INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Reducing Peak Power Demand Of Ladoke Akintola University Of Technology, Nigeria - Using Artificial Neural Network

Philip A. Adewuyi
B.Tech.
Department of Mechatronics Engineering, Bells University of Technology, Nigeria
Muniru O. Okelola
M.Sc.
Department of Electrical and Electronics Engineering,
Ladoke Akintola University of Technology, Nigeria

Abstract:
As a nation, it is not possible to continue to build new power stations to cater for theever increasing demand for power by residential, commercial, and industrial consumers. Demand-side management provides a positive approach to manage the existing power being supplied by the power utility company, reducing the peak demand through load rescheduling, and to also save cost. Key strategies for the accomplishment of this objective were investigated. Artificial Neural Network was introduced to learn the power demand history of key loads in a university environment in order for the artificial neural network to make accurate decisions based on such learning experiences. Artificial neural network structure used which contains three-layer network having one input neuron, hidden layer with ten(10) neurons and one output neuron, gives better results in terms of mean square error of 0.008 which makes the model developed to be ideal for the representation of the university's load profile. Diversity factor was also taken into account to effectively train the artificial neural network for the major power demand items on campus with such units' load rescheduling carried out and analyzed with very encouraging reduction in peak load demand and overall cost saving.
This work clearly presents benefits in terms of economy of usage and longevity of power equipment. Most importantly, long term cost saving is visible.

Keywords**:** *power demand, ANN, load profile, epoch, forecast, management, PHCN*

1.Introduction

Can we continue to build more power stations to meet the ever increasing power demand? More power stations create more green-house effects. Generations are punished for it and climate is greatly affected. Resources to build new power stations are increasingly becoming very expensive. Utilities companies are rampantly shedding the little generated power. For how long can we as a country continue to operate this way? The question that readily comes to mind and begging for a solution is how to manage the little electric power that utility company supplies in order to still have a commensurate and equally efficient output. Many consumers are willing to pay more for electrical energy but such power is not readily available. Regrettably as electric power is generated, consumption goes on simultaneously, and there is no equipment yet invented that has the ability to store electric power in large quantity (Vaninsky, 2007). So we are at a cross road as to how to move forward in a positive and efficient way to make significant progress. Do we have to continue this way all our lives? Why can we not do our best to contribute to clean energy being craved for in our world today? It is therefore necessary to devise a means to really manage the little electric power being generated and supplied by the utility company. By this, energy management at the consumer end is focused. So the bulk of this work is based on the techniques to be adopted by the consumer to save energy through a programme called "demand side management" (Steve Cooke et al, 1991). By adopting this technique, cost would be saved on power consumption and consumers would be disciplined as regards the culture of electric power usage. The benefit of the new technology would be fully put into practice. As our country, Nigeria plans to improve on the present insufficient megawatts of generated electricity which as at 2011 stands at an average value of 3088.22MW (Adams, Akano, & Asemota, 2011), the full integration of demand-side management technique would go a long way in supporting the improvement in consumer attitudes and behaviours towards deriving the benefits in terms of cost saving and the overall efficiency in the generation, transmission, and distribution aspect of electric power industry.

The rest of this paper is divided into sections such as; power demand analysis and management approach, daily load profile analysis, ANN overview, results and discussion(where ANN training and in-depth investigation is carried out), conclusion and recommendation.

2.Methodology

2.1.Power Demand Analysis and Management Approach

Power demand analysis and management is used to describe all activities such as; planning, implementation, and monitoring of power supply by the authority and utilization at the consumer end. However, they may be initiated by the influence in the pattern and magnitude of a utility's load. A key approach for the realization of the power management goal is load management (LM). It is technically subset of power demand analysis and management that encompasses only the actions initiated by the utility or its customers as a result of incentives to accomplish peak clipping, valley filling or load shifting (Jun, 2009).

By using a systematical approach to setting up a power demand analysis and management program, it is possible to identify the quantities and specific uses of energy consumed and provide a base for comparison over time (Eric & Anne, 2006). Once a base level has been established, targets to reduce consumption can be set and the success of the power demand analysis and management program can be quantified. For the program to be a success, it is important to develop it so that the results are reviewed frequently, the policy eased and the plan of action revised (Florian et al, 2011).

The University, Ladoke Akintola University of Technology(LAUTECH), Ogbomoso, Nigeria is supplied with electricity by PHCN(Power Holding Company of Nigeria) from three feeders; Senate building feeder at 11kV, Engineering/Library feeder at 33kV, the Moshood Kashimawo Abiola (MKO) feeder also at 33kV and charged under a tariff tagged MD tariff (Olaomi, 2005).

This tariff is a three-part tariff. The first is a peak consumption charge. The total electricity consumed by the University between 7.00am and 11.00pm, from Monday to Friday. It is measured in unit of kilowatt-hour (kWh) and at present the university pays ₦11.24 per kWh. The second part is an off-peak consumption charge which is the total electricity consumed at all other times. It is charged at ₦8.50 per kWh. The third part of the tariff is a demand charge based on the maximum power demand in kilowatt(kW) for each month.

At this juncture, instead of the present manual control and monitoring system in LAUTECH, a novel control and monitoring system is proposed for easy load control and optimal results. This system which uses artificial neural network(ANN) as its core intelligence unit is termed "Power Predictor and Controller" (PPC). This system has

instant on-line access to numerous control systems to be situated on campus. Various loads (key loads) located at Senate building, 1200–lecture theatre, MKO lecture theatre, 1500-lecture theatre, Library, Anatomy Department, Mechanical Workshop and University's Health Centre. These loads must be controlled directly from the PPC (Brian, 2001).

2.2.Data Source

All the data used for this work is sourced from the electrical maintenance department of Ladoke Akintola University of Technology, Ogbomoso, Nigeria in December, 2011.
The university loads during the peak period are shown in the table 1 below:

Type of Load	**Demand(kW)**
Compact Fluorescent Lamp	38.1
Ceiling Fan	408.54
Television	17.57
Air-Conditioning Unit	1430.63
Photocopier	138.75
Desktop Computer	44.14
Laptop Computer	36.56
Refrigerator	9.5
Motorized Combined Workshop Machine	344.525

Table 1: LAUTECH's peak load demand before ANN application

From this data, an approximation must be made on the savings that are possible in:

- The short term, involving little or no capital expense
- The medium term, involving limited capital expenditure giving a payback period of 12 to 18 months.
- The long term, involving a major capital expenses and possibly reorganization of load, processes and personnel involved with energy and cost savings accrued after two or three years.

2.3.Daily Load Profile

The following section presents the profile for electrical usage at LAUTECH for a typical day all year round since the structure of the campus is non-residential.

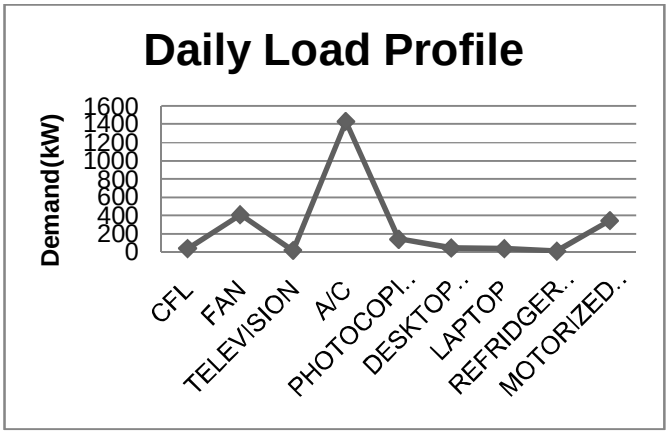

Figure 1: Typical daily load profile

Typical daily load profile of LAUTECH is a shown in figure 1 above. The air-conditioning unit is the largest load power demand equipment on campus. This is due to high temperature characterized by the weather condition around Ogbomoso. Also, this load demand pattern is due to the combination of high temperature and maximum campus population. With higher temperature and more people on campus, the demand for air conditioning, photocopier, and fans is at its highest. April, May, September and October characterized the months at which lowest demand occurs. This is due to holidays and festive periods around this time. The figure 1 also suggests that the university's electrical demand is directly proportional to the air temperature. This also indicates that the university's loads are mainly corresponding to the use of air-conditioning. Figure 2 explains this behavior.

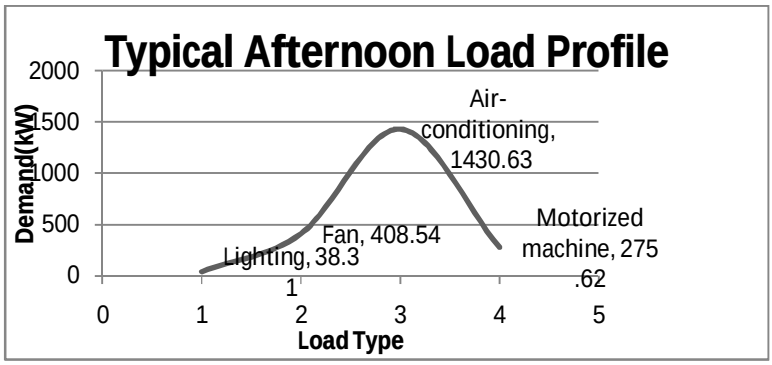

Figure 2: Typical Afternoon Load Profile

3.ANN Overview

The characteristics of the brain inspired the development of artificial neural network(ANN). The arrangement of neurons and synapses strength which is determined by complex chemical process establishes the concept of neural network (Martin, Howard, & Mark, 1996). It is in this vein, that an artificial neural network takes its prominence. Artificial neural network uses parallel structure model of operation similar to the biological neural network to carry out data processing. An artificial neural model consisting of scalar input 'p' that is multiplied by weight 'w' to form 'wp' which is one of the terms that will be sent to the summer in addition to another input 'l' multiplied by a bias 'b' to produce summer output 'n' which is moved to the transfer function 'f' to produce the neuron output 'a' is a typical example of a single-input neuron which is stated mathematically in equation (i) :

$a = f(wp + b)$……(i)

By comparing this ANN structure with the biological neural network, the weight correspond to the strength of a synapse, the cell body represent the summation plus the transfer function, and the neuron output represent the signal on the axon.

For this work, the transfer function used for the ANN training is the gradient descent transfer function as it gives better performance for a single input data. A three layer structure consisting of an input neuron, ten neurons as the hidden neurons and an output neuron(that is, 1-10-1 structure) is used as shown in figure 2.1.

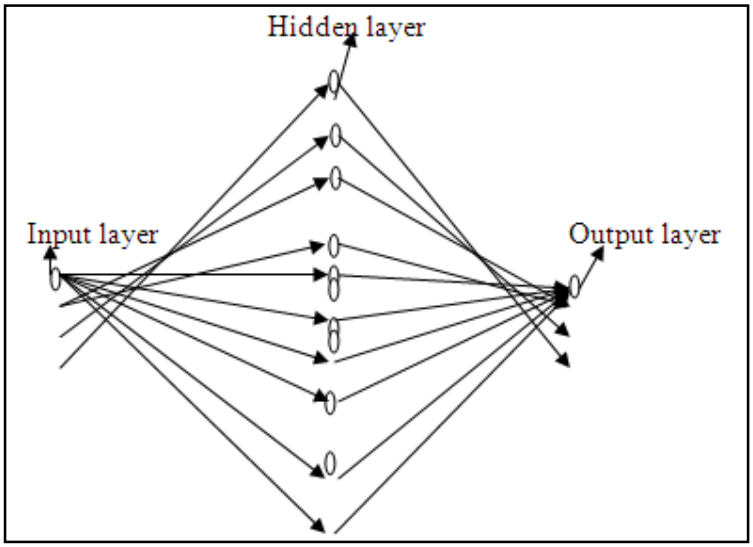

Figure 2.1: ANN structure

4.Results and Discussion

4.1.ANN's Contribution

Artificial neural network was applied to train the load demand due to;

- Lighting
- Electric Fan
- Air-Conditioning Unit
- Motorized Machine

In order to enable the artificial neural network learn effectively, a diversity factor appropriate to each load demand was introduced to predict the corresponding target load demand.

The following table according to IEC 60439(International Electrotechnical Commission, 2011) shows the diversity factor applicable to each load circuit function:

Circuits Function	Diversity Factor (ks)
Lighting	0.9
Heating and Air-Conditioning	0.8
Socket Outlets	0.7
Lifts and catering hoist	-
Most powerful motor	1
Second most powerful motor	0.75
All motors	0.8

Table 2

By using this simple model;

$\Delta D = \Sigma\{(D \times f) + \mathcal{E}\}$ ……..(ii)

$f = \frac{L1}{L2}$……(iii)

Where;

ΔD is the target load;

D is the Maximum load;

f is the diversity factor, and $\mathcal{E}$ is the load variations, computations were carried out for different load types peculiar to the university(LAUTECH campus);

L1 is the maximum demand load;

L2 is the running load.

Therefore, for the combined lighting load, we have;

Maximum Demand(kW)	Target(kW)
38.31	34.48

Table 3

4.1.1.ANN Training (for Lighting)

The network architecture employed was a 3-layer network having 1-input neuron, 10-hidden neurons, and 1-output neuron. The transfer function used was gradient descent as it performs better with single input data.

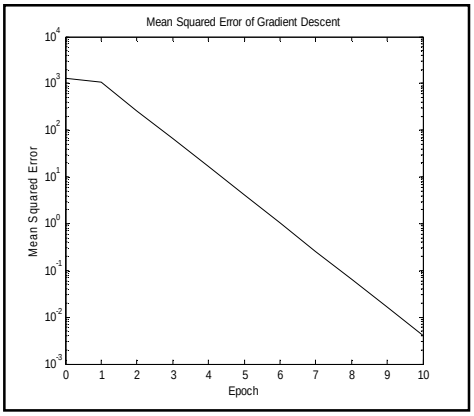

Figure 3: Training result

After the ANN training, the simulation result is given in the third column of the table below:

Maximum Demand(kW)	**Target(kW)**	**ANN Result(kW)**
38.31	34.48	34.41

Table 4

4.1.2.Air-Conditioning

For the combined air-conditioning loads;

Maximum Demand(kW)	**Target(kW)**
1430.63	1144.5

Table 4

After the training by using the ANN architecture, the simulation result is given in the third column of the table below:

Maximum Demand(kW)	**Target(kW)**	**ANN Result(kW)**
1430.63	1144.5	1144.4

Table 5

The training display on MATLAB's command window is as shown below where the performance goal was met at epoch 8;

TRAINGD-calcgrad, Epoch 0/300, MSE 1.31134e+006/0.01, Gradient 915670/1e-010

TRAINGD-calcgrad, Epoch 8/300, MSE 0.00542133/0.01, Gradient 0.294157/1e-010

TRAINGD, Performance goal met.

MOTORIZED MACHINE

Therefore, for the combined motorized machine loads;

Maximum Demand(kW)	**Target(kW)**
344.525	275.62

Table 6

After the training using the ANN architecture, the simulation result is given in the third column of the table below:

Maximum Demand(kW)	Target(kW)	ANN Result(kW)
344.525	275.62	275.5612

Table 7

The training display on matlab screen is as shown below where the performance goal was met at epoch 10;

TRAINGD-calcgrad, Epoch 0/300, MSE 75282.7/0.01, Gradient 50065.7/1e-010

TRAINGD-calcgrad, Epoch 10/300, MSE 0.00332939/0.01, Gradient 0.282667/1e-010

TRAINGD, Performance goal met.

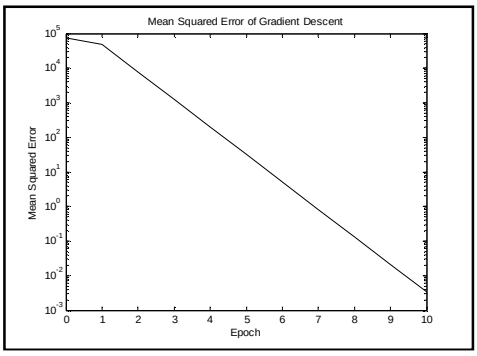

Figure 4: ANN result for motorized machine

4.1.3.FAN

Therefore, for the combined fan loads;

Maximum Demand(kW)	Target(kW)
408.54	367.686

Table 8

After the training using the ANN architecture, the simulation result is given in the third column of the table below:

Maximum Demand(kW)	Target(kW)	ANN Result(kW)
408.54	367.686	367.6006

Table 9

The training display on matlab R2007a version's command screen is as shown below where the performance goal was met at epoch 10;

TRAINGD-calcgrad, Epoch 0/300, MSE 135735/0.01, Gradient 130454/1e-010

TRAINGD-calcgrad, Epoch 10/300, MSE 0.00742472/0.01, Gradient 0.422126/1e-010

TRAINGD, Performance goal met.

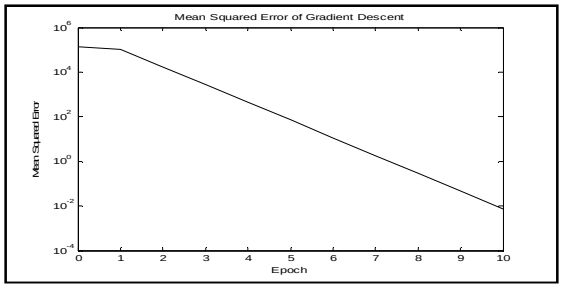

Figure 5: Fan ANN training profile

Type of Load	**Demand(kW)**
Compact Fluorescent Lamp	34.41
Ceiling Fan	367.60
Television	17.57
Air-Conditioning Unit	1144.40
Photocopier	138.75
Desktop Computer	44.14
Laptop Computer	36.56
Refrigerator	9.50
Motorized Combined Workshop Machine	275.56

Table 10: LAUTECH's peak load demand after ANN application

A new load profile resulting from the application of artificial neural network is shown in figure 6 below:

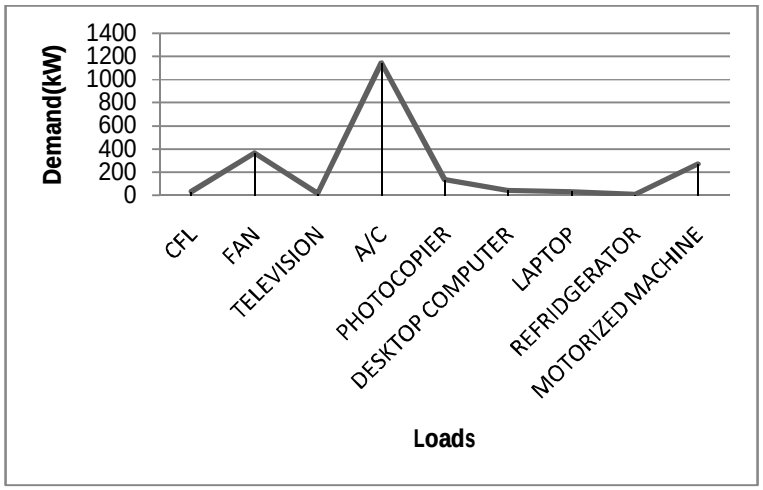

Figure 6: Resulting ANN daily load profile

5.Conclusion and Recommendation

By using the transfer function TRAINGD, the trained data were handled effectively with the resulting mean square error of less than 0.008. This shows that the disparities between the target power demand values and the resulting artificial neural network(ANN) results is not too significant.

Also, comparison between the typical load profile and the resulting ANN load profile shows significant improvement in power consumption pattern of the ANN controlled system of the university leading to cost savings, overall energy savings, and reduction in peak load demand.

In addition, at the centre of the power demand management program, artificial neural network (ANN) should be integrated. The ANN unit, as an artificial intelligence black box, would serve in creating instant predictions and subsequent control of pre-programmed power controllers installed in every building on the campus.

The ANN would monitor and control various load equipment on campus. Air-conditioning units located at senate building, library, anatomy department, health centre, computer department, ICT centre and various offices are amongst load units that would be directly controlled from the ANN unit. The system also provides lighting controls to switch on and off numbers of off -peak hours lighting.

The MATLAB being the backbone of the program has an in-built capability that provides a powerful link between the ANN and any external software package which support a dynamic data exchange (for example Microsoft Excel). In this ways, the full

power of excel can be harnessed and used to produce detailed statistical analysis of the ANN outcome.

Planning should be given an important consideration in order to match the consumer's preferences and behaviour to the available power supply for the benefit of both consumer and utility.

Future work could investigate domestic consumers' loads and the overall effect of integrating demand side management program on the national grid efficiency.

6.Reference

1. Vaninsky A. (2007). Efficiency of electric power generation in the United States: Analysis and forecast based on data envelopment analysis. Energy Economics, 29, 326-338.
2. Adams S.O., Akano R.O., and Asemota O.J. (2011). Forecasting Electricity Generation in Nigeria using Univariate Time Series Models. European Journal of Scientific Research, 58, 30-37.
3. Steve Cooke et al (1991). Making Management Decisions. Prentice Hall, London.
4. Olaomi A. (2005). Electrical Installation and Design. Unpublished Lecture Note, LAUTECH, Nigeria.
5. Brian S. (2001). 16th Edition IEE Wiring Regulations. Newness, Oxford.
6. Jun H. (2009). The Development, Implementation, and Application of Demand Side Management and control (DSM+c) Algorithm for Integrating Microgeneration System within Built Environment. Unpublished PhD Thesis. Energy Systems Research Unit Department of Mechanical Engineering University of Strathclyde, United Kingdom.
7. Florian K. et al (2011). Valuing Investments in Multi-Energy Conversion, Storage, and Demand-Side Management Systems under Uncertainty. IEEE Transactions on Sustainable Energy, Vol. 2, No. 2.
8. Eric B. and Anne R. (2006). Demand Side Management for residential and commercial end-users. Retrieved from www.leonardo-energy.org
9. Martin T. H., Howard B. D., and Mark B. (1996). Neural Network Design. PWS Publishing Company, United States of America.
10. IEC 60439 Document. Retrieved from http://electricalnotes.wordpress.com/2011/10/31/demand-factor-diversity-factor-utilization-factor-load-factor/

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Negotiating Opening and Closing Sequences in Legislative Interactional Discourse

Ayo AYODELE
PhD
Department of English,Lagos State University,Ojo, Lagos, Nigeria
Oludotun AYODELE
Lagos State Ministry of Education, Alausa, Ikeja, Lagos, Nigeria

Abstract:

The legislature, as the representatives of diverse interests in society, thrives on interactional cooperation and orderliness expressed in institutionalized procedures and interactive formats. This paper, therefore, is an attempt to characterize the exchange formats that procedurally serve as openings and closings leading to topical shifts and interactional flow in legislative interactional discourse. The discourse analytic perspective adopted in the paper provides the basis for characterizing conversational exchanges as negotiated encounters between interlocutors whose collective aspiration is to produce successful encounters. The research findings reveal that openings and closings within the macro context of a regular legislative sitting mark structural boundaries identifiable as initiation, progression and termination. It is further revealed that the initiation exchange comprises of a framing move consisting of a call, pray and a welcome acts. Within the general structure I [P↔ E^n] T of the discursive event, exchanges constitutive of topical transitions consist of elements of structure that can be captured as; I R[ø /(I R^n)]F, while the pattern of moves producing termination exchanges consist of IRm+ Rs F(q+c+a). While revealing that these negotiated patterns serve as frames signposting legislative interactional discourse, the study points the way forward to further investigation of the role of culture and power in the successful enactment of this format.

Keywords: *legislative interactional discourse, conversation, opening, closing, exchange*

1.Introduction

In political discourse, the legislative interactional discourse (hereinafter LID) sub-genre is primarily involved with the negotiation of information and the sharing of knowledge which ultimately enhance the process of law making and governance. (Ayodele 2010) Broadly speaking, legislative discourse encapsulates linguistic and discursive activities aimed at doing politics through legitimizing or contesting legislation, representing diverse interests, scrutinizing the activity of government, doing opposition, and influencing opinion. (Dijk 2003, 2004)

The interactional activity of legislatures is hinged on the linguistic activity of legislators who produce talk and texts in an institutional and orderly manner that accentuates the maxims of conversational cooperation. This characterization of LID as conversation, therefore, requires that attention be paid to the properties and organization of conversation to provide a background for understanding and analyzing the negotiated patterns of legislative discourse openings and closings. Generally, elements of structure in LID consist of successively coherent sequences (of pairs) of utterances or utterance parts, at both macro and micro levels of legislative discourse description. One apparent fact worth noting at the outset about LID is that 'a legislative session' (which constitutes a single conversational unit) does not just start or end; it is systematically and procedurally initiated and terminated.

In LID, deliberations are formally structured as dictated by the Order Paper (agenda) spelling out the boundary and scope of deliberative activities at any legislative session. Typical topics represented as items on the Order Paper include:

- Prayers
- Approval of Votes and Proceedings
- Message(s) from the Governor
- Announcements
- Petitions (if any)
- Matters of Urgent Public Importance
- Personal Explanations
- Order of the Day
- Adjournment

Generally, topical casting in the form of transition from one item to the other is the exclusive prerogative of the Speaker (or any person to whom such authority has been delegated). The task of this paper, therefore, is to develop a schema that will adequately

describe the opening and closing formats in legislative discourse. The analysis is an attempt to explicate the ways in which legislators produce and appreciate orderliness (in initiating and termination of legislative debates) as the basis for successful interactional action in the process of legislation on the floor of the legislature.

2.Data Collection

The data collected and analysed in this paper consist of electronic recordings of legislative sessions of the Lagos and Ogun State Houses of Assembly in Nigeria. The Lagos State House of Assembly (LSHA) and the Ogun State House of Assembly (OGSHA) are constituted as a unicameral legislature comprising forty (40) and twenty five (25) elected members respectively. Within the period under observation, a total of fifty (50) sessions (of both plenary and committee of the whole House) were observed. The duration of each sitting was determined by the number of and the extent to which items on the order paper might be discussed. Of the total number of sessions observed, various segments of thirty (30) sessions were purposively selected for recording to capture the features that constitute the focus of this paper. The selected data were transcribed and subjected to qualitative analysis using the methods of the conversation analytic framework to account for the structural properties of the opening and closing exchanges in the data. There are insightful concepts from the speech act theoretical framework used to handle the discursive functions of utterances.

3.Conversational Openings and Closings

Conversational openings and closings refer to the discursive and linguistic formats that characterize the initiation and termination of communicative events. Since Schegloff and Sacks (1973) pioneering study, conversational opening and closing formats have received considerable research attention in the field of sociolinguistics and pragmatics, and more exhaustively in conversation analysis.

One context in which the beginning of conversations has been extensively studied is telephone conversations, both between members of the same culture (Schegloff and Sacks, 1973; Godard, 1977; Schegloff, 1979, 1986; Lindström, 1990; Hopper, Doany, Johnson & Drummond,1991; Hopper, 1989, 1992; Halmari 1993). The study of conversation openings, particularly on the telephone has revealed that openings are interactionally compact and brief (Schegloff, 1986), and generally serve as routines to negotiate interpersonal relationships (Gumperz, 1982; Schegloff, 1986). Schegloff

(1972, 1979, 1986) further describes telephone conversation openings in terms of an ordered set of opening sequences: the summons-answer sequence; the identification-recognition sequence; the exchange of greeting tokens.

Conversational closings, on the other hand, are exchange formats for bringing a communicative encounter to a close. Referring to the succession of closing utterances as terminal exchanges, Schegloff and Sacks (1979) identify preclosings or indicators which as discourse markers suggest that one party is ready to terminate the conversation and at the same time, offer the other participant the opportunity to introduce another topic of conversation. It is obvious therefore that conversations, whether desultory or formal, do not just end, they are brought to a negotiated close.

In a more recent research on the interactional aspects of talk occurring in computer-mediated environments, Raclaw (2008) identified two patterns of closing sequences available to users within instant message (IM) discourse; the expanded archetype sequence and the partially automated closing. Built on Button's (1987) archetype closing format, the expanded archetype sequence, though closely related to the structure of closings found in spoken discourse, contains features unique to the medium and exhibits a slightly different preference structure based on speaker accountability within the online sphere. The partially automated closing is conceived as a replacement for what would be entire turns at talk in spoken closing sequences with features specific to the automated messages medium. This, in a way, strengthens Stubbs's (1983) position linking conversational structuring to the structural arrangement that allows for topic beginnings and endings. The argument rests on the thesis that discourse competence exemplifies the participant's understanding that coherence in spoken discourse derives from the structural arrangement that allows for topic beginnings and endings. As Schegloff and Sacks (1973) illustrated, conversational closings are intimately tied to the larger system of turn-taking that speakers employ during talk-in-interaction. They also involve the exchange of two sets of adjacency pairs between speakers (Button, 1987).

Detailed as these research efforts were, particularly those that focus on casual interactions and formal classroom interactions (Fakoya 1998, Olateju 1998) sufficient attention appears not to have been given to the opening and closing sequences of institutional communicative events, for instance, board meetings, court proceedings and legislative sessions. The formal and institutional nature of these discursive practices impose on participants in these contexts the need to strictly adhere to certain formulaic patterns, which knowledge is part of the member-resources brought into the

communicative event for effective participation. This paper, therefore, is a response to the obvious need to characterize the formulaic pattern of the sequence of utterances that exemplify the opening and closing exchanges in legislative discourse.

4.Analytic Framework for Discourse Structure in LID

Within the discourse analytic perspective adopted for our analysis, the exchange constitutes the structure-bearing unit consisting of reciprocal contributions by participants in conversational interaction. Consistent with this position is the view that the adjacency pair is the minimal structural unit upon which propositional coherence is built. This implies that the descriptive units of the exchange are related to each other, not necessarily in a manner of one consisting of the other, but rather that the structural framework operates by classifying each successive discourse event in the light of the immediately preceding one. Our notion of the exchange derives mainly from Sinclair's (1980) position which holds that if the exchange is the minimal unit of interaction, then the [IRF] is a primary structure for interactive discourse in general.

The legislative discourse structuring being presented, therefore involves representation at two levels of interaction; the macro and micro.The exchanges at the macro-level serve as conversational boundaries within which a particular legislative session is enacted, while the micro-level structure exemplifies the exchange structure of topical progression. The macro level representation is conceived in terms of three main obligatory elements of structure; Initiation (I), progression (P) and Termination (T), also referred to as INPROT. The discourse practice enacted in the daily legislative sitting/session is formally structured with a pattern dictated by the agenda for the day's proceedings which begins with a prayer and ends with the adjournment. The group of exchanges that constitute the initiation (I) and the termination (T) belong to the organizational classes of exchange, while the exchanges exemplifying progression (P) function largely as conversational. Both initiation and termination exchanges structure the discourse in a manner that sees some groups of utterances as constituting opening moves, while others function as closing moves. On the contrary, the element P realizes conversational exchanges involving topical development and transition within the framework of a legislative session. This orientation towards form requires the setting up of a structural construct that will capture the various elements that are constitutive of the opening and closing exchanges.

Generally, the proposed structure of the discursive event in a legislative session can be represented as:

- I [P↔ E^n] T

where [P↔E^n] indicates the possibility of multiple exchanges E^n realizing and constitutive of the element P of the LID structure. Element E consists of a succession of IR(F) structures at the micro level of discourse enactment on the floor of the House during any particular sitting.

In LID, the initiation (I) exchange comprises of at least one move realized as framing move consisting of three major acts characterized as a *calling act*, a *praying act* and an*welcoming act*. The initiation exchange structure is presented in Fig.1.

Exchange type		Move		Act
				1 *call*
I	→	Fr	→	2 *pray*
				3 *welcome*

Figure 1: LID Initiation exchange structure

The call, pray, and welcome acts are ritualistic in their enactment as the opening format for the legislative interaction of the day's sitting. The call (of the House to order) act performed by the Speaker of the House, signifies the commencement of the business of the day. However, the initiation is not complete until the praying act has been performed after which the Speaker (or whoever is delegated to preside over the sitting) gives a welcome address.

Progression (P) exchanges comprise conversational exchanges, E^n. At the macro level of LID organization, each set or combination of exchanges are focused on specific agenda items referred to as the business of the day. Usually, the first item on the agenda without which deliberations cannot proceed is "Approval of Votes and Proceedings." (hereinafter referred to as AVP). This agenda item provides the first opportunity for the members to make contributions meant to affirm or modify the accuracy and veracity of the records (minutes) of the previous sitting. As is constituted in the initiation exchange type, the primary elements of a typical exchange in the group of progression exchanges in legislative discourse are also moves made up of acts.

The structure of the moves involved in the exchange for the Adoption of Votes and Proceedings (AVP) could be represented as follows:

Exchange type	Moves	Acts
AVP	Initiation	direct
	Response	comment ø/ I, R
	Follow-up	acknowledge + select terminate

Table 1

Exchanges constitutive of the progression can, therefore, be summarized as

- I R[ø /(I R^n)] F

From the above, it is revealed that AVP exchanges are generated by a combination of initiation, response and follow up moves. The initial initiation move may actually be followed by silence, indicated as ø, which in any case would still produce the follow-up move. The follow-up (terminate act) completes the deliberation on the AVP item. On the other hand, the introduction of member-bills and issues brought up for deliberations are introduced through motions raised by the members on the floor of the House. Motions are structured in a way that reflects at least three elements that can be represented as: I R(m + s). This structural pattern characteristic of motions indicate that a request for the motion to be moved constitutes the initiation, I, followed by the responding moving act Rm by the mover which in itself initiates the responding seconding act, Rs, that forms the concluding part of the motion.

The last element of the macro structure of legislative discourse is the termination, T. Technically referred to as adjournment, termination comprises organizational exchanges that bring the legislative sitting to a close. Like the initiation, the termination exchange is formulaic, and consists of a succession of negotiated moves aimed at bringing the session to a close. The pattern of these moves can also be represented as:

- T → I R(m+s) F(q+c+a)

'I' stands for the initiation element usually realized by the Speaker's eliciting act requesting for a motion for adjournment to be moved by the majority leader. The act Rm is the first pair part of the motion move. Rs serves as the second pair part that completes the sequence of acts making up the motion move. Following a successful moving of the motion for adjournment, the Speaker makes a follow-up (F) move that may require putting the question, F(q) for the adjournment to the House, to which a subsequent

concurring act F(c) is also required, before the final adjournment (Fa). Once the question is put and concurrence obtained, the Speaker then formally brings the session to a close.

5.Data Analysis

5.1.Initiation (I) Exchange Structure

The sequence of utterances that constitute the initiation (I) element of the LID macro structure comprises at least two moves realized as framing (Fr) and opening (Op) consisting of major acts; calling act, a praying act (Fr) and a greeting, welcoming, focusing and directive acts (Op). These acts coincide with two agenda items usually preceding other items on the order paper. Figure 2 presents a graphic representation of the structure of the initiation exchanges.

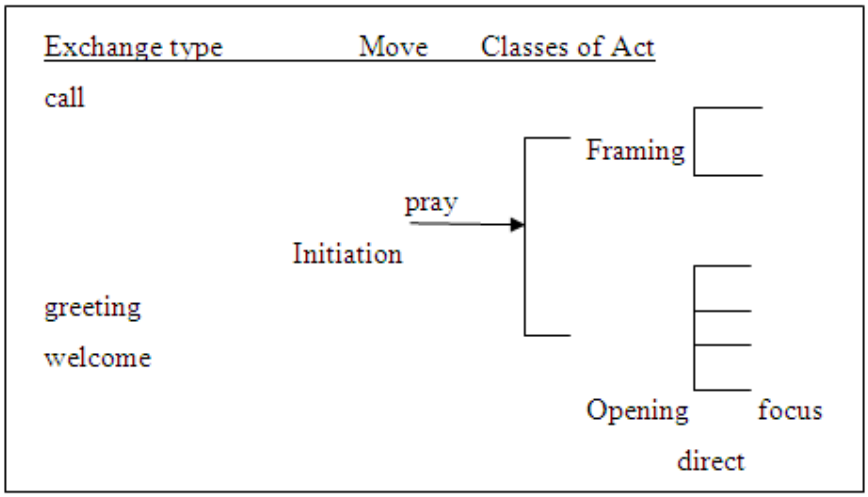

Figure 2: Initiation Exchanges in LID

The Initiation exchange consists of the framing move (Fr) and an opening move (Op). In LID frames are realized by utterances that function to indicate boundaries (marking the beginning and the end of various agenda items) in the deliberations. The call, pray, and greeting acts are ritualistic in their enactment as the opening move for the legislative interaction of the day's sitting. Both in terms of their sequential placement in the structure of the initiation exchange and their discursive role in LID, these acts serve as the introductory rituals that the House enacts at every of its sittings.

The call (of the House to order) act formally opens the sitting. It is performed by the Clerk of the House immediately the Speaker and other officers of the House, led by the

Sergeant at arms, are ushered into the Chambers and the maze (the symbol of the legitimacy and authority of the House) has been positioned on the table. Sometimes this act is accompanied with verbal cues; "order' or "all rise". The *pray* act comes next in the framing move. Here the Speaker or any member so appointed by him offers prayers for the success of the day's deliberations. While the *call* act does not necessarily elicit verbal responses, the *pray* act requires a response from members. The *pray* act ordinarily should serve as the concluding part of the initiation. There is, however, an overlap between the framing move in the initiation and the opening move of the progression exchange. In other words, the initiation is not complete until the Speaker (or whoever presides over the sitting) has given a *greet* and *welcome* address operating as the head in the structure of the opening move. The foregoing points to the fact that, in terms of a structural representation of the opening format, both *call* and *pray* and *greet* acts serve as 'pre-head' elements; while the *welcome* act constitute the 'head'. In a similar vein, there are other optional acts; for instance *apology*, *focus*, *direct* that come as 'post-head' elements of the initiation move. This is exemplified in the following fragment;

- Fragment A

Mr. Speaker: greet 1 Good morning honorable members,
welcome 2 you are welcome to this sitting of Monday, 3rd June
direct 3 Shall we go through the Votes and Proceedings for Thursday, 30th May?

- Fragment B

Mr. Speaker: welcome 1 Distinguished honorable members, you are welcome to today's session.
apology 2 We apologise to the members of the public for the lateness in sitting, due mostly to the rain. It has been raining cats and dogs in Lagos and this must have kept some people away.
focus 3 I believe every honorable member has a copy of the Votes and Proceedings of Monday, 22nd September.
direct 4 Let us quickly go through and see if there are minor alterations to be made before approving same.

The Speaker's opening move in utterances 1 and 2 of fragment A consists of acts that can be grouped into pre-sequences and the head. Though sometimes absent, the greeting act e.g. "Good morning, honourable members" (fragment A act 1) occupies the pre head position and serves as the link between the framing move and the opening move. The act (which is generally a significant feature of the Nigerian interactional culture) gives an indication of the time of the day, "good morning" during which the session takes place. It is customary to greet others either on the basis of time of the day or the activity in which a participant is engaged at the time of the interactional encounter. As evident from Fragment B where the greeting act is absent, the greeting act could be described as an optional element of the opening structure.

The welcoming act 'you are welcome to this sitting' (fragment A2) and 'today's session' (fragment B1) which features as a constant element of the opening move, marks the outer boundary of the opening 'rituals' for the day's deliberations. Usually, the welcoming act also indexes the specific legislative session (today's session/ this sitting of Monday, 30th May, 22nd September etc.). Reference to time and period of legislative sittings has implication for the legality and effective date of implementation of laws passed by the legislature, hence the need for explicitness in how the date, time and period of legislative sessions are indexed and documented.

The act of apologizing (fragment B2) also comes as an optional post-head sequence (does not exist in fragment A). However, the expression 'lateness in sitting' (fragment B act 2) is a pointer to the time of the legislative session, which obviously was not in the morning. Except there exists a need for this act, it will not feature as an essential element of the structure of the opening sequence. It is followed by another significant element of the opening sequence, focusing act.

The focusing act actually serves as an interrogative; eliciting affirmation from members of the House who are in attendance. The act draws the attention of the House to the next item on the order paper thereby becoming a transitional act between the initiation exchanges and the progression exchanges. In A, the focusing act is implied in utterance 3 which suggests that copies of the Votes and Proceedings (a vital members' resource) of the previous session were already circulated to the members present at the session. The focusing act is however more explicitly stated in fragment B utterance 3, "I believe every honorable member has a copy of the Votes and Proceedings of Monday". The assumption expressed by the Speaker stems from the fact that the Votes and proceedings

is a vital resource which forms part of the knowledge component of the contextual category of legislative discourse.

The last element of the initiation exchange structure consists of a directive act issued by the Speaker. The directive act procedurally requires members to go through the Votes and Proceedings and consequently adopt same before proceeding to the business of the day. "Shall we go through the Votes and Proceedings of Thursday, 30th May?" (fragment A3), "Let us quickly go through and see if there are minor alterations to be made before approving same" (fragment B4).

5.2.Termination (T) Exchange structure

Legislative sessions are brought to a close or terminated following elaborate patterns consisting of a succession of initiations and responses. Like the opening format, the structure of the termination or adjournment exchange is formulaic. However, unlike the Speaker-driven opening, the sequence of moves culminating in the termination of the legislative session is member-driven. Negotiating the terminal moves involves a minimal pair of initiation and response moves. The response move equally exhibits another level of cooperation that requires the twin moves of moving R(m) and seconding R(s). The sequence of moves and acts that characterize the exchange can therefore be represented as,

$$T \longrightarrow I\ R(m+s)\ F(q+c+a)$$

T = Termination, I = Initiation, Rm = Moving Response, Rs = Seconding Response, Fq =Follow up initiation (putting the question), Fc = Follow up response (concurrence), Fa= adjournment.

Bringing the session to a close requires validly negotiated moves involving an initiation (I) by the Speaker, to which at least two responses are required; the act moving the motion (Rm) for an adjournment, followed by another seconding act (Rs). Having acknowledged the motion for adjournment, the Speaker makes a follow-up (F) move that puts the question (of whether the members agree or disagree with the adjournment) to the House (Fq). Members' response to the question (Fc) takes the form of "ayes" or "nays". The series of utterances making up the termination exchange can be categorized into three major moves; initiation move, response move and follow–up move. Each of these moves comprises various acts performed by the participants (legislators). The termination exchange can be summarized as follows;

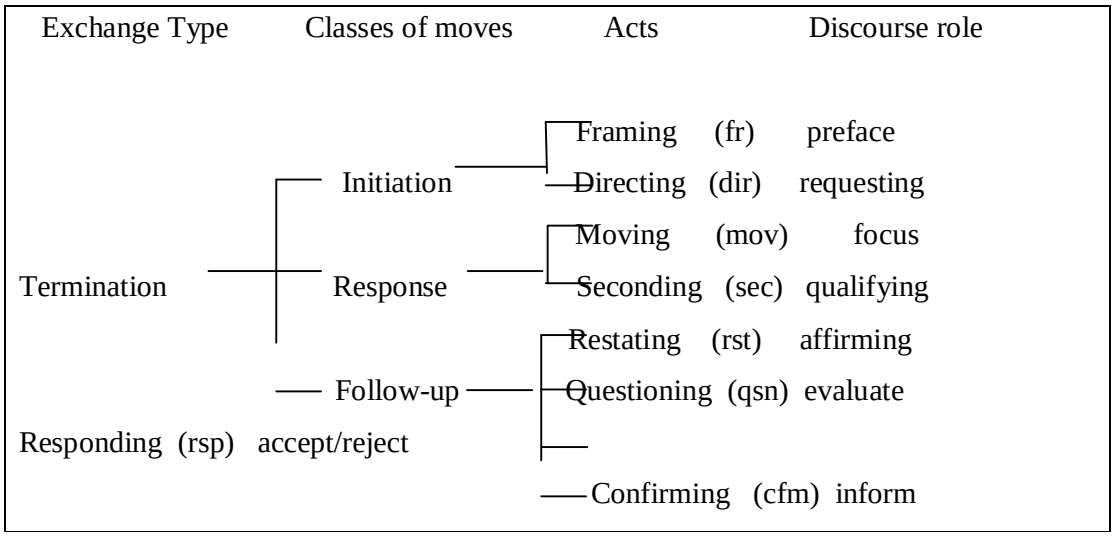

Figure 3: Termination Exchange Structure in LID

The termination exchange structure represented in Figure 3 above is exemplified by the following fragment C.

- Fragment C

Mr. Speaker:	1	Can the honorable deputy majority leader move the motion for adjournment?
Dr. Bal.	2 Rm	Mr. Speaker, sir. I hereby move that further proceedings of this House be adjourned till Monday, 14th November.
Barr. Ode:	3 Rs	Mr. Speaker, sir. I rise to second the motion as moved by the deputy majority leader.
Mr. Speaker:	4 F	That's the motion for adjournment. Those who are in favour say aye, (pause)
Members:	5	aye
Mr. Speaker:	6	Those against say 'nay'
Members:	7	ø (zero response)
Mr. Speaker:	8	The 'ayes' have it. The House stands adjourned till Monday, 14th November.

Fragment C consists of a combination of moves and acts that can generally be regarded as representative of the termination exchange in LID. In the initiation move of the T exchange, the Speaker performs a *directive* act, "Can the honorable deputy majority leader move the motion for adjournment?" Though with an interrogative form, the

utterance (directed usually at the majority leader, or in his absence to the deputy majority leader) has the discourse role of requesting for a local action of moving (a motion), thus serving as the first pair part to the succeeding utterance. The *directive* act, however, could be prefaced by a pre-directive element consisting of an expressive utterance foreclosing the previous exchange as demonstrated in the following example,

- Fragment D

Mr. Speaker:	9. closing		I believe we have had enough contribution as it were on the subject.
	10. directive		So, may I request for a motion in that regard?
Member:	11. Moving	(pre sequence)	Mr. Speaker, sir. In view of the fact that we have exhausted the issues on the Order Paper,
	12	(head)	I moved that further proceedings be adjourned till Monday, 22nd September, 2003 at 10. 00 am. I so move

The *closing* act (fragment D9) prefaces and connects to the succeeding directive act (fragment D10) in a manner that bridges the previous succession of utterances that constitute the progression exchange and those culminating in the termination exchange. The connective adverbial 'so' (utterance 10) further reinforces the propositional cohesiveness between utterances 9 and 10.

The response (R) element of the T exchange is characterized in terms of at least two items, Rm (moving act) and Rs (seconding act), which generally characterize the motion exchange in LID. While Fragment C utterance 2 enacts the moving act, exponenced by the explicit performative expression, "I hereby move that further proceedings of this House be adjourned" (Rm), fragment C utterance 3 "I rise to second the motion as moved by the deputy majority leader" fulfils the seconding role (Rs). Sometimes, the moving act accepts a pre modifying element of structure with a focusing discursive role, as shown in fragment D utterance 11.

The follow-up move in the termination exchange in LID is characterised by four major acts; restating, eliciting, responding and confirming acts. In combination, these acts are indicative of the terminal procedure for bringing the House session to a close. This procedure is exemplified in the following extract.

- Fragment E

Follow-up move

13 restate That's the motion for adjournment.

14 elicit 1 Those who are in favour say aye, (pause)

15 respond aye

16 elicit 2 Those against say 'nay'

17 respond 2 ø (zero response)

18 concur The 'ayes' have it. The House stands adjourned till Monday, 14th November.

The Speaker's utterances 13 and 14 serve as a follow-up sequence to the motion earlier moved for the adjournment. It is made up of two parts, the restatement of the motion moved, "that's the motion for adjournment" and a second part that 'puts the question' of whether or not the House agrees to adjourn the session, "Those who are in favour, say Aye." The corresponding act of responding, which could be acceptance or rejection of the motion, determines the next move of the Speaker. When the response is positive as indicated by the dominant 'ayes', the Speaker responds by confirming (the position of the House) and then informing the House of the adjournment (Fa). On the other hand, if the response is negative with a resounding 'nay', the Speaker equally will confirm the position, and subsequently inform the House of the next move. Once the Speaker pronounced the House adjourned, the session stands adjourned till the next session that will be specifically indicated by the Speaker. It is, however, observed that while the motion for adjournment is being raised, other incidental or subsidiary motions could be moved and be attended to. For example, the following extract shows that though the Speaker had called for the motion for adjournment, other matters came up for discussion.

- Fragment F

Mr. Speaker: 19 In the absence of any further business on the Order Paper, may I have motion for adjournment?

Barr.Omo: 20 Mr. Speaker, sir, I want to bring to the attention of the House that on Thursday , the Commissioner for the Environment and the General Manager of Lagos State Environmental Protection Agency are supposed to appear before the House…

I will therefore move an application that the clarification by the Commissioner for the Environment be taken on Thursday 10th November, 2005.

Mr. Speaker: 21 Under motion for adjournment, the substantive motion for adjournment will be further amended to read Thursday instead of Monday.

Mr. Ajos: 22 I rise to second the motion as moved by the majority leader.

Alhaji Kola: 23 Thank you, Mr. Speaker, sir.

Under motion for adjournment, I raised the issue that my name was put under 'absent' yesterday and the mistake is yet to be corrected.

Mr. Speaker: 24 That is absent excused, but what time of the day did you tell me?

Well, Shall we take it that the House stands adjourned till Thursday, the 10th of November, 2005?

Members: 25 Resolved.

In this fragment, the main motion on the floor of the House was for adjournment. A subsidiary motion (Rm) seeking for an amendment to the main motion is, however, moved by the speaker in extract 20. Extract 22 provides the seconding act (Rs). An incidental motion seeking for a correction of an earlier record before the motion for adjourned was also moved by the speaker in 23. It was not until the incidental motion was disposed that the question for adjournment was put. One obvious fact here is that the termination exchange in LID may be multiply indexed by a succession of initiations and responses.

The possibility of embedded exchanges (intra motion exchanges) within the termination exchange benchmarks the difference between legislative discourse and other forms of institutional meetings where further discussions may not be allowed once the motion for adjournment is moved. Such possibilities, therefore, have to be factored into the structural representation of the termination exchange format in order to accommodate the embedded exchanges. The following structural representation is therefore proposed as the pattern for sequence of utterances functioning in the boundary exchange for terminating legislative session; I Rm+s $(IR)^n$ F i + r, where I stands for initiation move, (19) followed by the mover's and seconder's responses, Rm+s. (20, 22). However, while moving the motion, the mover raised a subsidiary motion, which occupies a pre-move

position. Utterance 21 can be accounted for in terms of being an acknowledging move (this is an optional element). It indicates acceptance of the subsidiary motion.

(IR) ^{n} stands for succession of utterances constituting the embedded exchanges. For example, after the main motion for adjournment has been moved, an incidental motion reporting an observation was raised (extract 24). Extract 25 provides the follow-up to the observation raised in 23 and indeed performs the acts of agreeing, "That's absent excused", checking "but what time of the day did you tell me", framing "well", and questioning, "shall we take it that the House stands adjourned till Thursday, the 10th of November, 2005?"

Classes of Moves	**Types of Acts**	**Text Realization**
Initiate	Framing	1. In the absence of any further business on the order paper. 2. I want to thank you for staying this late to consider and deliberate on Matters… We would continue tomorrow and Wednesday
	Directing	1. May I have a motion for adjournment? 2. So, on that note may I request for adjournment? 3. Can the honorable deputy majority leader move motion for adjournment?
Respond	Moving (pre head) head	[in view of the fact that we have exhausted the issues on the order paper] a. I move that further proceedings be adjourned till Monday, 22nd September, 2003 at 10. 00 a.m. I so move. b. I rise to move that this House do stand adjourned till tomorrow, Tuesday, 4th June, 2002 at 10.00 a.m. c. I hereby move that further proceedings of this House be adjourned till Monday, 14th November, 2005 at 10.00 a.m.
	Seconding	Mr. Speaker, sir, I rise to second the motion as moved by the majority leader.
Follow-up	Restate	That's the motion for adjournment
	Elicitation	Those who are in favour say 'aye' and those against say 'nay'.
	Responding	"Ayes" / "Nays"
	Confirming	The ayes have it. The House stands adjourned till…

Table 6: Representative Moves and Acts In Termination Exchanges

6.Conclusion

Opening and closing sequences in legislative discourse follow a highly context-shaped structured format. The legislative institution has a procedural approach to the negotiation of both the opening and closing of its sittings. The legislative sessions are usually opened (initiation) through a structured combination of call, pray and welcome acts. These acts present a frame that indexes the setting of the communicative event and lead to the discussion of the order paper. Within the opening structure, both call and pray acts serve as pre-opening acts, while the welcome act functions as the head, formally declaring the session open.

The closing (termination) of the legislative session follows a more elaborate pattern that features a complex but highly structured format; I R(m+s) F (q+c + a). In negotiating the closing of a session (adjournment), legislators follow a formalized procedure that gives the Speaker the responsibility of initiating the adjournment for which there must be a complementing moving and seconding acts which in themselves are pre-closing acts. The closing move requires that the Speaker first puts a question to the House, to which there must be a concurring act (both acts are pre-closing acts) before the session is finally declared adjourned.

The effective participation of legislators in the business of the House is hinged on their level of competence with regards to legislative procedures such as the opening and closing formats. That probably accounts for the floor and turn advantages that longer-serving members of the House have over newly elected members. The characterization of the opening and closing sequences carried out in this paper is part of a more extensive work on the nature of legislative interactional discourse. This therefore requires that other areas of the discursive events in the legislature, for instance, the progression exchanges are still open to further investigation.

7.Acknowledgements

The following people contributed immensely to the completion of this study; the administrative staff of the Lagos and Ogun State Houses of Assembly, particularly MrOgayemi, and Mrs.Sule for the access to the sittings of the House and the library; DrOdebunmi who read through the manuscript and offered valuable suggestions; Honorable Agoro and FeyiOlukoya for the electronic materials for this project.

8.Reference

1. Ayodele, A. O. (2010). Conversational strategies in legislative discourse in Lagos and Ogun state Houses of Assembly in Nigeria.Unpublished PhD thesis.University of Ibadan.
2. Button, G. (1987). Moving out of closings. In G. Button and J. Lee (eds.) Talk and Social Organization, 101-151. Multilingual Matters Ltd.
3. Fakoya, A.A. (1998). University classroom interaction: a discourse analytic description. Unpublished PhD thesis.University of Ibadan.
4. Godard, D. (1977). Same setting, diffferent norms: phone call beginnings in France and the United States. Language in Society, 6, 209-219.
5. Halmari, H. (1993). Intercultural business telephone conversations: A case of Finns vs. Anglo-Americans. Applied Linguistics, 14 (4), 408-430.
6. Hopper, R. (1989). Sequential ambiguity in telephone openings: "What are you doin' ". Communication Monographs, 56 (3), 240-252.
7. Hopper, R. (1992). Telephone conversation. Bloomington: Indiana University.
8. Hopper, R., Doany, N., Johnson, M. & Drummond, K. (1991).Universals and particulars in telephone openings.Research on Language and Social Interaction, 24, 369-387.
9. Lindström, A. (1990) Identification and recognition in Swedish telephone conversation
10. openings. Language in Society,23: 231-252.
11. Olateju.M.A. (1998).Discourse analysis: analyzing discourse in the Esl classroom. Lagos, Crossland Educational Services.
12. Raclaw, J. (2008)Two patterns for conversational closings in instant message discourse Journal of Language and Social Psychology23(4): 397-. 423.
13. Schegloff, E. A. (1972). Sequencing in conversational openings, In J. J. Gumperz and D. Hymes (eds.), Directions in Sociolinguistics: The Ethnography of Communication, New York, Holt, Rinehart and Winston, Inc. 346-380.
14. Schegloff, E.A. (1979). Identification and recognition in telephone conversation openings, In G. Psathas (ed.), Everyday Language: Studies in Ethnomethodology, New York: Irvington publisher.23-78.
15. Schegloff, E. A. (1986) The routine as achievement. Human Studies 9:111-151.
16. Schegloff, E. A. and Sacks, H. (1973).Opening up closings.Semiotica8(4): 290-327

17. Sinclair, J. M. (1980). Discourse in relation to language structure and semiotics. In R. Quirk, S. Greebaum, G. Leech, and J. Svartvik (Eds) Studies in English linguistics for. London: Longman. 110-124.
18. Stubbs, M. (1983).Discourse analysis: the sociolinguistic analysis of natural language. Oxford: Blackwell.
19. Van Dijk, T. A. (2003). Knowledge in parliamentary debates.Journal of language and politics.2(1), 93-129.
20. Van Dijk. T.A.(2004). Text and context of parliamentary debates.In Paul Bayley (Ed) Cross- cultural Perspectives on Parliamentary Discourse. Amsterdam: Benjamins. 339-372