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Evaluation of the Factors Affecting Application of Total Quality Management in Building Constructions in Nigeria: Evidence from Calabar

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ABSTRACT: *This study is an empiricalinvestigation of the factors affecting application of total quality management (TQM) in building constructions in Calabar, Nigeria. The study used a sample of 455 respondents comprising the senior managers, project managers, engineers, architects, quantity surveyors, and technical managers of the construction firms in the State.Numerical data used in the study were obtained through questionnaires from desk and field survey. Descriptive survey research design was adopted while analytical tools employed weredescriptive statistics and principal component method of factor analysis. Electronically, the data analysis was aided with Statistical Package for Social Sciences (SPSS) version 25. Findings indicated that the major factor to this effect is management support (with a component score of0.365)while the least to this effect is staff training (with a component score of 0.263). It was therefore recommended among others that the State government of Cross River should set up monitoring and control team to ensure quality and constant improvement in products and services in the construction industries in the State.*

KEY WORDS*: Quality management; Quality products and services; Quality management system; Construction industry*

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I. INTRODUCTION

In today's world market, development and implementation of quality management as an initiative to solve quality problems and meet up with the needs of the final customer has made it possible for organisations to occupy advantageous positions and become more competitive. This long term development has also made it imperative for all parties involved in construction projects to strive at all times to produce commendable structures (Hoonakker, 2006; Feigenbaum, 2013).

Quality management begins with requirements carefully developed, reviewed for adherence to existing guidance and ultimately reflected in the criteria and design documents which accurately address these needs.In construction industries, quality management is a task which ensures that construction is performed according to plans and specifications, on time, within a defined budget, and a safe work environment (Olatunji, Abimbola and Nureni,2012). It has remained in the forefront amongst the critical factors to determine the degree of success or failure of a project.

Recently, the globalisation of the marketplace, international trade, and rapid technological innovationshas turned many of these industries into bystanders on the road to the future. It has also made their structures, processes and skills become progressively less attuned to the ever-changing realities of the demands and expectations of the present day clients. This change in organisational thinking from approaches based on production-oriented operations to a more competitively oriented method that places the achievement of customer satisfaction at the centre of business operations (Baidoun, 2004), has immensely tampered with the continuous improvement of processes, systems and skills in construction industries in Nigeria.

There is also,growing incidence of dumping of cheaper building materials especially from the Asian countries; and total quality management is still seen by many construction firms as optional extras rather than as a way of survival. Even on occasions where a good number of them attempt improvement efforts, they merely focus on catching up to competitors instead of focusing on those activities that will create new advantages to their goal.

To survive in this market changing environment, a number of these construction industries have begun to implement new ways of thinking and strategies to improving their organisational performance in order to become more efficient and flexible, and to achieve the benefits attainable with quality management (Al-Khalifa and Aspinwall, 2000) confident that improving the quality of their products and services will significantly aid the sustainable growth and competitiveness of the industries in the fast-moving environment.More so, despite that total quality management (TQM) will go a long way in assisting the industries to position themselves for the challenges ahead, many construction firms still pay lip services to TQM implementation.

II. REVIEW OF RELATED LITERATURE

2.1 Quality Management and Quality Management Systems

Quality management include all the activities that managers perform in an effort to implement their quality policy (Frank and McCaffer,2002). These activities include quality planning, quality control, quality assurance and quality improvement. It ensures continuous quality improvement with a view to ensuring a more desirable future. On the other hand, quality management systems refers to the set of quality activities involved in producing a product, process, or service, and encompasses prevention and appraisal. It is a management discipline that is concerned with preventing problems from occurring by creating the attitudes and controls that make prevention possible (Crosby, 1979 cited in Battikha, 2002).

Quality activities include the determination of the quality policy, objectives, and responsibilities and implementing them through quality planning, quality control, quality assurance, and quality improvement within the quality system (ASQC, 1997 cited in Battikha, 2002). These activities interact and are affected by being in the system, so the isolation and study of each one in detail will not necessarily lead to an understanding of the system as a whole. The main thrust of a QMS is in defining the processes, which will result in the production of quality products and services, rather than in detecting defective products or services after they have been produced.

Quality management within construction sector has led to improvements in quality, productivity and competitiveness through efficient management of process for value creation in the highly dynamic market (Matthews, Buratti and Kalidindi, 2011). However,Total Quality Management (TQM) is a management approach that tries to achieve and sustain long – term organizational success by encouraging employee feedback and participation, satisfying customers' needs and expectations, respecting societal values and beliefs, obeying governmental statutes and regulations (Harris & McCaffer, 2002). It is a philosophy that involves everyone in an organization in a continual effort to improve quality and achieve customer's satisfaction (Telsang 2004). TQM is saddled with the sole responsibility to produce products of high quality in the first place rather than depending on detecting defective products later through inspections. This can be achieved through continuous improvement, effective management policies, quality control training,team approach, product or service designs, supply of quality materials,control in production, distribution, installation and use, among others. It has contributed to sustainable growth of construction industries with strategic advantages in order to improve competitive abilities of the firms through a strong and positive impact on industrial performance (David and Gunaydin, 2010). As a management approach, TQMfocuses on value creation that has become a source of sustainable competitiveness.

Due to the appearance of the global market, customer demands have increased for high quality product which can be assumed as sustainable value in the competitive market (Anderson, Schroeder and Manus, 2011). Numerous firms have adopted TQM keeping in mind the current or future challenges in order to bring positive impact on industrial performance. As an example, Saudi construction sectors have adopted TQM to achieve long term profitability, sustainability and competitiveness (Albert, 2012).

2.2 Quality Management in Construction

Quality is one of the targets for standardization. The quality of a product or a complete building or other constructions is the totality of its attributes that enable it to perform a stated task or to fulfill a given need satisfactorily for an acceptable period of time. For a building and civil engineering work, a satisfactory product, although essential in itself, is not on its own sufficient. It must be incorporated in the design and construction in a correct manner. In buildings, more defects and failures arise from inadequacies in the treatment of products in design and construction than from shortcomings in the products themselves (Atkinson, 2005). In their work, Harris, McCaffer, Edum-Fotwe, (2006) stated that Quality Management has seen a transition from reacting to

the outcome of site production activities to becoming a strategic business function accounting for the raison d'etre of construction companies. Unless a construction company can guarantee its clients a quality product, it cannot compete effectively in the modern construction market.

Quality management is concerned with the operation process, organization, planning and formulation of strategies(Dale and Lascelles, 2007). It handles the process of planning, organizing and controlling the factors so as to provide high quality of work with low cost ensuring customer satisfaction and enhancing the reputation of the organization. In terms of practicing quality management for a certain process by an organization, formulation of strategy mostly focuses on customer satisfaction in order to meet their demands and expectations while improving the overall business efficiency.

As reported by Besterfield (2008), employee training plays an important role for organizations so as to improve employee skills and their work flow, as well as accelerating organizational performance that provide quality and customer satisfaction. Thus, quality management at all levels shouldincorporate adequate education and training that is able to contribute to ongoing quality improvement process and development of products.

Also, employees and management have to work as a team with all departments, integrated together to achieve required outcome of the quality management in order to provide value for organization and high quality outputs. Integration process within all departments can reduce defects, thereby reducing the overall operational costs to the organization. Thus, all department integration requires highly committed management to come up with quality function development in order to provide high quality output within low costs (Ramezani and Gharleghi,2013).

2.3 Empirical Literature

Despite the great benefits to be gained from the implementation of TQM, several organisations that have faced difficulties in the implementation of TQM and did not achieve the expected outcomes (Ngai and Cheng, 1997; Salegna and Fazel, 2000). For instance, Yeung, and Armstrong (2003) discovered that many companies adopting TQM did not get the expected benefits delivered. They singled out that management fail to recognize that there are barriers to overcome before obtaining the TQM benefits. There are also evidences of inadequacy of the vital components that influence the process of TQM implementation, and lack of knowledge about how these components should be introduced and managed (Al-Marri,Ahmed and Zairi,2007).

Hradesky (1995) considers that the failure of many TQM programmes is due to a lack of top management commitment in the organisation.In furtherance,Amar and Zain (2002) identified lack of top management as one of the barriers to implementing TQM in Indonesian manufacturing companies.

Withers and Ebrahimpour (2001) whose study was based on European firms discovered that lack of management commitment was one of the key reasons for TQM failure.This finding was supported in the study by Prajogo and Sohal (2004). In another study,Jun,Saiki, Tatsumi, Nakagawa, and Kawamukai (2004) pointed out that the major reasons for the failure of TQM implementation are lack of top management commitment, lack of customer focus, erroneous measures or no measures to track progress of quality performance, unrealistic expectations about the time frame and cost of TQM implementation, and the inability to develop and sustain a quality oriented culture.

Moreno-Luzon (1993) also discussed the difficulties that faced some organisations when developing quality management. The author discovered that these include resistance to change,lack of experience in quality management, lack of resources,short-term objectives, and lack of strategies and overall objectives. In a similar study,Ngai and Cheng (1997) identified four factors as the barriers to implementing of TQM in Hong Kong's services and industrial companies. According to the authors, these factors include cultural and employee barrier,infrastructure barrier, managerial barrier, and organisational barrier.

Kayis and Shin (2003) comparatively analysedthe cultural, conceptual, and practical constraints to quality management implementation in Australia and South Korea. They employed descriptive statistics and found that obstacles to TQM implementation in Australian banking industry include lack of top management support, lack of an innovative culture, poor communication between departments, lack of employee trust in management, and lack of understanding of customers'needs. Furthermore, they found that some of the obstacles to TQM implementation in the South Korean banking industry were suggestions of low employee quality, failure to provide challenges at work, poor communication, and little use of relevant data to set performance standards.

In the work of Mohanty and Lakhe (2000), difficulties in adoption of TQM are composed of lack of employee involvement and participation in quality improvement efforts, lack of top management commitment and motivation, perception that quality is the optional extra and not a necessity for development, poor internal communication, lack of focus on the needs of consumers, lack of political support, lack of established quality standards and inadequate test facilities, lack of advanced or modern technologies, insufficient education and training resources, resistance to change at different 113 levels, and inadequate knowledge and information about

TQM. Furthermore, Abdolshah and Abdolshah (2011) discovered that themajor barriers impeding the successful implementation of TQM in Iranian organisations are lack of management commitment, resource problems, and a failure to use the right framework for TQM.

Al-Khalifa and Aspinwall (2000) identified the main difficulties in implementing TQM in Qatar as lack of top management commitment and support, lack of empowerment at lower employee level, and a negative work climate. In the same vein,Al-Zamany, Hoddell, and Savage (2002) revealed that the three major obstacles facing organisations in the implementation of TQM in Yemen are inappropriate managerial traditions, lack of government supported programmes for quality,and lack of technical knowledge and training. Moreover, Bhat and Rajashekhar (2009) in their study conducted in India, found that the most important TQM barriers were the employees' resistance to change, no benchmarking of other companies' practices, lack of customer orientation, lack of planning for quality, lack of total involvement, lack of management commitment, and lack of resources.

Chaker and Jabnoun (2010) investigated the barriers to service quality in Islamic banks in Qatar. The study employed descriptive statistics and provided empirical evidence that lack of empowerment, centralization, and lack of transformational leadership are the major barriers. Matta, Martin and Desmond(2016), in a study of Malcolm Baldrige National Quality Award (MBNQA) winners, found that difficulties in implementing TQM were rooted in three causes: the holistic change of corporate culture; achieving and maintaining employees' acceptance of TQM; and integration with suppliers and customers.

From the reviewed literature, it was observed that only few researchers have focused more directly on the obstacles that hinder the ability of organisations to make a successful transformation to TQM or quality management,hence, the need to echo this in Cross River State of Nigeria.

III. METHODOLOGY

Research design adopted was the survey design. Data were collected data primarily from desk and field survey. The study employed descriptive statistics and principal component method of factor analysis. The choice of the principal component analysis (PCA) technique was to condense and single out the major factor affecting TQM in construction projects in Calabar, Nigeria. In applying this technique, it was maintained that the principal components are uncorrelated (orthogonal) and that the first principal component has the maximum variance, the second has the next maximum variance and so on.

A random sample of four hundred and fifty-five (455) respondents comprising of senior managers, project managers, engineers, architects, quantity surveyors, and technical managers were used. This sample size for the study was determined using the Taro Yamane (1967) formula for sample size determination when population (N) is known. The formula is stated thus:

$$n = \frac{N}{1+N(e)^2} \quad - - - - - - - - - \quad (3.1)$$

Where;
N= Population size
n= Sample size
e= Margin of error (usually 5%)

Population of the study comprised of all registered building construction companies in Calabar, Nigeria.Electronically,the data analysis was aided by Statistical Package for Social Sciences(SPSS) windows software version 25.

IV. DATA PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

Table 1: Respondents' opinion on effect of staff training on total quality management (TQM) of construction projects

Question Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Statistics	
						Mean	**Std.**
Relevant academic qualifications is an important factor that enhances staff performance	5 (1.1%)	29 (6.4%)	20 (4.4%)	302 (66.4%)	99 (21.8%)	4.01	0.785
Every building construction staff should be professionally qualified	20 (4.4%)	35 (7.7%)	60 (13.2%)	262 (57.6%)	78 (17.1%)	3.75	0.974
On the job training should be carried out regularly	0 (0.0%)	0 (0.0%)	21 (4.6%)	107 (23.5%)	327 (71.9%)	4.67	0.560
Staff should be encouraged to attend trainings, seminars and conferences	0 (0.0%)	0 (0.0%)	34 (7.5%)	309 (67.9%)	112 (24.6%)	4.17	0.540
Workshop should be organized for all staff in and off sites	0 (0.0%)	0 (0.0%)	59 (13.0%)	205 (45.1%)	191 (42.0%)	4.29	0.683
Cluster Mean	**1.1%**	**2.8%**	**8.5%**	**52.1%**	**35.5%**	**4.18**	**0.708**

Source: Author's computation from field survey, 2018 using SPSS 25.0

The cluster mean of 4.18 > 3.00 (likert mean) and associated standard deviation of 0.708 < 1.581 (likert standard deviation) indicates that staff training contributes to total quality management (TQM) of construction projects in the area. The result also provided that the outlisted are relevant factors for assessing the effect of staff training in construction industries (87.6% agreed as against 3.9% who disagreed). About 8.5% of the respondents could not take a stand on this issue.

Moreover, the respondents were of strong opinion that on-the-job training should be carried out regularly (4.67 > 3.00) in construction industries, stressing that these workshops should be organized for all staff in and off sites (4.29 > 3.00) while they are encouraged to attend those trainings, seminars and conferences (4.17 > 3.00). The respondents also pointed out that relevant academic qualifications is an important factor that enhances staff performance (4.01 > 3.00) and suggest that every building construction staff should be professionally qualified (3.75 > 3.00).

Table 2: Respondents' opinion on effect of management support on total quality management (TQM) of construction projects

Question Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Statistics	
						Mean	**Std.**
Policy statement on quality is essential for proper delivery of TQM	8 (1.8%)	32 (7.0%)	109 (24.0%)	209 (45.9%)	97 (21.3%)	3.78	0.920
Everyone in the organization should be involved in detecting defects	2 (0.4%)	12 (2.7%)	114 (25.6%)	237 (53.3%)	80 (18.0%)	3.86	0.752
Customer satisfaction should be the goal of top management	13 (2.9%)	30 (6.6%)	79 (17.4%)	107 (23.5%)	226 (49.7%)	4.11	1.088
Top management should encourage staff to produce defect-free output at first attempt	0 (0.0%)	5 (1.1%)	174 (38.2%)	187 (41.1%)	89 (19.6%)	3.79	0.761
Top management should motivate staff for effective performance	0 (0.0%)	0 (0.0%)	55 (12.1%)	241 (53.0%)	159 (34.9%)	4.23	0.647
Cluster Mean	**1.0%**	**3.5%**	**23.3%**	**43.1%**	**28.6%**	**3.95**	**0.834**

Source: Author's computation from field survey, 2018 using SPSS 25.0

Table 2 presents the respondents opinion on effect of management support on total quality management (TQM) of construction projects. The cluster mean value of 3.95 > 3.00(likert average) and associated standard deviation of 0.834 < 1.581 (likert standard deviation) indicates a general agreement that management support contributes positively to total quality management (TQM) of construction projects in the area. This result is also strengthened by a total of 71.7% agreement against 4.5% who disagreed to that. 23.3% of the respondents stood undecided which is a high level of nonresponse to the questions. Particularly, the respondents stressed that top management should encourage the staff to produce defect-free output at first attempt (mean response = 3.79) and as well motivate them for effective performance (mean = 4.23 > 3.00) in construction industries.

The respondents were also of the opinion that customer satisfaction should be the goal of top management (mean = 4.11 > 3.00) even when everyone in the organization is involved in detecting defects (mean = 3.86>3.00). They also agreed that policy statement on quality is essential for proper delivery of TQM in construction industries.

Table 3: Respondents' opinion on effect of project cost planning on total quality management (TQM) of construction projects

Question Items	**SD (%)**	**D (%)**	**N (%)**	**A (%)**	**SA (%)**	**Statistics**	
						Mean	**Std.**
Cost planning enables the project team to control cost of project within target	20 (4.4%)	74 (16.3%)	105 (23.1%)	159 (34.9%)	97 (21.3%)	3.53	1.126
Cost planning is used to produce the probable cost of the project	20 (4.4%)	58 (12.7%)	110 (24.2%)	141 (31.0%)	126 (27.7%)	3.65	1.142
Each element is allocated cost based on the cost of previous building of similar type	41 (9.0%)	55 (12.1%)	71 (15.6%)	113 (24.8%)	175 (38.5%)	3.72	1.326
Cost checks are continuously carried out through the construction period	10 (2.2%)	20 (4.5%)	59 (13.3%)	271 (60.9%)	85 (19.1%)	3.90	0.835
Cost planning is essential for proper project handling because of rising cost	0 (0.0%)	0 (0.0%)	78 (17.1%)	187 (41.1%)	190 (41.8%)	4.25	0.728
Cluster Mean	**4.0%**	**9.1%**	**18.7%**	**38.5%**	**29.7%**	**3.81**	**1.031**

Source: Author's computation from field survey, 2018 using SPSS 25.0

The descriptive result in table 3 above presents the respondents opinion on the effect of project cost planning on successful delivery of building construction projects. The cluster mean of 3.81 > 3.00 (likert average) indicates that good project cost interacts positively with the success of building construction projects in Calabar, Nigeria. Particularly, the opinion poll shows that cost planning is essential for proper project handling since it helps to tackle the problem of rising cost in the project (mean = 4.25>3.00); and enables the project team to control cost of project within target (mean = 3.53>3.00).

Table 4: Respondents' opinion on effect of project scheduling on total quality management (TQM) of construction projects

Question Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	Statistics	
						Mean	Std.
Critical path method is useful for planning construction jobs	28 (6.2%)	76 (16.7%)	119 (26.2%)	194 (42.6%)	38 (8.4%)	3.30	1.041
If project team fail to plan, they plan to fail	0 (0.0%)	0 (0.0%)	74 (16.3%)	268 (58.9%)	113 (24.8%)	4.09	0.636
Effective planning exposes likely problems that may arise during execution	10 (2.2%)	35 (7.9%)	81 (18.2%)	124 (27.9%)	195 (43.8%)	4.03	1.067
Some building clients are not aware of the importance of scheduling in TQM	0 (0.0%)	5 (1.1%)	104 (23.4%)	251 (56.4%)	85 (19.1%)	3.93	0.683
Where time is of the essence, wrong scheduling can lead to projects abandonment	0 (0.0%)	10 (2.2%)	85 (18.7%)	214 (47.0%)	146 (32.1%)	4.09	0.767
Cluster Mean	**1.7%**	**5.6%**	**20.5%**	**46.6%**	**25.6%**	**3.89**	**0.839**

Source: Author's computation from field survey, 2018 using SPSS 25.0

Looking at the respondent' opinion on the effectiveness of project scheduling to the successful delivery of building construction projects in Calabar, Nigeria, the researcher discovered that a total of 72.2% of the respondents agreed that project scheduling aids to achievement of a successful construction project while about 7.3% disagreed. About 20.5% of the respondents have no knowledge of whether or not project scheduling contributes to total quality management (TQM) of construction projects in Nigeria. The cluster analysis with a mean value of 3.89 > 3.00 and associated standard deviation of 0.839 supports that project scheduling contributes positively to the success of building construction projects.

Table 5: Respondents' opinion on level of success of TQM application in the execution of construction projects in Calabar

Question Items	SD	D	N	A	SA	Statistics	
						Mean	Inference
Inadequate training of project staff is responsible for the neglect of TQM application	31	54	106	209	45	3.41	Accept
Inadequate top management support can be responsible for cases of TQM non-compliance	8	21	71	254	101	3.92	Accept
Improper project cost planning could lead to cost overruns	0	0	114	217	124	4.02	Accept
Improper scheduling of project can lead to extension of project duration	6	61	147	109	132	3.66	Accept
Cluster Mean	**2.5%**	**7.5%**	**24.2%**	**43.6%**	**22.2%**	**3.75**	**Accept**

Source: Author's computation from field survey, 2018 using SPSS 25.0

The result in table 5 indicates that inadequate training of project staff, inadequate top management support, poor and improper project cost planning, and poor and improper project scheduling are the factors responsible for neglect of application of total quality management (TQM) in building construction projects. The cluster mean value of 3.75>3.0 agrees with this result.

Table 6: Correlation Matrix of the factors

		Staff Training	Management Support	Project cost planning	Project scheduling
Corr.	Staff Training	1.000			
	Management Support	.641	1.000		
	Project cost planning	.313	.684	1.000	
	Project scheduling	.228	.564	.565	1.000

Source: Author's SPSS 25.0 Result

The correlation result indicates association among the variables of interest. This result confirms the variables for factor analysis since they have high level of correlation.The factor analysis result (principal component method) which singles out the relevant and major factor affecting the application of total quality management (TQM) in construction projects was presented in the table below.

Table 7: Result of Factor Analysis

Variable Name	Variable label	Component score	Communalities
Staff Training	X_1	.263	.444
Management Support	X_2	.365	.851
Project cost planning	X_3	.326	.680
Project scheduling	X_4	.294	.554
Eigenvalue		2.529	
%age of variance		63.234	

***significant loading (± 0.60)**
Source: Author's computation from SPSS 25.0 Output

The principal component result which shows the contribution of each factor to total quality management (TQM) of construction projects indicates that the major factor to this effect is management support with the highest component score (0.365) and eigenvalue of 2.529. Particularly, the management support accounts for about 63.2% of the total variations in the system which is higher than the benchmark of 60%.
Moreover, all the indices have positive loadings; while significant loadings were observed in management support (X_2) and project cost planning (X_3). The least presence was seen in staff training (X_1).

V. CONCLUSION AND RECOMMENDATIONS

The importance of total quality management in the construction industry cannot be overemphasized since team work, production of defect-freeproduct at first attempt, customer satisfaction, and supply of quality materials will enable clients have value for their buildings, save cost on maintenance and reduce the frequent rate of building collapse in Calabar. This study has delved into the factors affecting application of total quality management in building constructions in Calabar, Nigeria. The study utilized the principal component method of factor analysis and outlined these factors to include inadequate training of project staff, inadequate top management support, poor and improper project cost planning, and poor and improper project scheduling. Particularly, the study revealed that the major factor to this effect is inadequate management support. In the light of these discoveries, the following recommendations were made:

1) The State government of cross river should set up monitoring and control team to ensure that project team members do not compromise on quality of products and standards in the construction industry. This will help to prevent quacks from carrying out construction jobs, and ensure that right quantity and quality of materials are used in building construction projects.
2) All local planning authorities approving building plans should be properly organized and adequately staffed with the right professionals to enforce all building laws, regulations and codes.
3) The construction firms should begin to insist that their suppliers show evidence of quality certification in order to enjoy patronage. This is very important as quality starts from the supplier through the organizational processes until it is received, measured and determined by the external customer/client.
4) The top management team of construction industries should endeavour to train their junior staffs on total quality management principles. They should also consider involving them in the industry's decision-making processes.
5) Construction firms should develop methods of benchmarking which are important tools for the continuous improvement of quality, and increase training in the field of benchmarking to achieve business excellence. For construction firms that have implemented TQM and do not succeed, the critical factors responsible for the failure should be carefully identified, analysed and corrected. It should not be seen as the end of the road but rather as a task or goal that must be achieved.

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