Factor Analysis of Communication in the Construction Industry

E.O. Aiyewalehinmi

Department of Civil Engineering Federal University of Technology, Akure.

---ABSTRACT---
This paper presents a factor analysis on management, non-employee and Union views of workplace communication in Building and Construction Industry. The purpose is to identify and recommend a common workplace communication approach where all social parties can work toward a common goal. The study identifiedthat the communication power base in terms of a hierarchy of allocated authority, with one of the social parties controlling all activities at all levels. Mail questionnaires were selected as means of data collection and responses were analyzed using (SPSS)package. Overall results of the analysis regarding employees' perceptions of workplace communication were 72.5%,Union 91.2% and management 60.9%of total variance obtained from all social parties. The role of workplace communication practice amongst the social parties in the industry was identified. Significantly the application of Factor analysis hasprovided a clear understanding of what is involved in the process of industrial relations communication and its impact.

KEYWORDS: *Management, Employee, Union,Communication and Reliability.*

I.   INTRODUCTION

Completion of every construction project needs not only material labour, which is carried out on communication labour that produces construction commodity byboth skilled and unskilled labour (termed blue collar) on the site, andthe white collar workers in offices.The blue collar worker produces material aspects of a construction commodity while the white collar produces informational conditions for the exchange and meaning aspect of a construction commodity. This means construction productivity is directly related to the amount and quality of information that flows between the people who are managing and those that are doing the work. The three social parties involve (Non-Employees, Management and Union) have an important role in determining the kinds of communication systems that operate in a project and the quality of information that is available. A constructionproject is unique in many ways. It is made up of a unique type of workers who specialize in building a one-of – a –kind physical object from a set of plans and specification different from all other non-engineering project.Nearly all construction workers are involvedin mixing materials and equipment.

1.1.Type Communication in Construction Industry

As construction industry becomes more complex, the industry organization becomes thinner, communication becomes a major concern and a major factor in defining events in the industry. Consequently, the role of communication in the construction industry becomes a major problem for researchers to define. Barnard (1938), in his study of the functions of executives, identifies communication as the principal cause of events and processes within an organization. Guevara and Boyer (1982) examined the effect of communication in two ways: communication characteristics and individual characteristics - as feedback, information processing, accuracy, modality choice, directionality, influence, mobility aspirations, and satisfaction with communication, trust, and interaction. Looking at the strategic role of communication systems in the industry, communication may be described as nerve systems that make it possible for several hundreds of people to do dozens of jobs or tasks in an integrated and orderly manner.

1.2.The role of communication in the process of Construction Commodity Production.

What is the role of communication in the process of commodity production exchange and consumption? What kind of human activities are involved in the production of these commodities?The concept of labour in commodity production is divided into two categories: material labour and communication labour. Material labour and communication labour in the construction industry can be seen differently from material and communication labour in the manufacturing sector of the industry. Historically, in the construction industry, workers have learned one of the trades of the industry (for example carpenters, plumbers, and so on) and have spent their entire

working career in that trade Weber Marx's (1947) study on capitalism or capitalist production from analysis of a single commodity. Weber recognized that a commodity is not a simple object of which use-value is determined by its own materiality. He explained further that every object possesses various properties, and is capable of being applied by different users. In addition, human beings are able to find various uses in the same thing. Moreover, the utility of an object is not determined simply by its material characteristics, but also by the flexible relationships between human desire and material properties. On the other hand, the utility of a thing gives it use-value, and the use-value of objects belongs to them independently of their material properties. In further writings, Marx recognizes that the use-value of a commodity is not merely a material thing but also a cultural product that is to be determined in the cultural context. In his analysis, in the commodity production process two kinds of labour processes can be identified: material and meaning. Material comes from nature and meaning comes from culture. Apparently, human beings need not only material labour working on nature but also "communication labour" - working on the human being.

II.   CONSTRUCTION COMMODITY

Construction products are not movable and they are not internationally competitive; the issue is how to define the quantity of human labour and the magnitude of value contained in construction commodity. This virtually depends on informational or communicational conditions. It is understood that value is created in the production process and determined in the exchange process. Communication labour produces demand power by producing informational conditions; for example, investing in the construction industry produces a labour inform of consulting process. Consulting includes various pieces of information such as planning, designing, financing, and so on. In short, these involve all various types of communicaision actions which can be regarded as communication labour. In other words, communication labour starts from the project initiation and goes through to completion and commissioning.After commissioning, communication labour is transferred to owners and users. Communication labour in the construction industry in regard to the industry's product has no limitation and is a continuous process. For the industry to understand its employees' desires the industry must maintain or provide the necessary informational or communication conditions for exchange. This includes recognizing the existence of their commodities, understanding the way their commodities are consumed and accepting their commodities as one's own use-value. By satisfying the informational conditions, the industry is indirectly increasing its productivity which could be characterized as an industrial relations revolution.

Figures 1.1 shows the line of communication among the four construction parties selected for the original study. It shows that individual parties depend on one another to function and also demonstrates that lack of communication promotes conflict of interests among the four major parties.
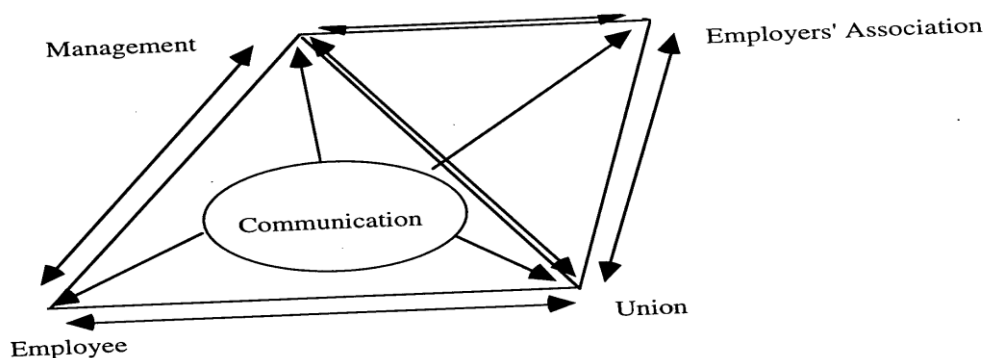

Fig. 1.1:Communication between the major parties

Fig.1.2 blow shows the complete project parties' communication process in the construction industry. The figure shows that projects parties get their work done by actively co-operating with one another. That is, all groups involved in construction of a project depend upon one another and upon what they get in return as a reward. The figure shows that information exchange in the industry is conducted through the social parties, that is, all traffic on a link is intended to travel between one of the social parties holding the position of authority in the office and other social parties at construction level. The construction industry communication network involves a wide range of information flows (Short, Medium and Long range). The figure alsoillustrates that there are many parties to large construction projects and that they are exposed to the above three types of information flows. The communication process in the construction industry is intended to fulfillsix basic functions:

a) Provide adequate feedback to each party involved in the project, b) Serve as a basis for modifying or changing behaviour toward more effective work habit, c)Identify factors that facilitate workers' satisfaction and productivity,d) Examine the level of authority among parties involved, e) Increase individual parties' participation, and
f) Provide data which management can manipulate to evaluate project decisions,
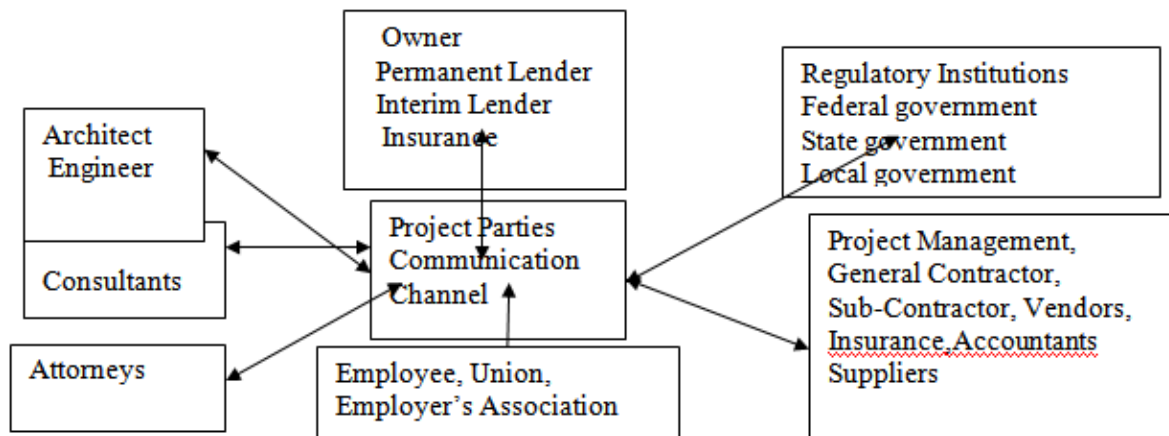Productivity and job assignments

Figure 1.2 Project Parties communication Channel.

III. COMMUNICATION KEY TO PRODUCTIVE CONSTRUCTION

Parker (1980)indicated that construction productivity is directly related to the amount and quality of communication that flows between those people who are managing and those who are doing the work. Parker's work is fascinating, taking into consideration the uniqueness of construction projects and the uniqueness of construction workers, including the difference between the physical object, plan and specification. This indicates the difference between the construction industry and other industries. His study can be related to the contemporary communication theory that examines various aspects of human communication. The effects of communication and employees' participation on efficiency, job satisfaction, employees' attitudes, management attitudes or behaviour can be linked with this theory. Vardaman and Halterman (1968), Mintzberg (1973), and Bryant (1990) each provide outlines and views about the relationships between managers and employees and communication and control within the administered organization. These authors combine a system and operation in a way that allows for many existing disparate, discrete thoughts about the concept of human communication. Both conceptual and operational human communication is concerned with various levels of methods of communication. On the conceptual level, macro and micro levels of human communication in the construction industry are not adequately aligned in part because they deal with different variables and thus subsystems of, or partial, industrial relations systems.

3.1.RESEARCH METHODOLOGY AND SAMPLES

NewSouthWales(Australia)was selected as the area which the data was collected. Data collection was limited to New South Wales because all the social parties are exposed to the same environmental working conditions. Mail questionnaires were selected as a means of data collection and responses were analyzed using a standard statistical package *(SPSSX).*Social parties are defined as management, non-management employees, employers' associations and the building and construction trade union.Initially, 42 construction firms were contacted. Their names and addresses were randomly selected from both Yellow Pages and Labor Council of New South Wales' lists of construction firms in the state. These companies were mailed the covering letter with a sample of questionnaires and forms to sign if they agreed to participate in the research study. When respondents completed this form, they supplied the data requested on the number of operating construction sites and number of employees, both management and site construction crews. Non-management employees working at individual construction sites were later contacted. Due to the research guidelines the number of eligible participants was set at two non-management employees per site.

3.2.MEASUREMENT OF VARIABLES

All variables were defined but they were not identified or measured on the basis of previous investigation or experiment because there was no empirical evidence to build on. Instead, they were derived from the study hypotheses and measured on the basis of Job Evaluation variables: Measured on a five Iikert point scale with responses ranging from not important to highly significant. Assumption that the observations are drawn from a normally distributed population before using analysis of variance (ANOV A with the Scheffe and F test) to test the propositions.Overall results of the initial analysis regarding management perceptions in regard to the propositions show that 81.5% of variables tested indicate no significant difference between the group means (hypothesis accepted and propositions confirmed) while 18.5% have a significant difference at a significance level of 0.05.

IV.   RELIABILITY

Reliability assessment has been a key means of scientific generalization since the 1970s. Peter (1979) reported that behavioural measures are rendered totally reliable and valid through reliability assessment. Reliability assessment is appropriate for multi-item scales such as used in this study.

4.1.Factor analysis

Factor analysis is more radical departure from statistical associated with experimental tradition, in that it does not accept arbitrary choices as to what are important variable in any field. Factor analysis groups numerous possible variables into fewest possible single whole or holistic influences. It offers a comprehensive and sensitive method of expressing quantitative relations between variables from observation of co- variables.

4.2.Employee, Management and unions' Perceptionsof Communication

Communication related variables investigated in this study are associated with management's, Employees and union influence on workplace communication and industrial relations reform. Their communication related variables and mean scores, standard deviation, and variance and range (minimum and maximum) are also identified. All variables identified in management, employee and unionrelating to decision making process influence communication significantly.The result identified that 75% of respondents ranked IWP (Improve Worker Productivity) important and very important. Clearly, the results show that all variables investigated are identified as important factors.

4.3.Factor Analysisof Management Employee and Union perceptions of workplace communication

The results below present the factor loadings and communality coefficients extracted from analysis of variable scores of the sample of management, employees and Union, regarding perceptions of communication. The factor loadings extracted from the analysis of item scores relating to employee perceptions of workplace communication. The factors together account for approximately 72.5% of the total variance obtained from the respondent group. Figure 3.1 shows the three dimensional plot of the loadings of the three factors and a scree plot of total variance (eigenvalue) associated with each factor. Factor 1 comprises seven items and expresses human relationships and functional effectiveness. Factor 2 clearly shows that industrial conflict is perceived to occur as a result of lack of communication and industrial Relations awareness. Factor 3 consists of three items and is related to interaction between management and employees. Factor 4 comprises of four items can be described in terms of effective communication between employee. The four items indicate lines of power and policy implementation, viewed as communication policy. Factor 5 can be defined as effective leadership communication style and the importance of the craft institution context to communication. Factor 6 consists of three items and can be viewed as interaction. Factor 7 comprises of three items indicating employees' participation. These items are associated with craft institutions, showing the difference between craft communication and bureaucratic communication.

Item	Communality Coefficient	Factor	Eigenvalue	CumPct
IWS	0.81652	1	10.23671	35.3
IEM	0.77434	2	3.31601	46.7
IEL	0.66656	3	2.10367	54.0
AES	0.74320	4	1.73901	60.0
FH	0.69227	5	1.34474	64.6
RIC	0.77853	6	1.19491	68.7
IWR	0.64272	7	1.10017	72.5

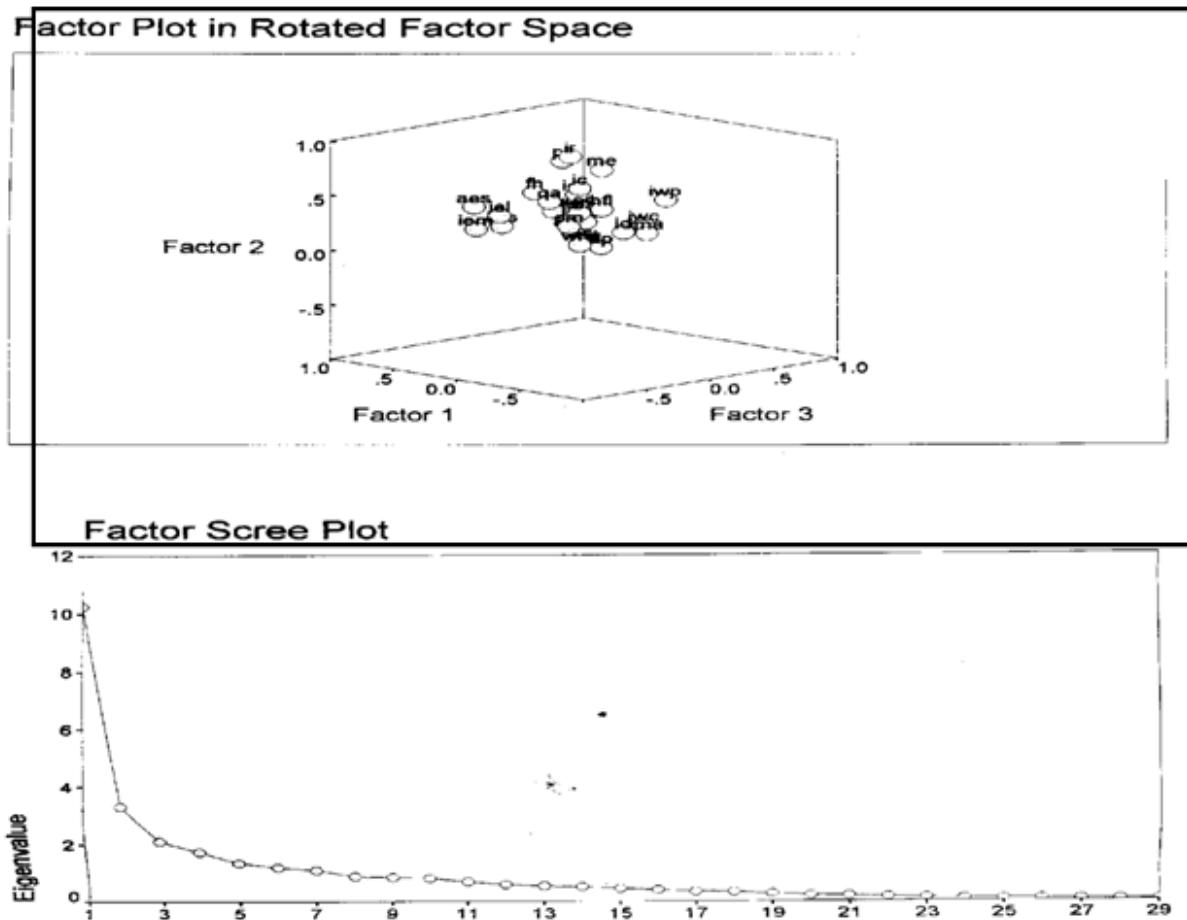|		
RLA	0.55780	
IR	0.75904	
PR	0.73345	
ME	0.69424	
IC	0.50589	
WRD	0.82415	
JS	0.79190	
HFL	0.78132	
CM	0.76833	
SW	0.80161	
EBA	0.68492	
IMA	0.71075	
EMT	0.65515	
QA	0.68366	
DP	0.76862	
IWC	0.67034	
IWP	0.69924	
IEP	0.58711	
ES	0.88371	
EC	0.86288	
CO	0.67700	
ID	0.82001	Cum = Cumulative, Pct= Percentage

Figure 3.1 Rotated Eigenvalue and Varimax (3D) factor plot relating to employee perceptions of communication

This section presents the factor loading extracted from the analysis of item scores relating to management perceptions of workplace communication. These factors together account for approximately 72.3% of the total variance obtained from the respondent groups. Figure 3.2 shows the three dimensional plot of the loadings of the first three factors and a scree plot of total variance (eigenvalue) associated with each factor. Factor 1 comprises eight items and can be described as indicating communication influence. Factor 2 consists of seven items and is related to effectiveness of management communication.On factor 2 management efficiency has the highest score, indicating that effective communication between parties can lead to effective co-operation between the parties. Factor 3 consists of three items considered to denote interpersonal communication. It can be viewed as trust, that is, parties relying on one another.

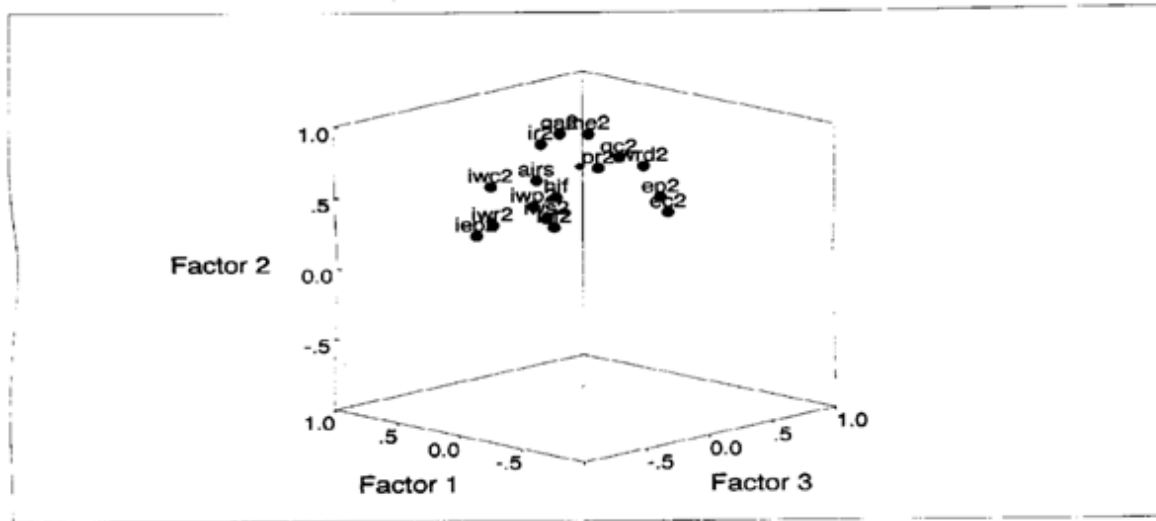| Item	Communality Coefficient	Factor	Eigenvalue	Cum Pct
IEP	.74823	1	8.85670	52.1
IWR2	.68248	2	2.04408	64.1
IWC2	.83035	3	1.38891	72.3
IWS2	.80754			
AIRS	.74280			
IEL2	.62274			
IWP2	.53840			
HIF	.41704			
ME2	.84332			
QA2	.81265			
IR2	.76329			
QC2	.67094			
WRD2	.58452			
IC2	.76185			
PR2	.72719			
EC2	.89603			
EP2	.84031			

Factor Scree Plot
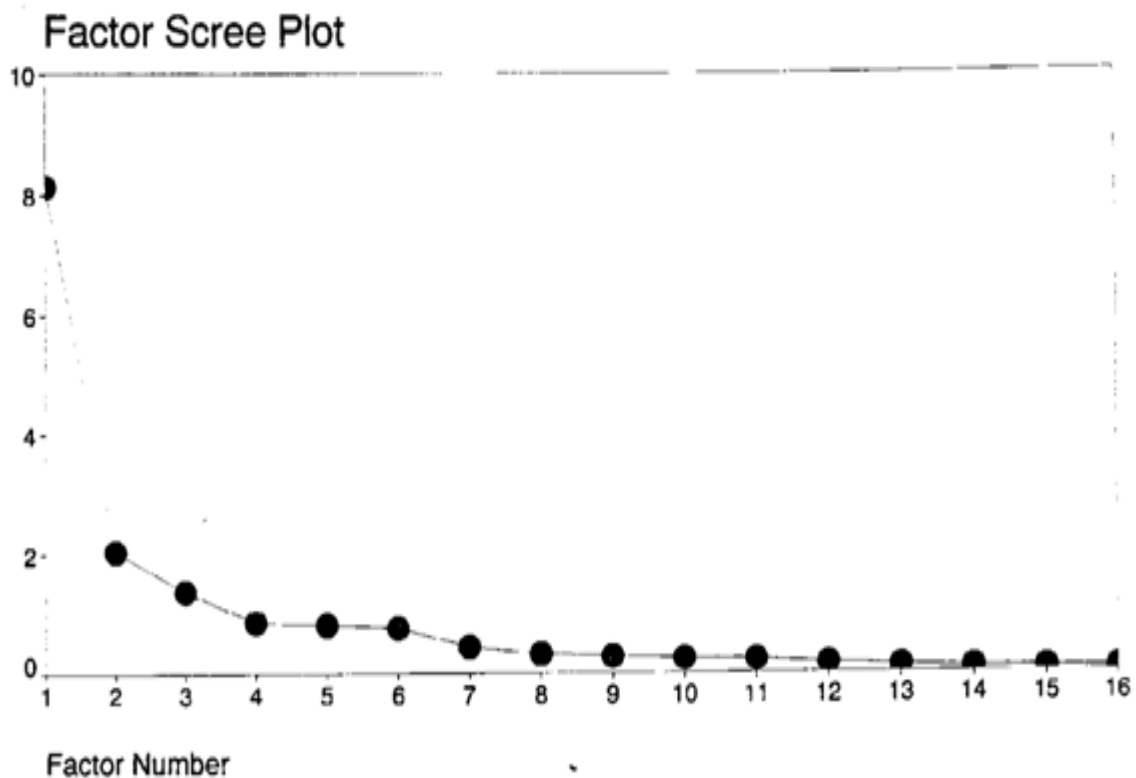
Figure 3.2 Rotated Eigenvalue and Varimax (3D) factor plot relating to management perceptions of communication

The result belowthe presents factor loadings and communality coefficients for six principal factors obtained from a factor analysis of items scores relating to union perceptions of workplace communication. These factors account for approximately 91.2% of the total variance obtained from the respondent groups. The figure 3.3 obtained from the analysis shows three dimensional plot of the loading of the first three factors and a scree plot of total variance (eigenvalue) associated with each factor.Factor 1 comprises nine items expressing management with ability, experience and knowledge. The union seems to identify management weakness in regard to lack of well- rounded managerial communication It is associated with job satisfaction, experience, knowledge and as well as communication. Factor 3 comprises four items and is related to ethics. It can be described as signifying ethical communication. Factor 4 includes two items and is related to employee participation and it can be described as communication value. Factor 5 consists of four items and is associated with construction parties' attitudes and actions. It shows effective communication and reduces industrial conflicts. Factor 6 comprises of three items representing industrial action.

Item	Communality coefficient	Factor	Eigenvalue	Cum Pct
QA	0.94256	1	16.03626	57.3
ES	0.93256	2	3.43781	69.6
QC	0.96821	3	1.96791	76.6
IR	0.97103	4	1.61957	82.4
EP	0.92955	5	1.41137	87.4
EC	0.92955	6	1.07455	91.2
DP	0.87216			
IC	0.94370			
PR	0.72723			
AES	0.91873			
IWS	0.95699			
IEM	0.98220			
SW	0.87899			
RLA	0.93343			
IWR	0.76875			
WRD	0.91110			
ID	0.91829			
HFL	0.96326			
JS	0.92132			
CO	0.93658			
EBA	0.94944			
RIC	0.88228			

EMT	0.94118
PCP	0.90350
CC	0.85427
STR	0.89474
IWC	0.86378
ME	0.95210
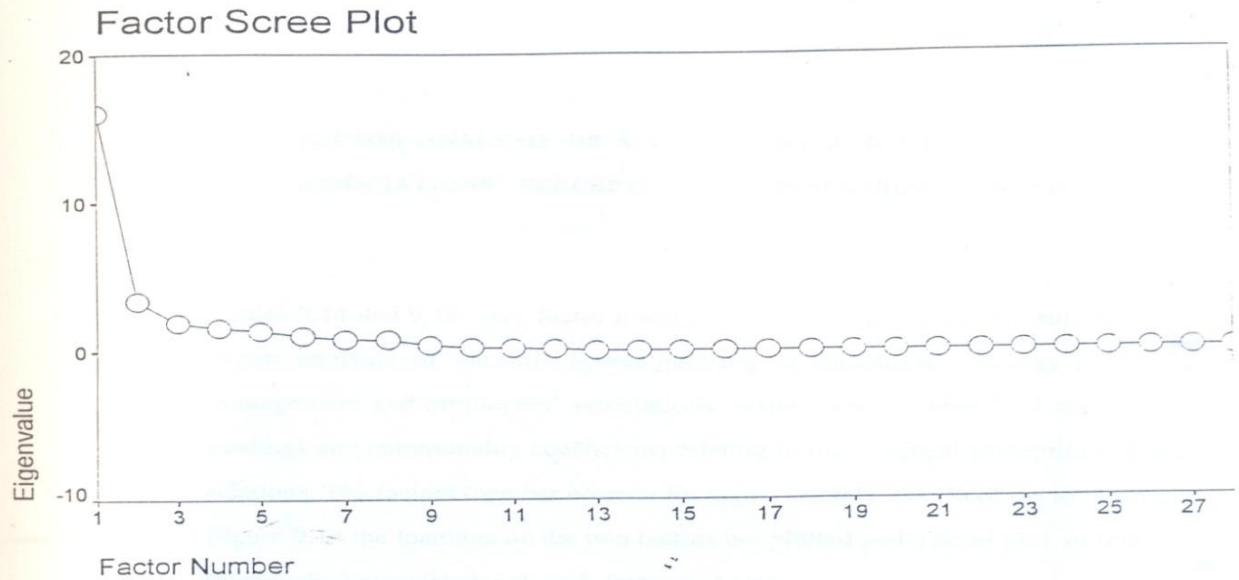
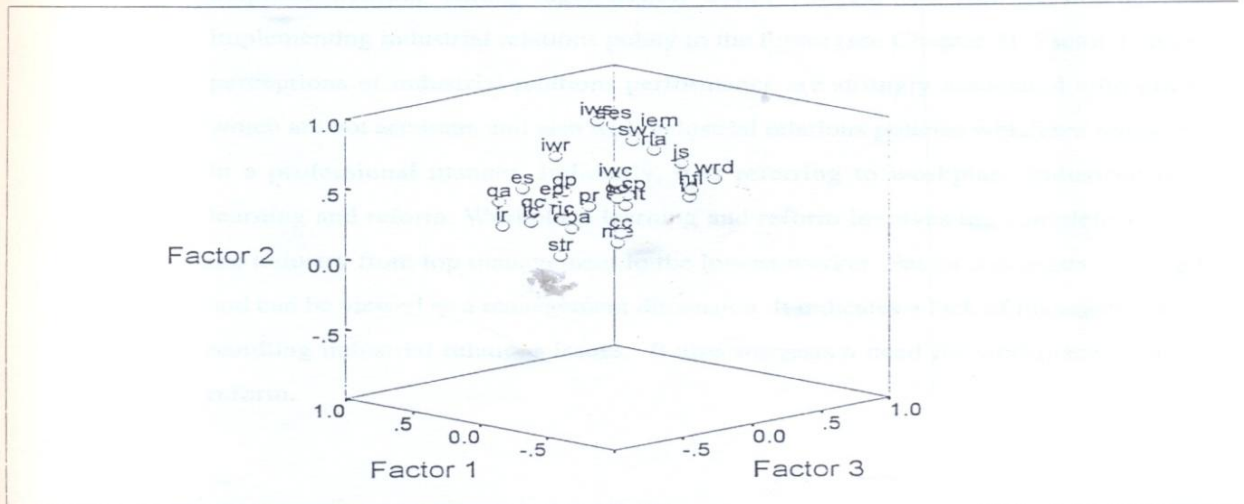Cum = Cumulative   Pct = Percentage

Figure 3.3 Rotated Eigenvalue and Varimax (3D) factor plot relating to union perceptions of Communication

Reliability and Valid Measures

The purposes of this section is to assess the instrument of measures as being valid if it measures what it is intended to measure. Assessing the validity of a measure iscrucial to the credibility of this research finding. Failure to assess the validity of measures may result in research findings that are at best misleading. The necessary condition for validity is reliability. In this study, it is important to see how reliable the results of all the statistical analyses are, because the scale data that has been used and the choice of sample scale could affect the validity. The following discussion focuses on the validity of measurement issues as they apply to the data on communication. Peter (1981)maintains that construct validity refers to the correspondence between measures and unobservable construct the measure is attempting to assess. Reliability of questionnaire data on communications is reported.   Table 1.1 below draws on this notion of construct validity. Cronbach's alpha shown in the table is the basic reliability used here. It is based on internal consistency of the test, that is, it is based on the average correlation of items within a test, if the items are standardized to a standard deviation of 1. Cronbach alpha can be interpreted as a correlation coefficient ranges in value from $0 – 1$.

The other entry in the table 1.1 is Standardized item, i.e. the alpha value that would be obtained if all items were standardized to have a variance of 1. Since the items on the research study scale have fairly comparable variances, there is little difference between the two alphas, indicating that all scales are quite reliable.

Table 1.1 Scale reliabilities

Employees		
Scale	Observed Item Alpha	Standardized Item Alpha
Communication (28 Items)	0.9293	0.9311
Management		
Communication (46 Items)	0.7075	0.8781
Union		
Communication (34 Items)	0.9646	0.9638

V.   CONCLUSION

The dynamic communication system within the construction industry involves all parties in the industry. All parties involved are expected to have communication skill, including a common ground for an agreement about role definitions and a clear consensus about the meaning of terminology used by the professionals and Para – professionals in the industry. In this study communication perceptions of three participating social parties are considered and they are Employees, Management and Unions. The finding shows that there was a sufficient amount of agreement between the factor structures of the three groups to assume that groundwork exists for improving workplace practice and industrial relation in the industry. The shift or change in workplace industrial relation breakdown in the industry shows that communication among the parties has been improved.The study identifies the direction, central value and spreading of communication data; this include the analysis of variability of the data and the dispersion of the research results. The result of the data shows that the majority of the variables are consistently high. This means that the hypothesized variables were generally supported.

REFERENCES

[1]   Barnard, C.I. (1938) the function of the Executive, Harvard University press, Cambridge Mass, pp.91.
[2]   Bryant, M. (1990) The Anatomy of Theory and its Relationship to Teaching Business Education University of western Sydney.
[3]   Guevara.M. and Boyer (1982) Communication Problem within Construction,
[4]   Mintzberg, H. (1973) the nature of Managerial work, New York: Haper and Row.
[5]   Parker, H.W. (1980) 'Communication: Key to productive Construction, Issues in Engineering, *ASCE vol 106:173 -180*
[6]   Peter, J. Paul (1981) "Construct Validity: A Review of Basic Issues and marketing Practices" Journal of Marketing Research, 18: 133-176. Journal of construction division, ASCE Vol. 107, No C04:551-557.
[7]   SPSSX Inc. (1986) SPSSX User,s Guide 2nd Edition. Chicago, III.: MvGraw Hill.
[8]   Vardaman, G.T. and Halterman C.C.(1968) Managerial Control through Communication. New York: John Wiley & Sons, INC.
[9]   Weber, M. (1947) Theory of social and Economic Organization, Henderson and Persons, Trans, England; Oxford University Press.