

# A System Approach: Model Development of Employee Engagement Factors Which Impact an Organization's Productivity

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**Abstract** In recent years, the global employment market has been subject to a growing body of theories in favor of allocating resources in both an instructive and applicable structure as to meet an increased trend in employee workplace commitment and productivity. Such theories propose that an unhealthy working environment may cause employee disengagement. It is implied that disengagement rates among employees result in lower rates of productivity and profitability. As such, it is of no surprise that this topic is viewed as one of the most controversial matters among accredited companies and organizations. On closer examination, with the help of the Gallup Employee Engagement Hierarchy pyramid, this paper will break down how distinguished and imperative factors such as workforce engagement, feelings of trust and happiness, and commitment to the workplace environment will bring about improvement, growth, and productivity to a company or organization. This qualitative description study involves exploring employee engagement strategies that have been used within **Toyota Production Systems (TPS)** to implement programs which have encouraged and contributed towards solving employee engagement issues within the organization. The conceptual framework of the study will utilize employee-focused design theory. The major purpose of this research is to conduct statistical analysis and evaluate the organizational productivity level, as well as how it is affected by the engagement of employees. More importantly, this research will determine if there is any correlation between engagement and productivity.

**Keywords:** *healthy environment workplace, employee engagement and productivity, trust and happiness, Toyota Production System (TPS), employee-focused design theory, statistical analysis of organizational productivity, gamification*

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## 1. Introduction

### 1.1. Lean Research and TPS Implementation

The concept of "lean" was introduced by Womack et al. [1] during the late 1980s and first referred to the deployment of a system which led to reduced costs and improved quality and efficiency at a Toyota automotive facility. Since its introduction, many organizations have attempted to replicate elements of the Toyota Production System (TPS) in order to achieve similar results. However, 74% of such companies were unable to make and sustain substantial progress throughout time [2].

TPS draws its inspiration from the traditional Japanese values of Monozukuri—"the process of making or creating" with an emphasis on creative thinking, beyond the mere repetition taught in some traditional schools [3]—and Hitozukuri—"education" or "a life-long passion for learning and development" [4]. While most

organizations attempting to optimize lean tools have adopted elements of the Monozukuri aspect of TPS, including standardization (i.e. visual management, standard work), continuous flow, and pull production, such companies have neglected to implement Hitozukuri elements of TPS, possibly explaining the difficulty in sustaining initial progress made through lean implementation over time [5]. Furthermore, because Hitozukuri is the part of the lean system which educates employees on how to apply Monozukuri elements within their respective roles, Hitozukuri is a prerequisite for the implementation of Monozukuri; however, many companies have not properly implemented these elements in the correct sequence during the application of lean [6].

It is only through the implementation of Hitozukuri and Monozukuri in the proper order can the foundations be built for implementation of the upper parts of the TPS house, as shown below. For example, companies which have attempted to implement Kaizen, Jidoka, and Just In Time (JIT) before applying standardization have not been successful [7].

## 1.2. Happiness, Trust, and Training on Employee Engagement, Productivity, and Profitability

Happiness is an abstract concept defined by some psychologists as the state of being thrilled or satisfied with life [8], and is two-fold: the "Health Model" focuses on generating happiness through positive feelings, while the "Disease Model" concentrates on minimizing possible inefficiencies and negative emotions such as dissatisfaction [9]. An integral component of happiness is happiness at work [10], which allows people to maximize performance and achieve full potentials. Enhanced collaboration with colleagues, creativity, goal achievement, learning, and success, accompanied by health, all spring from happiness [11]. Moreover, healthy and happy employees usually exhibit higher productivity and more quality connections in the long run, as happiness improves the quality of the interactions between employees and motivates learning [12]. Most people who are happy in the workplace are also productive and responsible [10]. Furthermore, there was a strong correlation between greater well-being at work and an increase in a business's profitability [13].

The lack of happiness in the workplace can result from injustices committed by a leader (Fitness, 2000, as cited in [14], p. 10). Trusting managers and the opportunity for clear and open communication can boost the emotional support employees feel from superiors, resulting in higher well-being (Aycan & Eskin, 2005, as cited in [14], p. 7). A study by Saunders and Thornhill [15] concluded that organizational justice had a significant impact on the trust of employees. Another determinant of occupational happiness is the perception of having opportunities to learn and evolve. DeConinck [16] found out that a supervisor's perceived support affects employees' trust in the supervisor and the whole organization. Based on previous studies on happiness, variables like psychological capital, perceived collaborative justice, supervisor support, income satisfaction, and growth opportunities are considered as the defining factors for occupational happiness, directly and indirectly.

Maginnis [17] indicated that standardization before implementing problem-solving plays a large effect on operational performance and the learning of team members. To reach consistency, documented standardized work, a method to identify wastes, and a workforce able to keep up with the standardization are required. Following the standardization, progressive improvement can happen via problem-solving to increase the level of consistency. The production system would not be altered without related training and education [18]. Training, according to Noe [19], is defined as "planned efforts to boost up the staff's learning of the job-related necessities". So, a standardized training process is vital to guaranteeing safety and quality.

## 1.3. Gamification and Operational/Organizational Excellence

Game mechanics are processes that offer players the opportunity to interact with a game world [20], and

gamification describes the application of such game mechanics in non-gaming environments [21] like the business space. Games involve the recognition of a player and a mission and the player is then engaged in a core engagement loop [22]. Features that are included in all games include long term and short term goals; SMART goals which are specific, measurable, achievable, realistic, and timely [21]; a clear relationship between choices and achievements; a status feature which provides users with real-time feedback; and increasing difficulty which offers players the ability to advance through progressively more difficult tasks [23]. Modern generation workers' interest in using knowledge, skills, and creativity, and pursuit of freedom, independence, and personal potential application at work make gamification particularly important.

Gamification can be utilized to improve employee motivation [24], attract people's attention, cement relationships, and boost creativity, which may in turn lead to increased productivity. The employer would enjoy motivated and efficient workers resulting in good results and profit for the employer and joy, raised income, and promotion for the workers. Gamification is used in recruitment, organizational problem solving, improvement of the corporate culture, and maintenance of valuable employees. As opposed to function-based design, which maximizes only efficiency, the human-based design that arises from gamification takes into account human feelings, insecurities [25], and desires and optimizes human motivation over pure efficiency. The ability of gamification to account for distinctly human factors such as communication, education, engagement, and teamwork as described in ISO 10018:2012 [26] also allows for the harnessing of human motivation in order to overcome the challenge of achieving untimed outcomes out of people in quality management systems.

Furthermore, gamification is the tool which can facilitate bidirectional communications between employees and employers which would allow for the implementation of operational/organizational excellence methodology, as operational/organizational excellence requires constant employee feedback in order to successfully function. Operational excellence is a methodology used to enhance performance outcomes, especially in dynamic environments where change seems to be the only constant aspect of organizations [27]. In this method, vulnerable, accepting, structured, disciplined, and innovative are the five steps of designing an operational excellence model. Each step in this model progresses toward lean production by minimizing risk, increasing profitability, maximizing business value, and focusing on business growth. The figure below depicts the development of this model.

## 1.4. Gallup Engagement Hierarchy

After interviewing 10 million employees, the Gallup team formulated a series of 12 questions which could be used to assess employee engagement in the workplace [28]. The questions are organized into four levels; from bottom to top: basic needs, individual, teamwork, and growth. In Figure 1, the Gallup hierarchy is illustrated. These levels must be satisfied in the order of placement on the Gallup engagement hierarchy pyramid in order to most effectively address employee engagement [28].



Figure 1. Gallup Q.12 Hierarchy [29]

## 2. Methodology

This study aimed to develop an employee engagement model that will improve productivity in an organization or production unit by examining the interaction between employee engagement factors. Those evaluated factors for the study are trust, workplace happiness, training, and its subsequent correlation with organization productivity/profitability based on lean system implementation. Several journals regarding employee engagement, trust, happiness, and training in a work environment, organizational productivity, gamification, and related sources were consulted in order to determine the factors underlying employee engagement.

Nowadays, each organization needs a robust human resource in order to develop, compete, and succeed in the globalized world [30]. For this study, a mixed model research method was applied. Creswell [31] defined a mixed model method as a mixed-methods study which includes the collection or analysis of both quantitative and/or qualitative data in a single study with concurrent or sequential data collection and which involves the integration of the data at one or more stages. The mixed model method is useful because it will take advantage of qualitative data that contributes to theory building [32] and provides a better understanding of complex organizational systems [33] while maintaining the rigor of research by transforming the data into quantitative results which can be tested using traditional statistical methods [34]. There are a variety of mixed models which apply this blended qualitative-quantitative approach in a variety of research fields. Limitations of this method include its high time consumption due to the multiple analysis phases and the difficulty that arises when explaining the transition between qualitative to quantitative data to the audience.

A correlation is the best-fitted regression line if the error of the estimation tends to zero [35,36]. The coefficient of determination ( $R^2$ ) parameter was calculated to determine the degree of goodness and accuracy of the proposed correlations. Therefore, three forms of estimation errors, including the average absolute error (AAE), and average biased error (ABE) were calculated to select the most appropriate correlations [37]. The lower the value of AAE, the less error there is in the prediction,

and the closer the prediction is to measured data. A more positive value of ABE represents overestimation while a more negative ABE indicates underestimation as compared to the measured values. Therefore, the correlation with the lowest AAE and ABE closest to zero was considered the best correlation [35]. All the estimation errors and the coefficient of determination were estimated using Equations 1, 2, and 3:

$$AAE = \frac{\left( \sum_{i=1}^n \frac{|P_i - M_i|}{M_i} \right)}{n} \times 100\% \quad (1)$$

$$ABE = \frac{\left( \sum_{i=1}^n \frac{(P_i - M_i)}{M_i} \right)}{n} \quad (2)$$

$$R^2 = 1 - \frac{\sum_{i=1}^n (P_i - M_i)^2}{\sum_{i=1}^n (P_i - \bar{M})^2} \quad (3)$$

where  $P$ ,  $M$ , and  $\bar{M}$  indicate predicted, measured, and an average of measured performance rates, respectively, while  $n$  is the number of sample data points which were used for the regression analysis. Therefore, these three parameters were used to assess the level of engagement correlation.

Regression analysis was carried out by using statistical software to form the aforementioned employee engagement model. Regression analysis is a crucial industrial engineering analysis method used to determine the relationship between independent variables and dependent variables [38]. A regression method can be utilized to create empirical equations and predict the response according to experimental data [39]. The dependent variable or response,  $Y$  may be related to  $k$  independent or regressor variables as shown in Equation 4.

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \epsilon \quad (4)$$

This model is called multiple linear regression model with  $k$  regressor variables. The parameter,  $j = 0, 1, \dots, k$ , is called a regression coefficient and  $\epsilon$  is a random error term. The parameter  $\beta_0$  represent y-intercept and  $\beta_k$  is slope coefficient for each explanatory variable. The model describes a hyperplane in the  $k$ -dimensional space of the regressor variables. The parameter manifests the expected change in response  $Y$  per unit change in when all the remaining regressors are kept constant [37].

Surveys containing twenty-five questions were conducted through the SurveyMonkey Enterprise as part of data collection and were distributed to a minimum of three hundred participants, the majority of whom were craft employees in various manufacturing industries within the U.S. The questions focused on multiple factors that were hypothesized to change the employee engagement level, with a key question asking employees to rate on a numerical scale summing to 100 the relative importance of trust, happiness at work, training, opportunities to grow and be promoted, and other factors in contributing to employee engagement.

### 3. Results

This study focused on understanding the interaction between employee engagement factors and their correlation with productivity/profitability based on lean system implementation. This section details a model tested using the independent variable "Engagement Rate" as the best fit for the dependent variable of "Productivity". Not only was the independent variable of employee engagement studied but the specific factors that determine employee engagement such as trust, happiness at work, and training were also examined; a model evaluating the effects of multiple independent factors on employee engagement and the correlation of these factors with productivity was generated.

In order to protect the privacy of the company where the research was done, the company will be called AZ. During this study, a survey on employee engagement at the real entity, company AZ, was completed. Another factor that was assessed was the productivity rate during the period the engagement survey was performed. The collected results were analyzed in Minitab<sup>®</sup> software to identify if there was any correlation between employee engagement and productivity at the surveyed production facility. The p-value for engagement rate tests the null hypothesis that the correlation coefficient is equal to zero (no correlation between engagement and productivity). A low p-value ( $< 0.05$ ) indicates that the null hypothesis can

be rejected. In other words, a predictor that has a low p-value is likely to be a meaningful addition to the model because changes in the predictor's value are related to changes in the response variable.

In the Minitab<sup>®</sup> data output shown in Figure 2, it is shown that the predictor variables of engagement rate are significant because the p-value is 0.000. The null hypothesis for this data set is rejected since the p-value is small. Therefore, there is a significant linear relationship between employee engagement and productivity.  $R^2$  is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination, or the coefficient of multiple determination for multiple regression. The obtained value of 75.51% indicates that the generated model explains most of the variability of response data around its mean as shown in Figure 3. In general, the higher the  $R^2$ , the better the model fits the data. It indicates that 75.51% of the variation in the Y variable (which represents productivity) can be attributed to the employee engagement rate.

The normal probability plot shows these regression results graphically. The normal probability plot is a graphical technique that evaluates whether a data set is approximately normally distributed. As indicated in Figure 3, the data closely follows the normal distribution. A normal distribution is a symmetric distribution and represents that observed random variables are around the central peak.

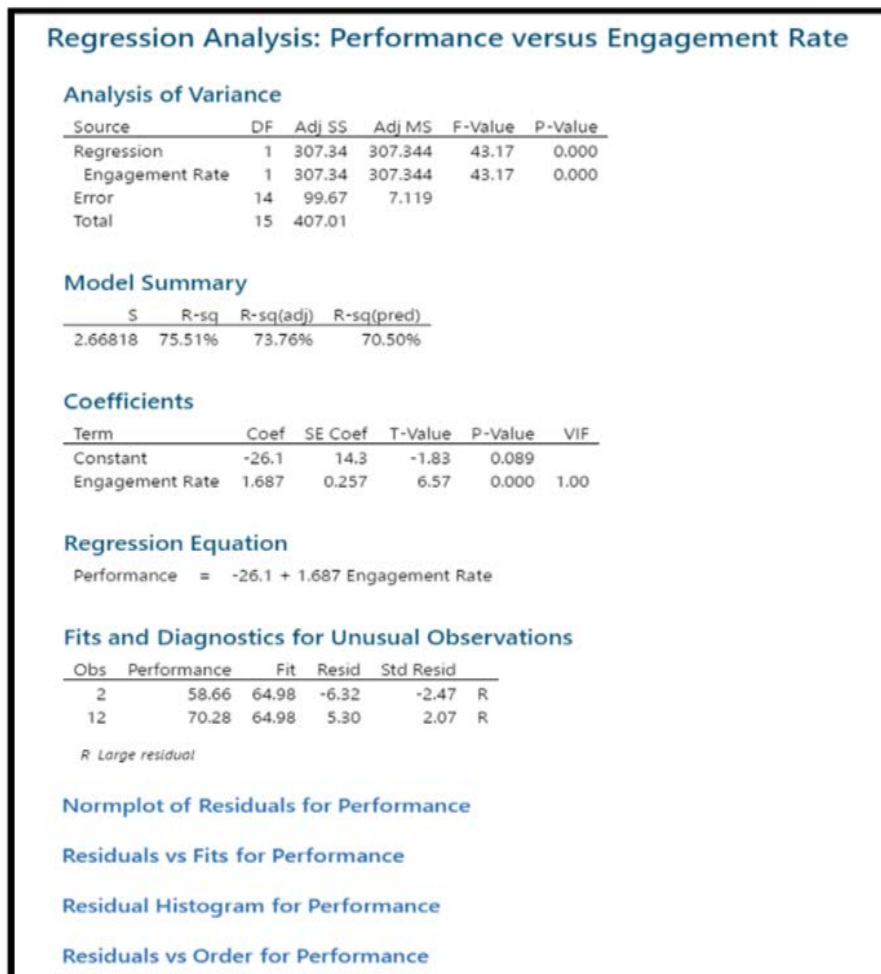


Figure 2. Regression analysis of engagement rate vs. productivity



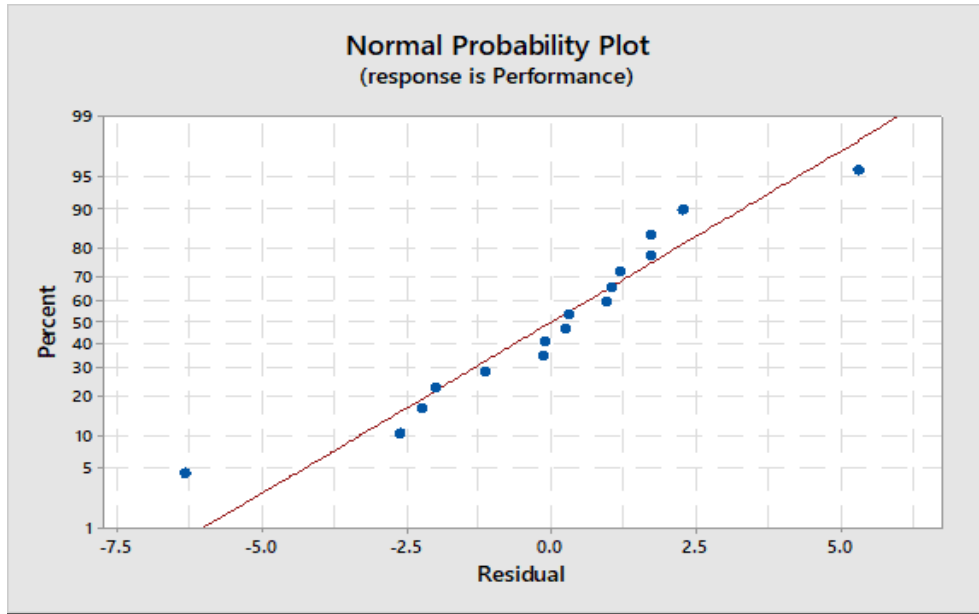


Figure 3. Normal Probability Plot

Equation (5) shows the coefficient for an engagement rate in performance and their correlation. It is a linear equation where 1.687 is the slope of the line and -26.1 is the y-intercept. The coefficient indicates that for every additional point in engagement one can expect performance to increase by 1.687.

$$Performance (Y) = -26.1 + 1.687 [Engagement Rate (X_1)] \tag{5}$$

One of the survey questions from participants evaluated the engagement factors of trust in employers, happiness at work, training, opportunity to grow and be promoted, and other factors. Those mentioned engagement factors will be modeled as the employee engagement rate ( $X_1$ ). Next, it will be updating Equation (5) to model those engagement factors and their correlation with performance. Based on 282 responses to the question and as appears in Table 1, trust and happiness were ranked by employees as being the most important factors for employee engagement, followed by the opportunity to grow and be promoted.

Table 1. Survey responses of the perceived importance of various employee engagement factors

Trust	26%
Happiness at work	25%
Training	18%
Opportunity to grow and be promoted	21%
Other factors	10%

A non-parametric alternative to the one-way ANOVA with repeated measures is the Friedman test which was developed by Milton Friedman in 1937 [40]. The Friedman test was used in this study to rank the factors and variables affecting employee engagement rates based on the survey which its result shows in Table 2. Since the asymptotic significance (p-value based on the chi-square approximation) is 0.000 which is lower than 0.05, the resulting difference is statistically significant and is not due to luck and accident. The Chi-Square value is a

nonparametric statistic that is used when collected data is measured at the categorical level. The Chi-Square score for this survey is estimated at 396.085 with a degree of freedom (Df) of 4. The Df for the Chi-Square is calculated based on the number of rows and columns as shown in Equation (6) where r is the number of rows and c is the number of columns and it refers to the maximum number of independent values in the data sample.

$$Df = (r - 1)(c - 1) \tag{6}$$

Table 2. Friedman Test of employee engagement factors

N	282
Chi-Square	396.085
Df	4
Asymptotic Significance	.000

The 0.000 p-value calculated in Table 2 proves that mean ranks shown in Table 3 are not all equal to each other. Based on the mean ranking shows in Table 3, trust has the highest score followed by happiness at work with the mean scores of 3.82 and 3.77. Also, the opportunity to grow and promote has a mean score of 3.20 and ranked the third possibility that can affect employee engagement rate. Therefore, the main focus needs to address the top three initiatives followed by the rest.

Table 3. Mean Ranks

	Mean Rank	Rank
Trust	3.82	1
Happiness at work	3.77	2
Training	2.66	4
Opportunity to grow and promote	3.20	3
Other factors	1.55	5

Two other questions that are related to trust and happiness at work are that gamification creates trust and increases happiness at work. The survey showed that only 9.22% of participants did not believe that gamification can create trust and only 6.03% of employees believed that gamification does not increase happiness at work.

Based on survey results, gamification can be used as a human-focused design aiding in the achievement of 'Operational Excellence' by developing, motivating, and engaging employees and supporting employee engagement factors. However, operational excellence should not be considered as a method to enhance change; on the other hand, it is a supportive tool and a process to be utilized by people within the organization [27].

#### 4. Conclusion

Based on the results of this study, it can be concluded that promoting gamification as a means to forge trust in employees of employers and as a means to increase happiness at work is a viable method to increase employee engagement rates; these elevated engagement rates will also increase organization productivity. Survey results indicate that employees will likely be receptive to attempts to increase gamification within the company. It is possible that gamification increases workplace happiness and trust between employees and employers by encouraging friendly competition between employees and by lowering employees' stress levels within work environments. Moreover, due to the high rating of trust by employees as a factor of employee engagement, this suggests that when employees trust an employer, the level of engagement is likely to increase; consequently, productivity at the work unit will increase. Promoting gamification can empower employees by giving real-time feedback on training results, and hence can foster greater trust between employees and employers. Lastly, gamification can provide a communication system by which employees and employers can give each other feedback, setting the stage for further implementation of operational/organizational excellence strategies as a solution for improving workplace productivity.

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