility, nature of work, growth and recognition. While non-satisfying factors express hygiene factors, such as, working conditions, job security, quality of supervisors, relationship with peers and organizational policies.

### 3.2 Process theories

These theories depend on the behaviour of individuals and how to change the behaviour of workers to achieve the motivation through the desired behaviour of workers.

Expectancy theory relies on understanding the relationship between effort, performance and rewards at performing the task [17]. The amount of effort a person exerts at work should be proportional to the level of performance. Furthermore, the rewards must be commensurate with the level of performance. In goal setting theory, Locke and Latham [18] explained that workers are motivated by difficult goals, Specific and challenging goals have a significant impact on performance. People who participate in goal-setting are thought to strive more to accomplish them than those who are just given goals.

The concept of fairness is covered in equity theory [19].

This theory assumes that an individual's assessment of the relationship between their effort and their output is a key factor for satisfaction with their work. People calculate this relationship as a ratio, which they compare to others they think to be equivalent in terms of their job duties. Reinforcement theory was developed by Skinner [20]; its goal is to control the behaviour of individuals by a set of

procedures. Positive reinforcement of a desirable individual's behaviour, such as a reward or promotion, motivates individuals to repeat that behaviour. Negative reinforcement reduces the frequency of unwanted behaviour for wrong behaviour. The description of motivation theories are illustrated in Fig 1 and Table 1.

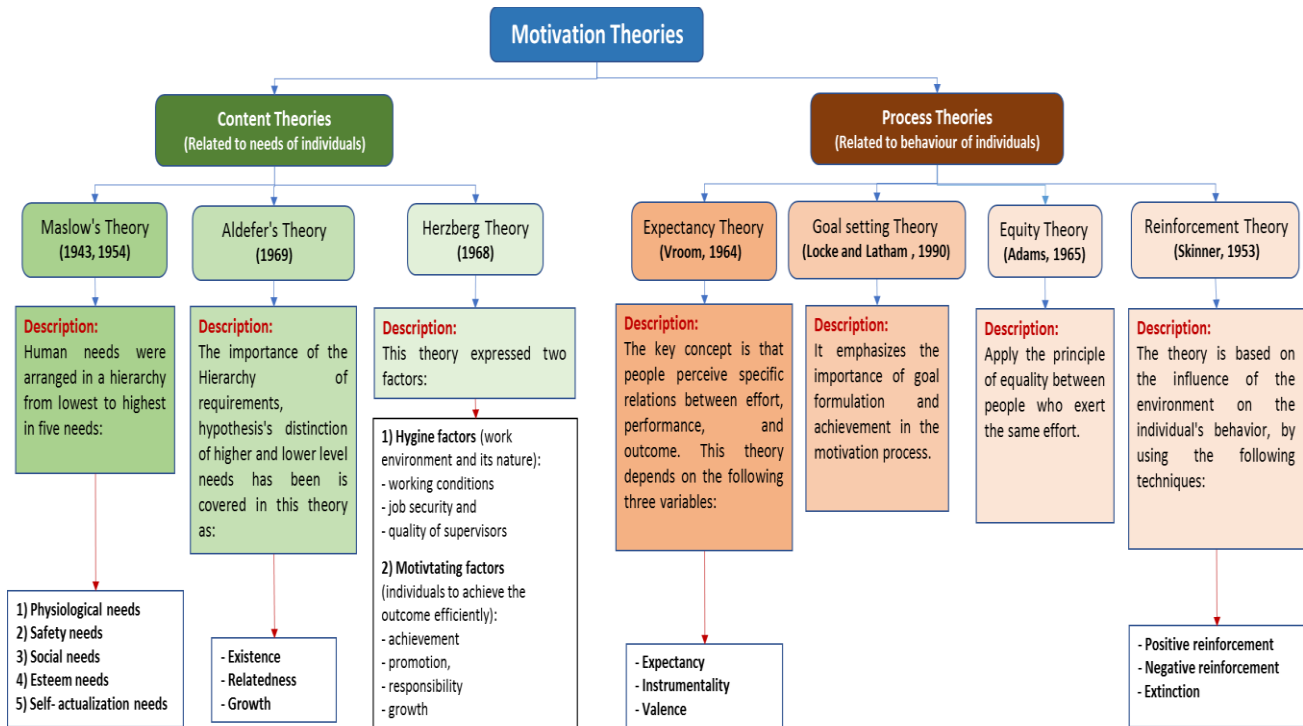


Fig. 1. Conceptual framework of motivation theories

#### 4. Motivation Construction

Several researches have studied the construction motivation in different countries. Some researchers identified the major factors affecting motivation of construction employees, whereas other researchers investigated the applications of motivation theories on the employee. Several studies are cited in this paper to identify the factors affecting motivation and how the motivation theories are applied to construction employees. The theories of Maslow and Herzberg were utilized to figure out what motivates employees in construction organizations in Azerbaijan. Both workers and managers agreed that salary and regular salary schedules were among the most motivating elements, as were job security and incentives, but managers were more concerned with responsibility and challenge, and workers were more influenced by management of site and peer relationships [21]. A study in Ghana examined the motivation of many skilled craftsmen, it proved that participation in decision-making and assigning more responsibilities, appropriate working conditions, good relations with colleagues, job security, and the financial aspect affect the level of motivation of these craftsmen in various construction projects [22]. Kaming et al. [32] investigated the motivation of craftsmen in Indonesia and discovered that good payment and pay for overtime work were the main motivators for them, as they were suffering

from poor financial condition, and social relations and safety programs against risks had a noticeable effect on their motivation. They also mentioned that respect by supervisors and achievement in their work reduces their demotivation.

Motivation is one of the influences on the performance of employees [8]. This study was applied to employees, specifically supervisors and engineers, and the results showed that training, wages, appreciation by superiors and development of skills are among the most important motivating factors for them. Aarabi et al. [24] emphasized the significance of motivating the employee to achieve a higher level of performance. The study established that providing training and advancement opportunities for employees enhances their motivation. Employees are also motivated by a good salary, suitable work environment, freedom in performing their tasks, and job security. Dwivedula and Bredillet [25] studied the factors affecting workers' motivation. According to the results of this research, motivation factors are categorized in five groups. Sub-factors were involved in each group. The first group includes factors related to the development of the worker, such as promotion, achievement, and the ability to make decisions. The second group was the work climate and included payment, appreciation, and freedom, and the third group was concerned with the importance of the task and its goals. Communication and job security were included as the fourth and fifth groups. According to Doloi [26], the work

environment influenced Australian workers' motivation Job security, and rewards were the top motivators for the workers. Workers are also influenced by recognition, promotions, and the workplace's location. Tabassi et al. [27] stated that providing training programmes influences the

motivation of construction manpower in Iran, and the output efficiency of the teamwork would improve when applying motivation and training strategies.

Table 1. Motivation theories in construction.

Theory	Application	Country	Results
Herzberg's Theory [16]	Construction workers [28]	<b>China</b>	The study proved that improving hygiene factors leads to motivating individuals, and this is consistent with the results of the research, as it was shown that improving salary, working conditions and job security will lead to workers becoming more motivated and thus boosting their performance.
	Construction engineers [9]	<b>India</b>	The results of this study showed that enthusiastic work, achievement and appreciation are among the main motivating factors for engineers. While severe business policies and inadequate working conditions are among the most demotivating factors for them. According to the study, the conclusions of Herzberg's theory are significant to engineers in Indian construction companies.
	Construction engineers [4]	<b>Hawaii</b>	This research it was found that the motivators have a high agreement with Herzberg. But the demotivation had some differences as the conditions of work; the appreciation and the payment were motivating in the Herzberg study, while in this study it turned into demotivation.
Equity theory Adams [19]	Construction crew workers [29]	<b>Canada</b>	This study, the factors affecting the motivation of the crew were identified in following categories: individual, crew, industrial and external, and at the project level. The outcome of this study is modeling these factors to measure motivation at the crew level.
	Construction workers [30]	<b>Portugal</b>	The study indicated that, rewarded workers equally according to their performance has a great effect on their productivity.
Expectancy Theory Vroom [17]	Construction workers [30]	<b>Portugal</b>	The results of this paper were counterproductive to the concept of the expectancy theory, where the responses of the workers indicated that their good performance is not always related to rewards. A small percentage of them receive some appreciation from the superiors if they make an effort to perform a particular task.
	Apprentices in construction [31]	<b>Mid-western city</b>	The findings of this research are negative with respect to the expectancy theory, as the study resulted in a poor relationship between effort and performance with satisfaction. However, valence was strong collerated with satisfaction.
Maslow's theory [14]	Managers and workers in construction industry [32]	<b>Kuwait</b>	The result of this study is in contrast to the theory of Maslow, which stated that physiological factors are among the first needs and motivators of workers, as a result of the various working conditions that Kuwait has experienced in the recent period, in addition to being one of the economically developed countries, so financial needs are not among the priorities of employees. Job security and self-development were the most important factors affecting the motivation of workers.

### 5. Study Methodology

In order to identify the key motivational factors affecting manpower in construction projects, the study was carried out in following a sequence of procedures that began with a comprehensive review for the past researches concerning with manpower motivation. At this step, a preliminary list of factors was created. Following by this stage, brainstorming discussions were held to review, standardize and filter the main list of motivation factors, in order to make it a comprehensive and practical list without excessive

repetition and then a questionnaire was developed. The questionnaire was distributed among various construction companies in Egypt. The questionnaire was filled out by contractor engineers, consultant engineers and labors of different trades. A statistical software package SPSS version 26 George and Mallery [33] was used to analyze the data collected. Demographic data of engineers and labors were analyzed and the reliability test was conducted using Cronbach's alpha coefficient. Relative importance weight of factors were calculated using 5% trimmed mean method, it is defined as the mean of all responses remaining after the

5% of excluded respondents have been removed [34]. As a result, it is more accurate than the traditional mean. Finally, the key manpower motivation factors for engineers and labors were identified. A framework of the study methodology is shown in Fig 2.

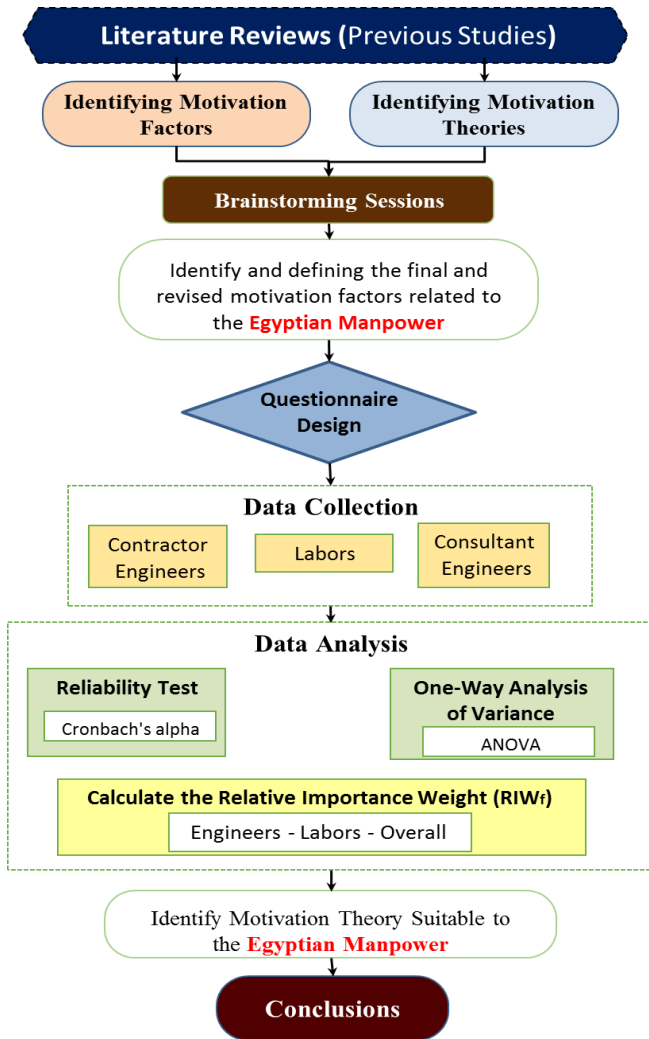


Fig. 2. Study methodology

5.1. Identifying manpower motivation factors in construction

Based on previous researches on manpower motivation in construction, various factors which have a sufficient effect on motivation were determined, as shown in Table 2.

5.2. Brainstorming sessions

A brainstorming session was held with experts in the field of construction to determine the final list of factors affecting the motivation of the manpower without unnecessary repetition. Brainstorming sessions were conducted through 7 interviews over 3 weeks. The brainstorming participants were divided into 6 project manager, which represented 40% of the total, 3 consultant, which represented 20 % of the total, 4 university professors, which represented 27%, and 2 supervisors in construction which represented 13%. Initially, the concept of motivation

and description of factors was reviewed to make sure everyone understands the topic of brainstorming. Twenty-eight motivation factors were identified, which were revised and reduced into fourteen motivation factors. 14 factors affecting motivation were categorized into four categories, and were classified into intrinsic and extrinsic factors, as shown in Table 3:

Table 2. Motivation factors and theories affecting construction manpower (engineers and labors)

No	Factors	Theory						
		Maslow's Theory	Herzberg's theory	Alderfer's Theory	Goal setting theory	Equity theory	Expectancy theory	Reinforcement theory
1	Achievement							
2	Recognition	✓	✓	✓				
3	Interesting work				✓			
4	Advancement (promotion)		✓					✓
5	Growth	✓	✓	✓				
6	Training		✓					
7	Nature of work		✓		✓			
8	Job security		✓			✓	✓	
9	Job status		✓					
10	Relationships with colleagues and supervisor	✓	✓	✓				
11	Relationships with managers	✓	✓	✓				
12	Organizational policies		✓					
13	Quality of supervision		✓					
14	Quality site management		✓					
15	Safety program	✓		✓				
16	Work conditions		✓					
17	Over time		✓			✓	✓	
18	Salary	✓	✓			✓	✓	
19	Fairness of payment		✓			✓	✓	
20	Timeliness of payment		✓			✓	✓	
21	Bonuses		✓			✓	✓	✓
22	Responsibility		✓					
23	Choosing work mates	✓		✓				
24	Penalty clause							✓
25	Challenging task				✓			
26	Freedom	✓	✓	✓				
27	Friendly environment	✓	✓	✓				
28	Distance from home	✓		✓				

Table3. Summarized list of 14 factors affecting the manpower motivation after brainstorming

Category	Motivation factors	Description	Intrinsic and Extrinsic
Management	1.Good safety program	Providing safety plan, employee training and programme of measurement and review of safety.	Extrinsic
	2.Quality of site management	The ability to control the schedule of tasks to follow the sequence of work, good communication with workers, attention to their commitment and quality of supervision.	Extrinsic
	3.Good supervision	The supervisor has sufficient knowledge, ability to lead and support workers.	Extrinsic
Development opportunities	4.Job training	Providing learning opportunities and periodic skills development sessions.	Extrinsic
	5.Advancement	Measuring the opportunities for promotions by competence.	Extrinsic
	6.Growth	The Assessment of the availability of chances for workers' self-improvement.	Intrinsic
	7.Challenging task	The competition among workers and the use of their abilities and experience to achieve goals.	Intrinsic
	8.Achievement	Successfully accomplishing difficult tasks. The employees are using their skills in advancing work.	Intrinsic
Financial	9.Good salary	Satisfaction with payment, pay timeliness, and equity in payment among those who perform the same work.	Extrinsic
	10. Bonuses	The use of incentive schemes and rewards for better performance.	Extrinsic
Work climate	11. Freedom	The freedom to deal with colleagues in the work place, obtain information, communication and form work teams.	Extrinsic
	12.Friendly environment	An appropriate work environment in the presence of respect among employees for them in addition to not working under pressure that causes employees to leave work.	Extrinsic
	13.Recognition	An appreciation of an employee's effort by their manager.	Extrinsic
	14.Job security	The sense of safety that comes with having a cushion against work and market risks.	Extrinsic

[35] was used:

$$N= Z^2* P (1-P) / e^2 \tag{Eq (1)}$$

### 5.3. Questionnaire design

A questionnaire survey was presented to both labors and engineers in several Egyptian companies. The questionnaire consisted of two parts. The first part is Biographical Data about the participants Such as name, age, job, years of experience, and the type of project. In the second part, the participants were asked to rate the factors affecting motivation based on their experience using Likert scale from 1 to 5, where 1 represented "very low" and 5 represented "Very High". A section was presented to allow the participants to list any additional factors from their point of view at the end of the questionnaire.

### 5.4. Data collection

According to the research methodology, the data collection process was carried out to ensure a high level of reliability in the acquired data. The relevant data was gathered via a survey questionnaire. The questionnaire form was created in a basic and straightforward style to ensure that participants could comprehend and reply to the questions independently to obtain the specific sample size for the unlimited population, the following equation from

Where N= the sample size of unlimited population; Z= the statistic value for the confidence level used, i.e., 1.645 for 90% confidence level; p= the value of the population that estimated (the value of p=0.5) and e= the sampling error, 10% for confidence level 90%.

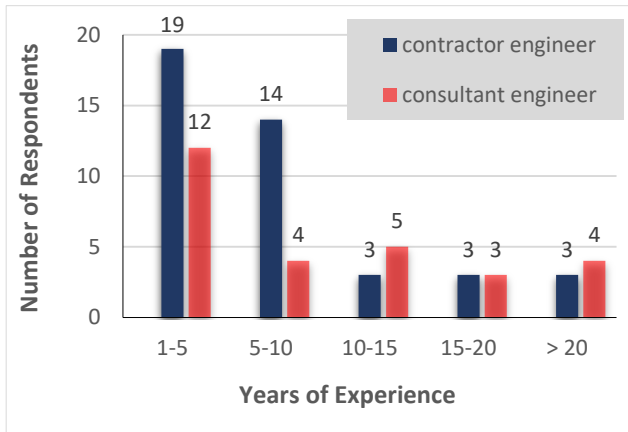
By inserting these values into Equation (1), the unlimited population sample size was **68** as the minimum value.

### 5.5. Responses to the questionnaire

The questionnaire was distributed across different groups of engineers based on the years of experience and type of representation in the project as a contractor or a consultant. Years of experience were divided into five categories, and responses were assigned to one of these categories. A total of 110 questionnaires were administered to engineers. 70 questionnaires, representing 63% were gathered from engineers working on different type of projects in Egypt (28 consultant and 42 contractor).

A total of 130 questionnaires were administered to labors. The labors were participated with 90 questionnaires representing, 69%; the demographic data of the respondents included the following: age, years of experience,

educational level, marital status, trade, and type of representation. Several craftsmen of bar bending, carpenter, painters, electricians, masonry, and else were shared their experience. The sample was made up of different experience categories, the largest proportion of the respondents (34%) have experiences from 1-5, followed by (23%) having 5-10, 16% had 10-15 years of experience, only 10% of them had experienced by 15-20, and 7% more than 20%. Fig 3 presents the number of respondents by type and by years of experience.

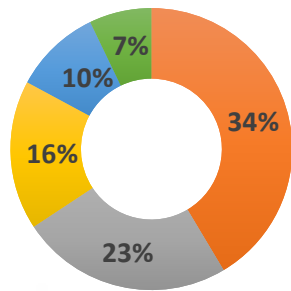


(a)



(b)

1-5 5-10 10-15 15-20 > 20



(c)

Fig. 3. Graphical representation of biographical Data of the participants: (a) Engineer's type of representation and years of experience; (b) Labor's type of representation and trade; and (c) Labor's years of experience.

## 6. Data analysis

Data analysis can be described as the process of evaluating data to find results. Appropriate and exact analysis will yield in accurate results, proper assessment, and, ultimately, an effective motivation strategy.

### 6.1. Reliability test

The Consistency Reliability Test is used to determine the extent to which elements of a particular construct are grouped together and are able to measure the real construct independently. Consistency reliability is measured by Cronbach's Alpha coefficient, it is measuring the degree of correlation between variables, normally ranges from zero to one [36]. Sekaran [37], and Moshood [38] stated that if the value is higher than 0.60 it indicates stronger internal consistency. Using SPSS (26.0), the alpha coefficient was calculated. The overall Cronbach's Alpha was found to be 0.71 for questionnaire of labors and 0.817 for questionnaire of engineer. This value means the accepted reliability and validity of the questionnaire data according to. As a result, measurement tools are usable, appropriate, and effective for data collection.

### 6.2. One-way analysis of variance (ANOVA)

The one-way ANOVA test is utilized to compare the mean value of two or more groups. It was conducted to determine whether there were any variations in motivation across the different categories of experience. The result of ANOVA for engineers and labors is indicated in Table 4.

The results show that there is no significant variation in the factors that motivate engineers according to their different experience categories. Also, the result for labors indicated the same output. For all factors, the coefficient F has a significance larger than .05, indicating that they are motivated by the same factors.

Table 4. Output of analysis variance for the participants ANOVA

Participant		Sum of Squares	df	Mean Square	F	Sig
Engineer	Between Groups	7.106	4	1.77	1.304	<b>0.382</b>
	Within Groups	84.322	65	1.31		
	Total	92.554	69			
Labor	Between Groups	3.833	4	0.971	1.157	<b>0.408</b>
	Within Groups	72.324	85	0.851		
	Total	<b>81.739</b>	<b>89</b>			

### 6.3. Results and discussion

The current study was conducted with the aim of identifying the key manpower motivating factors in Egyptian construction companies. In this study, the key manpower motivating factors were achieved through five percent trimmed mean method (5%). 5% of the questionnaires are excluded, and the average of the remaining questionnaires is calculated to represent the average value of the TM of each factor.

In order to calculate the relative importance weight of each factor according to engineers and labors, the sum of TM for all factors are calculated to get the weight of each

factors as expressed in following equations and the results are shown in Table 5.

$$\text{Total of TM for all factors} = \sum_{f=1}^F TM_f \quad \text{Eq (2)}$$

$$\text{Relative importance weight of each factor (RIW}_f) = TM_f / \sum_{f=1}^F TM_f \quad \text{Eq (3)}$$

Where;  
 TM<sub>f</sub>: 5% Trimmed mean.  
 F: Total number of factors affecting motivation.  
 RIW<sub>f</sub>: Relative importance weight of each factor affecting motivation.

Table 5. Relative importance weight of motivation factors.

Category	Factors	Engineer			Labor			Overall	
		TM <sub>f</sub>	RIW <sub>f</sub>	Rank	TM <sub>f</sub>	RIW <sub>f</sub>	Rank	RIW <sub>f</sub>	Rank
Management	1.Good safety programme	3.51612	0.07	9	3.5625	0.074	8	0.072	8
	2.Quality of site management	2.87096	0.057	13	3.5625	0.074	6	0.066	12
	3.Good supervision	3.58064	0.071	8	3.6	0.075	2	0.073	7
Development opportunities	4.Job training	2.87096	0.057	14	3.0875	0.064	13	0.061	14
	5.Advancement	3.83871	0.076	5	2.9125	0.061	14	0.069	10
	6.Growth	3.27419	0.065	12	3.1625	0.066	11	0.066	13
	7.Challenging task	3.35483	0.067	10	3.5125	0.073	9	0.07	9
Financial	8.Achievement	4.04838	0.081	3	3.6	0.075	3	0.078	3
	9.Good salary	4.08064	0.081	1	3.55	0.074	4	0.078	1
work climate	10.Bonuses	4.06451	0.081	2	3.55	0.074	5	0.078	2
	11.Freedom	3.37096	0.067	11	3.1375	0.065	12	0.066	11
	12.Friendly environment	3.82258	0.076	6	3.5	0.073	10	0.075	5
	13.Recognition	3.87096	0.077	4	3.6625	0.076	1	0.077	4
	14.Job security	3.70967	0.074	7	3.5625	0.074	7	0.074	6
Total TM of all factors		50.2742			47.9625				

6.3.1. Most important manpower motivation factors

Depending on the analysis of the questionnaires representing the responses of engineers and labors in Egyptian construction projects, the most important motivating factors of engineers and labors were identified, according to Pareto (20-80) rule. Pareto Principle is a familiar saying that asserts that 80% of outcomes result from 20% of

all causes for any given event. 20% of results represented around three factors, but five factors were taken into consideration Due to the convergence of the relative weights of the highest five factors. The top five factors were considered as the key factors. It is represented 40%, and 38% of the total factors of engineers and labors respectively. Fig 4 presents the ranking of 14 motivation factors according to their relative weights. The ranking of 14 motivation factors of engineers and labors are illustrated in Fig 4.

It has been observed that the five key motivators of engineers are good salary, bonuses, achievement, recognition, and advancement. Good salary was ranked as the first key factor affecting motivation of engineers with an RIW of 0.081. It has a sufficient impact on motivation of engineers, and it is considered as the first factor required for satisfaction, as when employers increase the salary of the workers, most employees work on their tasks and duties diligently. It appears to agree with Maslow's hierarchy hypothesis, and Alderfer's theory [14-15].

Herzberg [16] stated that engineers' satisfaction with salary is an incentive for them. With an RIW of 0.081

bonuses was ranked as the second key factor. The significance of incentive schemes on Egyptian engineers may be included in this finding. Periodic incentives increase their earnings and encourage them to produce the outcome efficiently. Achievement was ranked as the third factor with the same RIW as the two previous factors. Achievement is related to accomplishing difficult tasks and Responsibility for completing tasks at a particular time and in accordance with all quality standards. Engineers are satisfied when they use their skills in tasks commensurate with their abilities. This finding agreed with Herzberg [16], who considered achievement as the greatest motivator for engineers. Recognition was ranked as the fourth key factor with an RIW of 0.077 among other important factors. Appreciating the efforts exerts to attain specified goals at the required level of performance, which includes a variety of factors such as rewards, and positive feedback reinforces an efficient outcome. Maslow's theory of hierarchy arranged recognition as the third need. Herzberg established that recognition is a prime motivator for engineers. With a relative weight of 0.076 advancement was ranked as the fifth factor influencing the motivation of engineers. Opportunities for advancement through efficiency motivate them to exert more effort to complete their tasks. Advancement could be considered from different perspectives. Engineers might be promoted by reassigning them to new positions, by rewarding them with new responsibilities, or by engaging them in tasks that require creative and practical approaches. Herzberg's theory also considered promotion to be a motivator of employees. The findings showed that engineers' motivators do not correspond to the hierarchy of motivators in both Maslow's



and Alderfer's theories, but that engineers' motivators seem to be more closely related to Herzberg's dual factor theory.

It appears that the main motivating factors of the labors are not very different from the engineers, who are involved in some of the main motivators, but to a different degree of importance. Recognition is the first motivator for labors with an RIW of 0.077. Good supervision was ranked as the second factor for labor with an RIW of 0.075, Good supervision is summarized in the supervisor's ability to leadership, communication, and share his experience with labors, as well as his ability to urge them to complete their tasks successfully, which leads to improved performance. Herzberg included this factor in his theory, where he recognized that if the relationship with the supervisor was inadequate, this would be demotivating for the employee. The third most important motivating factor for labors was the achievement with an RIW 0.075. Salary and bonuses have the same degree of importance for labors with an RIW of 0.074. Factors that motivate labors are consistent with Herzberg's theory.

6.3.2. Identify motivation theory suitable to Egyptian manpower

The motivation of Egyptian manpower was evaluated according to the overall results. The average of the importance weights of engineers and labors was used to establish the overall importance weights. As an example, the importance weight of the good safety programme was calculated as the average of the engineer's weight (0.07), and labor's weight (.074), which resulted in an overall importance weight of (0.072). The ranking of overall motivation factors is shown in Fig 4.

The overall results established that the first and second motivators of the manpower is the salary, and bonuses respectively. Egypt country is one of the development countries with a low rate of income. Manpower in these countries considers money as the most important need to fulfill their requirements. Money's value can differ depending on the state of the economy in a particular country. When salaries are constant or dropping due to rising inflation, the value of money increases as a motivator. On the other hand, money becomes less important when the economy is high and the employees have reached a good standard of living, where the real income earned will be proportional to the expenditure on needs, then the effect of money as a motivator decrease [39-40]. Achievement was ranked as the third factor; it has the same rank in the individual cases of engineers and labors. The fourth motivator, according to overall results, was recognition; it has the same rank for engineers, but for labors it was the first factor to motivate them. The fifth motivator for the Egyptian manpower is the friendly environment. Based on the review of motivation theories, and according to analysis of the factors, the results investigated that the motivators of Egyptian manpower does not belong to the theories of Maslow [14] and Alderfer [15], as the motivators of Egyptian manpower don't apply the sequences of both theories. But, the Egyptian motivators are, in reality, a part of Herzberg's theory. Herzberg established that salary and rewards are prime demotivators if the employees are not satisfied with their income, and if the construction companies paid them a sufficient salary, and implemented incentive programmes,

the employees would be motivated and satisfied with their work. On the other hand, a sense of accomplishment is one of the major factors which satisfying the employees, so achievement and recognition for exerted efforts, and assigning more responsibilities are among the most important motivating factors. Employees are also, satisfied, and motivated if they have an appropriate work environment, and good relationships with colleagues, supervisors, and management. On the other hand, it is apparent that extrinsic factors have the maximum impact on the motivation of Egyptian manpower.

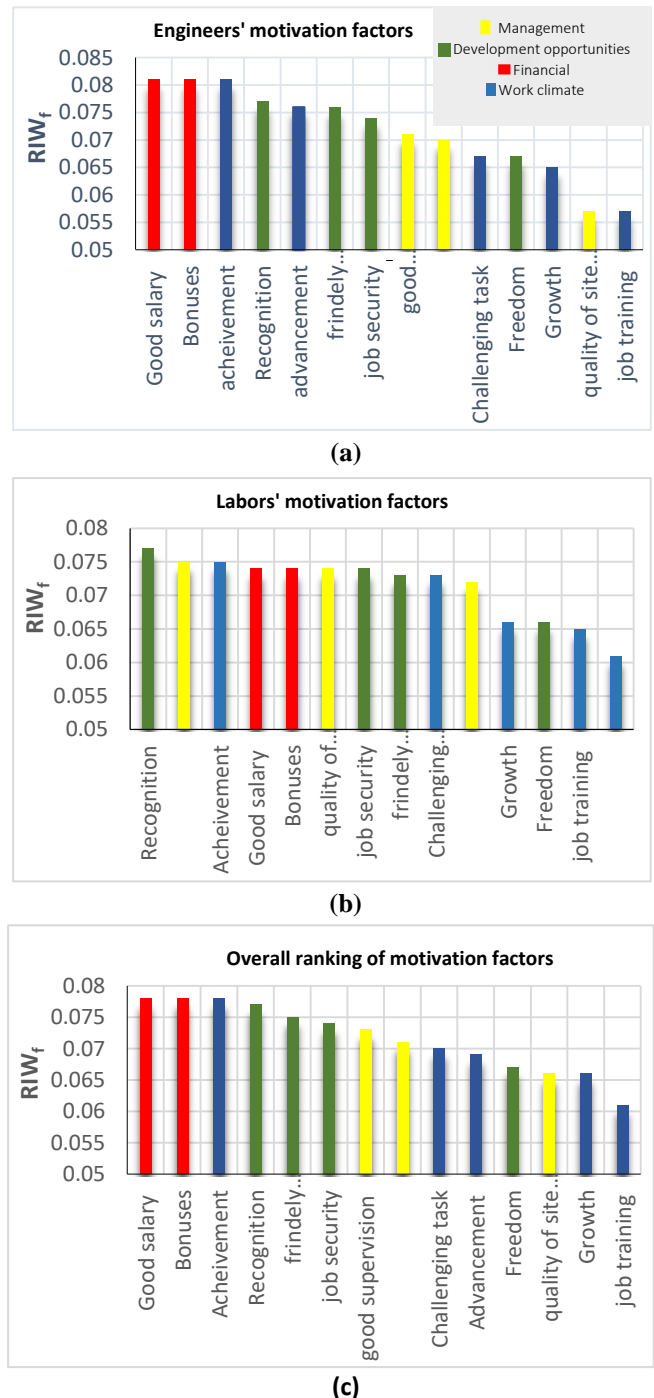


Fig. 4. Graphical representation of the ranking of 14 motivations factors according to their Relative Importance Weight (RIW<sub>f</sub>): (a) Engineers' motivation factors; (b) Labors' motivation factors; and (c) Overall ranking of motivation factors.

## 7. Conclusions

Several researches indicated that motivation is considered as one of the important factors that affect productivity in construction industry. This research tried to fill a knowledge gap by identifying the main factors that have been shown to influence Egyptian manpower motivation and which motivation theory is related to them in order to achieve the required level of construction productivity. Using a questionnaire survey methodology, the rank of 14 factors that influence the motivation of the construction manpower in Egypt was established. The reliability of the questionnaires was checked through Cronbach's Alpha coefficient. The trimmed mean method was used to determine the relative importance weight of motivation factors according to engineers and labors, as well as identifying the key manpower motivating factors in Egyptian construction projects. The results revealed that both engineers and labors are motivated by good salary, bonuses, achievement, and recognition. While engineers are more motivated by advancement, labors are more concerned with good supervision. The findings establish that the motivators of manpower in Egypt are relevant to Herzberg's theory. The researchers can apply the findings in future studies concerning the motivation of manpower in construction projects. Based on the result of this study, a model can be developed to measure motivation, which contributes to predicting productivity.

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**Appendix (A)**

**Questionnaire Survey for Engineers**

**"Impact of motivation on construction Labor productivity in Egypt"**

The questionnaire is conducted for the purpose of a MSc. Research is being prepared by Engineer / Nourhan Abdelaziz Abdelhaleem. The aim of this research is to study the impact of motivation on construction labor productivity and to predict the labor's productivity in the finishing works. It will be so grateful and appreciated to support in finishing this survey with your experience in construction engineering.

**A) The Participant Biographical Data**

<b>Name:</b>						
<b>job:</b>	<input type="checkbox"/>	Contractor engineer	<input type="checkbox"/>	Consultant engineer		
<b>Age:</b>	<input type="checkbox"/>	Less than 20	<input type="checkbox"/>	30-40	<input type="checkbox"/>	50-60
	<input type="checkbox"/>	20-30	<input type="checkbox"/>	40-50	<input type="checkbox"/>	Over 60
<b>Years of experience</b>	<input type="checkbox"/>	1-5	<input type="checkbox"/>	10-15	<input type="checkbox"/>	More than 20
	<input type="checkbox"/>	5-10	<input type="checkbox"/>	15-20	<input type="checkbox"/>	
<b>Mobile No:</b>				<b>E-mail:</b>		

Note: Please read all factors before filling your response

Give a rank for the effect of every factor on the labor motivation based on your experience and Share your experience with examples of what is being implemented in construction projects. Please indicate, by placing a “√” on each line, the level of impact of each factor.

(1= very low, 2= low, 3= Moderate, 4= High, 5= Very High)

<b>B) Motivation Questionnaire</b>								
<b>Motivation factors</b>			Based on your experience					in examples of what projects implemented construction
			1	2	3	4	5	
<b>Management</b>	<b>1</b>	Good safety programme						
	<b>2</b>	Quality of site management						
	<b>3</b>	Good supervision						

Development opportunities	4	Job training						
	5	Advancement						
	6	Growth						
	7	Challenging task						
	8	Achievement						
Financial	9	Good salary						
	10	Bonuses						
Work climate	11	Freedom						
	12	Friendly environment						
	13	Recognition						
	14	Job security						
Others	15							
	16							
	17							
	18							

### Appendix (B)

#### Questionnaire Survey for Labors

هذا الاستبيان لدراسة مدي تأثير التحفيز علي إنتاجية عمال التشيد في مصر، كجزء من رسالة الماجستير الجارى إعدادها من المهندسة/ نورهان عبدالعزيز عبدالحليم  
شاركنا بتجربتك في هندسة البناء ونشكركم علي مجهودكم

اولا: البيانات الشخصية للمشارك		
		الاسم:-
		رقم الموبايل:-
<input type="checkbox"/> مشرف	<input type="checkbox"/> عامل	الوظيفة:-
		التخصص:-
<input type="checkbox"/> 40 -30	<input type="checkbox"/> 30 – 20	<input type="checkbox"/> أقل من 20 سنة
<input type="checkbox"/> أكبر من 60 سنة	<input type="checkbox"/> 60 -50	<input type="checkbox"/> 50 -40
<input type="checkbox"/> ابتدائية	<input type="checkbox"/> يجيد القراءة والكتابة	<input type="checkbox"/> أمي
<input type="checkbox"/> مؤهل فوق متوسط	<input type="checkbox"/> مؤهل متوسط	<input type="checkbox"/> اعدادية
<input type="checkbox"/> مطلق	<input type="checkbox"/> متزوج	<input type="checkbox"/> أعزب
		الحالة الاجتماعية:-

عدد الاولاد:-	<input type="checkbox"/> لا يوجد	<input type="checkbox"/> 1	<input type="checkbox"/> 2
سنوات الخبرة:-	<input type="checkbox"/> 1 - 5	<input type="checkbox"/> 5 - 10	<input type="checkbox"/> 10 - 15
نظام التوظيف:-	<input type="checkbox"/> عمالة مؤقتة	<input type="checkbox"/> عمالة دائمة	
اسم الشركة:-			
اسم المشروع:-			
نوع المشروع:-	<input type="checkbox"/> سكني	<input type="checkbox"/> غير سكني	<input type="checkbox"/> بنية تحتية

ثانياً: البيانات الخاصة بالإستبيان برجااء وضع علامة (√) والتي تعبر عن درجة الأهمية لكل عامل إعتماًداً علي خبرتك وتتراوح بين (1-5) حيث أن (1=لا يؤثر, 2= يؤثر, 3= تأثير متوسط, 4= تأثير عالي, 5= تأثير عالي جدا)

عوامل التحفيز	1	2	3	4	5	أمثلة لما يتم تطبيقه بالمشروعات
1 تطبيق برامج الأمان الجيدة						
2 ادارة الموقع الجيدة من حيث تنظيم العمال ومتابعة الانتاج وتطبيق التكنولوجيا						
3 قدرة المشرف علي قيادة ودعم العمال						
4 توفير الدورات التدريبية وفرص التعلم						
5 فرص الترقية طبقاً للكفاءة						
6 توفر فرص التطوير الذاتي والمهني للعاملين						
7 التحدي والمنافسة في العمل لتحقيق الأهداف						
8 انجاز الأعمال الصعبة بنجاح						
9 تقاضي رواتب جيدة						
10 المكافآت المالية والحوافز						
11 حرية التعامل مع الزملاء في مكان العمل وحرية الحصول علي المعلومات وتشكيل فرق العمل						
12 وجود الاحترام المتبادل بين الموظفين وعدم العمل تحت ضغط مما يخلق بيئة عمل مناسبة						
13 تقدير جهود الموظف من قبل المديرين						

						الأمن الوظيفي (عدم الخوف من ترك الوظيفة)	14
أى عوامل إضافية من وجهة نظرك:							
							1
							2
							3
							4