UNIVERSITY OF CAPE COAST

TIME DELAY IN ENGAGEMENT SCHEDULES IN TERTIARY INSTITUTIONS: A CASE STUDY OF THE UNIVERSITY OF CAPE COAST

BY

EMMANUEL ASARE AYIM

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:…………………..…… Date:…………………………

Name: Emmanuel Asare Ayim

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ……………………. Date: …………………

Name: Nathaniel Kwamina Howard

Co-Supervisor's Signature: ………………………….. Date: ……….………

Name: Bismark Kwao Nkansah

ABSTRACT

The objective of the study was to examine the incidence of time delays in engagement schedules on campus (University of Cape Coast). The study made use of past records of time delays in starting Committee and Boards meetings from five colleges and two major meetings (Academic Board and University Council) at the University of Cape Coast. The study relied on secondary data extracted from minutes and agenda files of Committee and Board meetings. The Minitab package and Microsoft Spreadsheet were used to analyse the data. The statistical techniques used in the study were the Scatter Plots, Time Series Analysis and Stochastic Processes. The College of Education Studies had the highest average of delay (18.92 minutes) to starting a meeting. There was a significant difference in the means of the time delays among these colleges: College of Education Studies and College of Agriculture and Natural Sciences, and College of Health and Allied Sciences, and College of Education Studies. The College of Agriculture and Natural Sciences had the highest probability (80.70%) of always starting their meetings on-time in the long-run. The College of Education had the highest probability 0.8119 of starting their meetings with a large delay in the long-run. It would be recommended that the colleges with higher possibility of starting their meetings ten minutes late should encourage its Board or Committee members to be prompt with attending to meeting/schedules. The researcher would again recommend that the University Management should come out with a policy that when a meeting delays for more than an hour that meeting should be rescheduled.

KEY WORDS

Delay/Lateness

Engagement Schedule

Markov Chain

Meetings

Steady State Probability

Stochastic processes

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DEDICATION

To my family and friends

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LIST OF ACRONYMS

CANS	-	College of Agriculture and Natural Sciences
CoHAS	-	College of Health and Allied Sciences
CHLS	-	College of Humanities and Legal Studies
CES	-	College of Education Studies
CoDE	-	College of Distance Education
ANOVA	-	Analysis of Variance
CAUC	-	Christ Apostolic University College
SPSS	-	Statistical Product for Service Solutions
UCC	-	University of Cape Coast

CHAPTER ONE

INTRODUCTION

Meetings are prominent sites of temporal behaviour in organizations. They consume huge amount of time, punctuate and interrupt the temporal flow of work, provide venues of time coordination and allocation, and mark time in organizations (e.g., the weekly staff meeting, management meeting). Through two studies, it could be found that meeting lateness is a high base rate and seemingly consequential workplace event, with both objective and subjective elements, and potential implications for individuals, relationships, groups, and the organization more broadly (Rogelberg, Scott, & Kello, 2006). Meeting lateness associates include job satisfaction, intent to quit, satisfaction with meetings in general, age, and conscientiousness. In light of the occurrence, consequences, and conceptual complexity of meeting lateness, along with the dearth of extant research on the topic, this study seeks to find the impact of the lateness on the next meeting.

Background to the Study

Organisations are groups of people who work interdependently toward some purpose. Organisations are not buildings or other physical structures, rather they are people who work together to achieve a set of goals. Employees have structured patterns of interaction, meaning that they expect each other to complete a certain task in a coordinated way (in an organised way) (McShane & Von Glinow, 2000).

Due to an organisation's nature (as an interaction between employers and employees), engagement schedules do also exist in every organisation.

These engagement schedules are known as *meetings*. Almost every time when there is a genuinely important decision(s) to be made for the benefit or growth of the organization a group whose membership is from the organisation or outside the organisation or both are assigned to make such important decision(s) for the organization (Hackman & Kaplan, 1974). These group(s) may be known as a Board, Committee, Standing Committee, or an Ad Hoc Committee. Kayser, (1990) defines a meeting as “a gathering where people speak up, say nothing, and then all disagree”. To explore the complex human interactions such as meetings, one needs to understand what meetings are and their components in detail.

There is value in defining meetings as the definition reveals the variety of purposes they serve and the specific techniques required for each to bring about the greatest return on investment (Auger, 1964). Webster (1998) defines a meeting as “an act or process of coming together” that may be “a chance or a planned encounter.” This definition incorporates the concepts of formality level and joint process or action; however, it is somewhat imprecise and inexplicit. Goffman (1961) is more explicit in defining a meeting as that which “occurs when people effectively agree to sustain for a time a single focus of cognitive and visual attention.” Hildreth (1990) adds the concept of a shared goal to define a meeting as a “communication encounter between persons for a common purpose.” Nunamaker, Dennis, Valacich, Vogel and George (1991) incorporate the concepts of physical and temporal dispersion and define a meeting as “any activity where people come together, whether at the same place at the same time, or in different places at different times.”

The definition of meeting in this research combines elements of all those found in some other literature: “a focused interaction of cognitive attention, planned or chance, where people agree to come together for a common purpose, whether at the same time and the same place, or at different times in different places.” This definition includes several important dimensions of meetings: focused interactions, groups of people, a common purpose, the level of formality, and temporal and physical dispersion. Each of these dimensions may affect the meeting itself and the support required to improve group productivity. In this study, our definition includes formal board and committee meetings. Our concept of a meeting involves people sharing data, information, knowledge, and wisdom to garner their collective intelligence and bring it to bear to solve a problem or achieve a goal together.

Many studies (Auger, 1964; Auger 1987; Erickson, 1998; & Rice, 1973) have revealed that meetings dominate workers’ and managers’ time. Again, studies have shown that meetings are essential and that the number of meetings and their duration has been steadily increasing.

The delay in the start of an event/meeting has become a Ghanaian culture. The attitude of many Ghanaians (if not all) towards honouring an appointment or event at the said time is very appalling. This kind of attitude cut across all the social strata of Ghanaians. It is found among politicians, civil servants, public servants, employees of the private organization, market women, and so on. Most recently, the former speaker of parliament rebuked members of parliament for their lateness towards their duties in the house. (Adogla-Bessa, 2016).

Another incidence which is worth noting was an incidence where the former Local Government and Rural Development Minister and former Chief of Staff, Mr. Julius Debrah refused to swear-in District Chief Executives for their lateness in attending the ceremony (Ghana News Agency, 2014). On the international front, the Korean Ambassador to Ghana, Mr. Lyeon Woon-Ki heavily criticized officials from the Ministry of Transport (including the Minister and the President of the Republic) for their lateness in attending a scheduled event (Ghanaian Times, 2016). Just recently, the Regional Minister for the Eastern Region, Mr. Eric Kwakye Darfour warned all civil society organizations to desist from lateness.

Time, as defined by the Macmillan Dictionary, is "the quantity that you measure using a clock" (Macmillan Dictionary 2007). It can also be defined as "a particular moment during a day measured by a clock" (Macmillan Dictionary 2007). Man cannot control his/her location in time as it is with their space. Time, therefore, plays a fundamental role in our lives, especially in the decisions that we make. Time clearly affects the decisions that we make. Time also affects our lives in another way; specifically in the production of timed actions. In sports, for instance, the timing of actions is often the most important aspect of one's skill set.

Schedule, on the other hand, is defined as "a plan of activities or events and when they will happen" or "to plan for something to happen at a particular time" (Macmillan Dictionary 2007). Sometimes, events which have been organized to take place at a particular time do not happen at the scheduled time. These delays do not only occur when smaller (local, organizational, etc.) events are scheduled but even national events are delayed. These delays may be due to some reasons by the participants or the event organizers or planners. Some of the reasons for delaying the start of an event includes some unforeseen emergency to attend by participants of the event, members of the committee tight schedules, etc.

Delay in the start of an engagement schedule has a significant negative effect on the said schedule. This negative effect may lead to a rush through of the meeting and may result in an unproductive event. Delays also have a negative effect on the economy. In Ecuador, lateness to work and events cost the country seven hundred and twenty four million dollars annually (The Economist, 2003).

Statement of the Problem

Scholars have examined temporal phenomena at work for decades, starting perhaps most notably with Taylor's (1911) time control studies. Temporal scholarship is influenced by the changing nature of work such that each change brings new temporal phenomena to examine. For example, interest in polychronicity (i.e., a preference for multitasking) emerged as Western nations moved from a well-defined/structured manufacturing economy to a service-based economy. Today, workplace hierarchies are flatter, and work is more decentralized and team based than since the advent of the industrial age (McPhee & Poole, 2001). One implication of this change is a substantial increase in the number of meetings (an estimated 11 million a day in the US; Rogelberg, Scott, & Kello, 2006), thus prompting new opportunities for temporality researchers.

Meetings are purposefully initiated, work-related interactions involving three or more individuals (Leach, Rogelberg, Warr, & Burnfield, 2009). Meetings have more structure and boundaries (e.g. certain individuals are invited) than a simple chat, but less than a lecture (Rogelberg, 2006). Meetings are also salient sites of temporal behaviour/activity in organizations. First, meetings occupy a sizable portion of the workday itself. Rogelberg, Leach, Warr, and Burnfield (2006) and Van Vree (1999) found in a large study of employees in the US, UK, and Australia that 6 hours a week is spent in meetings, on average, and managers and senior managers far exceed that estimate. Second, meetings interrupt or ‘‘punctuate’’ the flow of temporal activities (Watzlawick, Bavelas, & Jackson, 1967) over the course of a workday (Rogelberg, et al., 2006). Third, time in an organization is often marked by meetings (e.g., the weekly staff meeting). Fourth, we often assess the use of time and hold others accountable for used/misused time by having people report on progress of various tasks and initiatives in meetings (Bangerter, 2002). Fifth, the quality of meetings is often evaluated in temporal terms (e.g., ‘‘this meeting was a waste of time’’). The final salient temporal phenomenon associated with the increasing usage of meetings, which was the focal point of Rogelberg et. al (2013), is lateness. The study explored the construct of meeting lateness across two concurrently conducted studies. The studies examined lateness from two complementary, but different, viewpoints that, when combined, provide a more complete picture of this understudied phenomenon.

In Study 1, Rogelberg et. al (2013) took a qualitative and quantitative look at how meeting lateness was construed by employees. In Study 2, conducted concurrently with Study 1, Rogelberg et. al (2013) considered meeting lateness as an objective time phenomenon (arrival after the meeting start time). By doing so, Rogelberg et. al. (2013) were able to examine base rates of meeting lateness. Additionally, Rogelberg et. al. (2013) were able to garner further insight into the nature of meeting lateness by investigating a set of correlates. Finally, Study 2 also begun to document the perceived consequences of meeting lateness from the participant's perspective. Taken together, the two studies addressed the nature of the construct, its frequency, and its perceived impact. Although there was a paucity of meeting lateness research, Rogelberg et. al. (2013) recognized that being an unexplored construct does not in and of itself substantiate the need for exploration. In the case of meeting lateness, however, Rogelberg et. al. (2013) believed there was good reason to speculate that it was a consequential individual and organizational phenomenon warranting initial investigation. Theory, research, and arguments from a variety of areas suggest a substantive conceptual connection between meeting lateness and (1) group decision-making quality, (2) employee well-being/stress, (3) interpersonal relationships, (4) power and deviance, (5) withdrawal, and (6) overall organizational effectiveness. (Rogelberg et. al, 2013).

The daily activities of men cannot be excluded from engagement schedules. The activities include meeting with your family, friends, superiors, and colleagues at work. Sometimes, such engagements, in one way or the other are delayed. The delays have so many effects on the engagement and on the economy. Mr. Gyan-Apenteng a columnist and a former chairman of National Media Commission (NMC) hit the nail directly on its head as the economic cost of lateness (delays) to work and other engagement schedules were more than that of the United Kingdom. The cost of delays was estimated at Nine Billion Euros annually (Essabra-Mensah, 2016). Many have cried on the lateness of citizens on engagement schedules. These attitudes exist in most of the institutions in Ghana.

Variance from the above studies, the area that has received little or no attention in the literature is the impact of the lateness on the next meeting. It is this gap that has propelled this study. This study sought to analyse the incidence of these delays in engagement schedules on University of Cape Coast campus.

Objectives of the Study

The main objective of the study is to examine the incidence of time delay in engagement schedules on campus. Specifically, the study focused on:

1. Examining the pattern of time delays in engagement schedules in an identified government institution;
2. Fitting an appropriate model for the delay and time span of an engagement schedule.
3. Comparing the incidence of delays in the engagement of various divisions of an identified government institution.

Source of Data

The study relied on secondary data. This data was collected from the various meetings of committees from the Colleges, Academic Board and Council meetings. The study purposefully took data from the minutes of the Committees of the Colleges and Council. The study recorded the actual time the meeting started, the intended time the meeting was to start and the time the meeting closed. These data were collected over two academic years.

Research Questions

The following research questions guided the study:

1. What is the pattern of delay in engagement schedules in an identified government institution?
2. Which model best fits the time delays in engagement schedules?
3. How different is the incidence of delays in the engagement of various divisions of an identified government institution?

Scope of the Study

Although the University of Cape Coast has a Management in place to steer the affairs of the University, managing it is basically by committees. The 2016 Statutes of the University of Cape Coast clearly states that, the major committees of the University are divided into two, namely; Council Committees and Academic Board Committees. Apart from these two major committees, the University of Cape Coast has about forty (40) Committees which have their own mandates. Out of the forty committees, six (6) are under Council and the remaining thirty-four (34) are under the Academic Board.

Apart from the forty committees, there are other Sub-Council and Sub-Academic Board Committees. Departments, schools/faculties, and colleges committees meetings are also carried out as and when needed. The study focused on meetings of committees of colleges of the University of Cape Coast.

The study focused on meetings of the University of Cape Coast. These meetings were organised by the Colleges, Academic Board and Council committee. The study focused on the time the meeting actually started, the time the meeting came to a close and the intended time the meeting was to start.

Justification of the Study

This study is engineered towards the notion that the incidence of delays in the start of an engagement schedule has an impact on the engagement. It was therefore hoped that through the recommendations of the study, both the management and staff of the University will re-think their perception and attitude towards scheduled engagements and devise means to honour any engagement schedule on time. This will increase productivity and save cost in the University.

Delimitations

The study took place in the University of Cape Coast in the Central Region of Ghana. The researcher focused on the minutes of committees of the various colleges of the University. The variables that were considered in this study were the time start of meetings of committees, the intended time start of the meeting and the time of closure of the meeting.

Organisation of the Study

The thesis is organised into five chapters. Chapter One captures the introduction which includes the background to the study, statement of the problem, objectives of the study, research questions, the scope of the study, the justification for the study, delimitations of the study and organisation of the research. Chapter Two focuses on the review of the relevant literature relating to the topic. Chapter Three concentrates on the methodology of the study and explains the research procedures, including the study design, the study area, the study population, sources of data, sampling, data collection techniques, fieldwork and data processing and analysis. Chapter Four covers the analysis and findings of the study. In this regard, the analysis and discussion focused on the pattern of the delays in the start of engagement schedule and its effect on future events. Finally, Chapter Five presents the summary, conclusions, and recommendations of the study, with suggested areas for further research.

Chapter Summary

This chapter elaborated on the background of the study. Incidence of honouring a schedule late was highlighted. It further justify the importance of the study. The problem to be investigated were also explained in this chapter. The objectives of the study were clearly stated to guide the study. Furthermore, the source of data and the scope of the study were explained in detail. The investigation was conducted at the University of Cape Coast. The data was a historic data (i.e. time recordings of the intended time of starting a meeting, the actual time which the meeting started and the time the meeting closed). The chapter closed with the organisation of the study.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The purpose of this study was to examine the incidence of time delay in engagement schedules on campus. This chapter reviews literature related to the current study. The review is done according to the following outline: Punctuality and Time Adherence in Engagement Schedules, Concept of Delays in Engagement Schedules, Pattern of Delay in Engagement Schedules, Causes of Delays in Engagement Schedules, Appropriate Model Fit for the Delay of an Engagement Schedule, Appropriate Model Fit for the Time Span of an Engagement Schedule, Incidence of Delays in Engagement of Various Divisions of an Identified Government Institution, and Theories and Models

Punctuality and Time Adherence in Engagement Schedules

Punctuality is one of the crucial ingredients of modern life and progress (Basu & Weibull, 2002). In organisations and institutions, punctuality covers the ability of different individuals to exchange ideas and thoughts and coordinate on time to meet timelines for engagement schedules. Punctuality and adherence to time have been the centre of much research in the past and in the present. It is anticipated that it will be so in the future. Some earlier researchers such as Zerubavel (1982) as well as Clayman (1989) have all expressed their views concerning punctuality. For instance, Zerubavel (1982) opined that standard time is among the most essential coordinates of intersubjective reality and one of the major parameters of the social world. Zerubavel argued that social life would probably not have been possible at all were it not for our ability to relate to time in a standard fashion. The implication of the view of Zerubavel is that without the ability to adhere to timelines, social life and order would not be possible. In support of this view, Clayman (1989) asserted that as a general principle, organized social life requires that human activities be coordinated in time. In the light of these views, punctuality and adherence to time are of major cognisance in research (Kanekar & Vaz, 1993).

Punctuality is important, however, it is made much more important during engagement schedules. During scheduled meetings, there are deadlines to be met. The participants in the meeting or engagement are also involved in other active endeavours. It is therefore necessary, that punctuality is ensured in engagement schedules. In ensuring punctuality and adherence to time for engagement schedules, there is intra-group synchronization and external synchronisation (McGrath & O'Connor, 1996). This implies that members in a particular group have to accommodate to each other's actions in order to ensure that engagement schedules are not delayed (Gevers, Rutte, & van Eerde, 2006). However, individuals' attitude towards punctuality and adhering to time schedules have been seen to be a matter of preference or a person's innate behaviour trait (Basu & Weibull, 2002).

After carrying out a study of 15 men and 22 women in Cleveland State University, Richard and Slane (1990) concluded that a person's "punctuality style is a persistent personality characteristic" and a trait that correlates well with a person's innate anxiety level, arguing that punctual people exhibit less anxiety in general. The implication of this finding of Richard and Slane is that the personality characteristic of individuals contributes to their level of punctuality and adherence to time. Apart from the role played by personality, punctuality, and adherence to time and schedules have been found to vary across cultures and societies. For instance, Kanekar and Vaz (1993) conducted a study on undergraduate students in Bombay University and concluded that Indians were notorious for their unpunctuality. Another study by Levine, West, and Reis cited in Basu and Weibull (2002) on punctuality patterns in Brazil and the United States, the researchers found systematic variations across these two societies, stating specifically that punctuality in the United States is a more salient issue than it is in Brazil. This implied that punctuality was considered a significant issue in the United States than in Brazil.

Besides these influences, an important element in punctuality and adherence to engagement schedules are shared temporal cognition. Gevers et al. (2006) viewed shared temporal cognitions as the extent to which group members have congruent mental representations of the temporal aspects of a specific group task, such as the importance of meeting the deadline, (sub) task completion times, and the appropriate timing and pacing of task activities. In simple terms, it is the understanding people in a group have about the time aspects of tasks and activities. Cognitions are shared when group members have common or overlapping views regarding the time aspects of task execution, which does not necessarily mean that group members have actively discussed them (Thompson & Fine, 1999). Such a shared understanding regarding the time aspects of tasks helps group members to anticipate and understand each other’s actions, and to adopt more compatible work patterns. This, in turn, enhances the coordination of task activities and benefits team performance, especially in meeting deadlines and avoiding delays in engagement schedules (Gevers et al., 2006). Thus shared understandings of time are assumed to enhance team members' accurate expectations of task execution, and behavioural adaptations to the needs of the task and other team members (Cannon-Bowers, Salas, & Converse, 1993).

However, shared understandings of time will only facilitate meeting deadlines and timelines when these understandings are in line with the time demands of the task to be performed. This implies that when all group members underestimate the duration of an engagement or consider the deadline to be unimportant, sharing these understandings is more likely to impede their ability to meet timelines for engagement schedules. As such, these groups would probably be better off with one or two members with diverging perceptions on time who might promote a more appropriate allocation of time in task execution (Waller, Giambatista & Zellmer-Bruhn, 1999).

The influence of shared understandings on time usage is also dependent upon the pacing styles of the members. Thus, not only should share understandings of time be to a high degree, but also the pacing styles of the members should be fast enough to avoid delays. Therefore, it can be assumed that a group is more likely to delay engagement schedules when the members generally start task activities late and agree on how to use time. If, however, the group members, on average, start working on the task early, i.e. have an early action pacing style, their agreement on how to use time will help overcome delays in engagement schedules.

Overall, punctuality and adherence to engagement schedules is an important aspect of group performance as has been indicated by some studies (Chang, Bordia, & Duck, 2003; Waller et al, 1999). Thus, adherence to engagement schedules is of necessity in every institution or organisation. In the current study of a public tertiary institution, adhering to engagement schedules is of important consideration for the success of the institution.

Concept of Delays in Engagement Schedules

Engagements according to Rogelberg et al. (2013), are salient sites of temporal behaviour in organizations. They consume large amounts of time, punctuate and interrupt the temporal flow of work, provide venues of time coordination and allocation, and mark time in organizations. An example of an engagement is weekly staff meeting). Delays in time can be seen as the opposite of punctuality. In the workplace, an individual's punctuality will not only have an effect on how a person is viewed by colleagues, but will also affect their productivity (Costa, Wehbe, Robb, & Nacke, 2013). As a result, being late for a meeting can be disruptive to the working team, costing everyone time and causing the individual to miss valuable information. Delays in engagement schedules imply situations where scheduled activities take place at times later than the planned times. Lauby (2009) called this not showing up or starting on time. Delays also refer to not meeting up with proper or usual timing (Breezes, Markey, & Woll, 2010). It can be seen as a system of network breakdown (Peretomode, 2001) and a situation of not meeting up with programme timeline.

Delaying is one of the most recurring and the most "frustrating problem" that schools have to deal with (Sprick and Daniels, 2010). It is a problem, not just to the students but also to instructors and the entire school community (Cowan Avenue Elementary School Community, 2007). In the context of the current study, delay in engagement schedules can affect the entire university community. According to the results of the study of the U.S. Department of

Education on “truancy”, which is related to tardiness, being present and on time in going to school are big factors on the “success and behaviour” of the students (Zeiger, 2010). Thus, it is a lot important to value time and practice being on time while being a student.

Pattern of Delay in Engagement Schedules

Being on time and meeting engagement schedules is important for organisations to achieve their objectives, however, in most instances, staff are not able to adhere to engagement schedules for a variety of reasons. The most common form of work disengagement is exhibited through withdrawal behaviours such as lateness. Lateness implies a situation where an individual arrives after the proper, scheduled or usual time (Oxford Advanced Learners Dictionary, 1995). Lauby (2009) also opined that it as a term used to describe ‘people not showing up on time’. In most cases, delays in engagement schedules result from lateness. For instance, when a meeting is meant to start at 10:00 am, the meeting is likely to delay if the participants of the meeting arrive 30 minutes after the start time. This implies that the lateness of the participants was connected to the delay in the engagement schedule. Lateness can also be viewed as ‘tardiness’, which implies being slow to respond, thus not meeting up with proper or usual timing (Breezes et al., 2010). Therefore, delays in engagement schedules can mostly arise out of lateness of individuals.

Blau (1994) identified three specific forms of delay behaviour categorized by the pattern, frequency, and duration, including increasing chronic delay, stable periodic delay, and unavoidable delay. Chronic delays arise from lower job satisfaction, lower job involvement, and lower organizational commitment (Blau, 1994). Stable periodic delay, however, may be due to issues related to work and family conflict. Individuals that stable delays may be unhappy with their jobs but may consider other things more important than arriving on time all of the time (Blau, 1994). Unavoidable delays may be primarily due to transportation issues, emergencies, personal illness and accidents (Blau, 1994). Thus, any situation that is beyond the control of the individual might cause unavoidable delays. These three man forms of delays are recognised in engagement schedules of public institutions.

Gevers et al. (2006) examined whether groups were better able to meet deadlines when group members had shared temporal cognitions that is when they agreed on the temporal or time aspects of their task. In a longitudinal study involving 31 groups, the researchers studied the effect of shared temporal cognitions on meeting a deadline and explored two antecedents of shared temporal cognition: the similarity in group members' pacing styles and the exchange of temporal reminders. The study revealed that both antecedents are relevant to shared temporal cognition, be it at different stages of group collaboration. Further, the study found that shared temporal cognitions may either facilitate or impede meeting a deadline, depending on the content of group members' pacing styles. The implication is that delay in engagement schedules was influenced by the similarity in group members' pacing styles and the exchange of time-based reminders. Therefore, as members in a specific group keep reminding themselves of the need to stick to timelines of engagement, they can be punctual. The reverse is true.

Fischer and Mosier (2014) conducted a study to examine how communication delay will impact distributed team performance, and whether communication media will moderate or exacerbate its effect. Twenty-four teams of three were assigned the roles of space crewmember (2 participants) or flight controller (1 participant) and had to collaborate remotely on computer-based tasks simulating failures in the spacecraft's life support system. Communication medium (text vs. voice) was a between-group variable; presence/absence of communication delay was a within-group variable. Performance variables included time to repair system failures and a number of incorrect repairs. Audio-recordings of team members' voice communications were transcribed and logs of their chats uploaded for further analysis. The study found that teams took significantly longer to repair system failures when team communication was asynchronous rather than synchronous. While communication medium had a significant effect when team interactions were synchronous, it had no differential impact under time-delayed conditions. Preliminary communication analyses suggest that under time-delayed conditions, successful teams in each media condition were those who adapted to the constraints of their communication medium to establish shared task understanding. From these findings, it can be concluded that delay in engagement schedules was influenced by the communication medium as well as the shared understanding of the tasks to be performed.

In addition, Clark, Peters, and Tomlinson (2003) used a sample of male and female workers from the 1992 *Employment in Britain* survey to estimate a generalised grouped zero-inflated Poisson regression model of employees' self-reported lateness. It was identified that lateness or delays among staff are modelled as a function of incentives, the monitoring of and sanctions for lateness within the workplace, job satisfaction and attitudes to work. It was concluded therefore that various aspects of workplace incentive and disciplinary policies turn out to affect the delays in engagement schedules among staff.

Causes of Delays in Engagement Schedules

It is important to identify the causes of delays in engagement schedules in public institutions. Excessive delays can be a physical sign that an employee has disengaged from the organisation. It is sometimes difficult to tell the reasons for delays in engagement schedules. However, delays are linked to lateness which is also linked to several factors. By identifying the causes of the delays, the menace of delays in institutions can be curbed.

Culture and Delays

The influence of culture on behaviour, perceptions, and cognition seems to be an accepted fact in the social literature (Hatch, 1993). In any society, people have certain beliefs, assumptions, and values that help form certain norms that influence attitude and behaviour. These beliefs, assumptions, and values form the culture of the society. Since culture influences behaviour, people from different cultures can be said to have different tendencies and attitudes toward delay (Levine, West & Reis, 1980).

Therefore, people may have very different reasons for lateness and non-adherence to time, depending on their cultural norms. In this context, some authors have suggested that people from developing countries who tend to be tardy or late may be acting appropriately within a more flexible conceptualization of time than those from developed countries (Brislin & Kim 2003). In contrast, in developed countries, tardiness may often be an indication of job withdrawal (Foust, Elicker & Levy, 2006). Thus, delays in engagement schedules may be a function of the cultural context.

Apart from the culture of the society that influences the delay tendencies of individuals, the culture within the specific institution or organization can also influence delay in engagement schedules. This presupposes that norms and organisational culture within the organisation often specify the type and level of work behaviour expected from someone. As a result, the culture within the organization can influence whether there will be delays in engagement schedules or not. For instance, in an institution where the delay to the start of meetings is not frowned upon but seen as a normal part of activities, it is likely that every engagement schedule will be delayed.

Organisational culture can, therefore, influence the preferred arrival time of individuals to meetings. Preferred arrival time refers to the amount of time (in minutes) before the start of work that a person arrives at a job (Koslowsky, 2000). How the individual will be received in cases of delays is therefore influential in adherence to engagement schedules. This has been referred to us workplace tolerance (Caplice & Mahmassani, 1992).

In summary, the culture within a society, thus, tolerant of delays or not along with the organistional culture can both influence delays in engagement schedules in public institutions.

Gender and Delays

The relationship between cultures can be mediated by gender. Some studies have indicated that men and women handle time conflicts differently (Duxbury & Higgins, 1991; Greenhaus 1998). In most societies, the cultural background affects motivations underlying women's employment outside the home. For instance, in developing countries, women are not meant to be fully engaged in their work compared to men. Women have to give some time off to the caring of the home. In this sense, it is likely women may delay in issues related to their work compared to men. This has been confirmed by several studies (Blau, 1994; Hammer, Bauer & Grandey, 2003). Therefore, delays in engagement schedules could be induced by the gender of the staff involved in the engagement.

Emergencies and Delays

In each day, there is the likelihood that emergencies might occur. This could include household crises, poor weather conditions or car accidents (Kasu, 2014). In times of such incidents, employees who are meant to be part of engagements may delay resulting in the delay of the engagement schedule. To resolve such issues and reduce delays, employees should report emergency situations to their superiors to ensure that engagements schedules are not delayed excessively. The employers can also get to communicate with their employees to find out how they have handled the emergency situations (Barton, 1994).

Work Stress

Delays in engagement schedules could also be traced to the stress experienced by workers at the workplace. When workers spend more time in the workplace working themselves off, they may enter get tired and depression from the stress of the workplace (Kasu, 2014). With this, it will be difficult for such workers to adhere to engagement schedules (Richard &Slane, 1990). Ultimately, this results in delays in engagement schedules.

Arrogance and Indiscipline

In some firms and institutions, some individuals feel more important than others. As such, these individuals might not give regard to rules and regulations in the firm in terms of lateness and tardiness. This might lead to lack of punctuality thereby delaying engagement schedules in the institution. Leadership and authority at institutions must ensure discipline for tardiness and lateness. Failure to do so can increase the incidence of delays in engagement schedules (Blau, 1994).

Empirically, so studies have been carried out to identify the causes of delays in engagement schedules. For instance, Mallillin (2017) examined the causes and extent of absenteeism, tardiness, and undertime of employees in selected Higher Education Institutions (HEI). The Descriptive Correlative Approach was utilized in the study in obtaining the data and other necessary information. The researcher used the questionnaire, observation, documentary analysis, and informal interview guide as an instrument to gather such data. Thirty (30) respondents participated in the study. The results showed that there is no significant relationship between the factors that may cause absenteeism, tardiness undertime of employees and the extent of the aforementioned factors that influence the respondents in terms of personal/family/home factors, management/administrators, work atmosphere, human relations and school policies. However, there is a significant relationship in terms of career perspective. The implication is that how employees view their careers and the extent to which they want to go in their careers can influence their withdrawal behaviours leading to tardiness and delaying.

Leigh and Lust (1988) also carried out a study using data from the United States Quality of Employment Survey and a Tobit regression model. They found that significant determinants of the number of days reported late within the last two weeks (sign of relationship in parentheses) include: wages (+), working too much overtime (+), experiencing commuting problems (+), work experience (-) and being a professional or managerial employee (+). In contrast to many of the psychological studies, they found no role for job satisfaction once other variables are controlled for and no link between the frequency of lateness episodes and absenteeism.

Incidence of Delays in Engagement of Various Divisions of an Identified Government Institution

Although deadlines are important time markers in organisational life (McGrath & O'Connor, 1996), many institutions appear to have difficulty meeting them. Several studies have confirmed this assertion. For instance, Tukel and Rom (1998) conducted a survey of 91 managers of project teams on punctuality and delays. The study found that 56 percent of the respondents indicated that deadlines are often exceeded or missed. This implies that engagement schedules are delayed in institutions and organisations most of the time.

The study of Karanja (2013) was aimed at determining the perceived factors that contribute to employee absenteeism in the Kenya Ports Authority. The study adopted a descriptive survey design. Purposive and stratified sampling was used in gathering the sample for the study. The study relied on a sample size of 80 staff members of the Kenya Ports Authority and data was collected by the use of a questionnaire. The data collected were analysed using descriptive statistics with the assistance of statistical package for social scientist (SPSS) and content analysis for qualitative data. The study found that 79% of the respondents indicated that absenteeism was a problem in the organization. Thus, by implication, members of the organization were not having the right approach towards attendance and meetings. Delay is linked to absenteeism in the sense that at times when an employee perceives his or her arrival to have been delayed, he or she likely to decide against attending the scheduled engagement. Further, the study found that the strict adherence to set down policies on absenteeism, counselling and rehabilitation of staff who have drug and substance problems, improved supervision of staff, fair treatment, motivation and recognition of staff and also rewarding of good attendance could help reduce issues of delay, lateness, and absenteeism.

In addition, Costa, Wehbe, Robb, and Nacke (2013) studied the effectiveness of leader boards, a common gamification technique, for improving punctuality of participants to regular work meetings. Leader boards were comprised of data collected by monitoring the arrival times of the participants, which influenced their scores in the leader boards. The study found that leader boards themselves did not promote punctuality of every participant, but gave rise to various gameful social comparisons. These gameful social comparisons that emerged among participants when using leader boards for our meetings were reported to be the cause of their punctuality improvements. In conclusion, the researchers indicated that there was an improvement in the punctual behaviour of the respondents to meetings. Thus, delays in engagement schedules were reduced.

The study of Ngozi (2015) was aimed at investigating the influence of absenteeism, favouritism, and tardiness on the deviant behaviour of university employees in Nigeria. A descriptive survey research design was adopted for the study. A total of 600 respondents were selected for the study, using proportionately stratified sampling technique. Four standardized instruments were used for data collection. The hypotheses generated for the study were tested at 0.05 alpha levels using Regression Analysis and Pearson Product Moment Correlation Statistics. The findings of the study revealed that absenteeism, favouritism and tardiness were found to have jointly contributed to employees' deviant behaviour in academia in Ogun State of Nigeria. In concluding, absenteeism and tardiness were common among the sample used in the study. Thus, absenteeism and tardiness were found among university employees. The current study is also carried out in a tertiary institution. The incidence of delays in engagement schedules will therefore be assessed in the current study.

Further, Brooks (2017) conducted a review of some previous studies. Brooks found that from a study by CareerBuilder, 29 percent of employees show up late to work at least once a month. Also, for 16 percent of such employees, lateness or tardiness was more frequent for them. In this sense, engagement schedules were more likely to be delayed. This is because the lateness and tardiness among the employees can affect engagement schedules.

In addition, Kasu (2014) conducted a study to identify the causes and effects of lateness or tardiness and the challenges employers are facing in trying to curb them and the possible measures that can be put in place to curb them with Christ Apostolic University College (CAUC), Kwadaso as a case study. Questionnaires and interviews were used as the main data collection tools to solicit responses from employees and management of CAUC. The responses from the questionnaires were analysed using the Statistical Product for Service Solutions (SPSS), which generated the frequency distributions and the various rankings of the responses and regression analysis. The study found out that most employees at the case study institution were reporting late to work. The implication is that tardiness and lateness were common among the employees in the university. In concluding, engagement schedules were mostly delayed. The behaviour of tardiness was attributed to low morale caused mainly by low salaries. Management of the university had challenges dealing with the problem of delays because the delays were caused by human attitudes and therefore were difficult to change.

Rogelberg et al. (2013) carried out two different studies to identify whether organizational scientists and temporality scholars should care about meeting lateness. Put simply, the authors aimed at identifying the incidence of delay in meetings or engagements. Both studies revealed that there was a high level of lateness and delays in engagements at institutions. The study showed also that the delays had potential implications for individuals, relationships, groups, and institution as a whole. Delays in engagements were also found to be related to job satisfaction, intent to quit, satisfaction with meetings in general, age, and conscientiousness. Rogelberg et al. concluded from their findings that delay in meetings and engagements was complex and therefore required more and further investigations.

Appropriate Model Fit for the Delay and Time Span of an Engagement Schedule

Clark, Peters and Tomlinson (2003) identified two largely distinct perspectives on delay at the workplace. These models were mainly found in the scholarly literature of economics and psychology. Clark et al. (2003) posited that economists emphasise the preferences of and constraints faced by, rational workers. In this sense, arriving late to meetings can be viewed as a choice taken after weighing up the costs and benefits of alternative uses of scarce time. Thus, arriving early, relative to an exogenous work start time, imposes a cost in terms of foregone leisure and is utility reducing. This cost will be higher where workers value leisure more. However, arriving late implies two types of cost. Firstly, earnings may be reduced for delays and lateness and secondly, lateness or delay is likely to increase the probability of dismissal reducing the flow of future earnings (Shapiro & Stiglitz, 1984). The economist model therefore shows a trade-off between the respective costs and benefits of adherence to time.

Caplice and Mahmassani (1992) found that employer flexibility is a statistically significant determinant of scheduling decisions taken by urban commuters in American cities. This finding is consistent with the emphasis on monitoring and sanctions in the economic approach. Green and McIntosh (1998) also analysed subjective measures of work intensity or effort and emphasised the sanction of job loss for workers who are supplying low effort. They found that the presence of trade unions is an important intervening variable which moderates the effect of the threat of job loss on the effort. The findings imply that the role of trade unions can interfere in the adherence to time or delays in engagement schedules at the workplace. If individuals perceive their jobs to be secured without threat, they are likely to ignore any cautionary measure and behave any way they want towards engagement schedules.

The factors which influence the costs and benefits of adherence to engagement schedules fall into three broad groups (Clark et al., 2003). First, the preferences of the individuals will be important. The individuals who value leisure more will, other things equal, prefer a later arrival time. Second, the compensation structure faced by the worker will affect schedule choice. The third set of economic determinants of lateness relates to the implications of late arrival for job security and tenure.

On the other hand, industrial psychologists focus on attitudes towards the workplace, particularly those relating to job satisfaction. The psychological model assumes that delays in engagement schedules can arise from withdrawal behaviour which is a manifestation of "neglect and disrespect" (Koslowsky, 2000) - for the job or employer. Several studies have been carried out to verify the potency of the psychological model. For instance, Koslowsky, Sagie, Krausz, & Dolman-Singer (1997) carried out a meta-analysis of 118 correlation coefficients across 30 samples from 27 independent studies. The published studies used as inputs to the meta-analysis had sample sizes ranging from 37 to 1,244 and were mainly conducted in single employers or workplaces. The meta-analysis found that the strongest (positive) correlation was between lateness and other types of withdrawal behaviour including absence and turnover. The next strongest correlation was a negative relationship between work attitudes - primarily job satisfaction - and lateness. The implication of the findings is that psychological explanation for delays was confirmed.

In another study, Bardsley and Rhodes (1996) report on the correlates of lateness and delays. The sample for the study was factory workers. The study was based on the framework provided by Steers and Rhodes (1978). In identifying the variables related to voluntary and involuntary lateness and delays. The study found that both motivation and ability to be on time were found to be important determinants of delays as well as joint moderators in explaining delays. The negative job satisfaction-lateness relationship suggested that a proportion of delay behaviour represented a response to an aversive work environment. In concluding, the researchers opined that (Steers and Rhodes', 1978) model of attendance was appropriate in identifying the correlates of delays at the workplace.

In addition, Bardsley (1987) conducted a study of employee lateness or tardiness. This study was conducted with a sample of 181 factory workers. This study utilized the Steers and Rhodes (1978) Process Model of Attendance. The participants provided responses to a questionnaire on 27 independent variables which were compared with tardiness frequency data obtained from company records for the previous nine month period. The data obtained were analysed separately for males and females utilizing correlational and regression techniques. The study found that in support of the model, for both the male and female sample, two variables were found to be significantly related to delays: (a) auto problems and (b) general transportation problems. For the male sample only, in support of the model, significant relationships were found between delays and two variables: (a) satisfaction with the group and (b) group attitudes. For the female sample only, in support of the model, significant relationships were found between tardiness and three variables: (a) satisfaction with the group, (b) child care at departure time, and (c) age. Further, for the male sample, curvilinear relationships were found between tardiness and two variables, job involvement, and supervisor enforcement while for the female sample, a curvilinear relationship was found for tardiness with perceived company policy against tardiness. In concluding, Bardsley (1987) posited that the Steers and Rhodes Model (1978) was appropriate as a theoretical framework to study tardiness, lateness or delays at the workplace.

Moreover, Steel, Rentsch and Van Scotter (2007) conducted a study to evaluate the absence-predictor types of Steers and Rhodes' (1978) model of employee attendance. This study was conducted in response to the several inconsistent findings on the model. Using data from 580 federal employees, a predictive analysis evaluated exogenous model predictors against absence criteria representing four different cumulating periods. Supplemental analysis explored the possibility of incremental endogenous-variable (i.e., Ability to Attend, Motivation to Attend) contributions. The results of both tests were consistent with a conclusion of partial model support. The results imply that the model of Steers and Rhodes can partially explain the concept of delay, lateness, and absenteeism. In the current study the model of Steers and Rhodes will be used and its ability to explain the delay in engagement schedules tested.

Gary (2001) carried out a review of the models used in explaining lateness and delays at the workplace. Gary opined after the review that psychological processes underlying lateness and delays at the workplace have historically been dominated by a withdrawal model that assumes that the behaviours are the product of unfavourable job attitudes. Gary argued that although the withdrawal model is useful for understanding lateness and delays, its dominance is something of a historical accident that is not well justified by the contemporary meta-analytic evidence. Gary, therefore, suggested elaborations of the withdrawal model, including the progression of withdrawal and the general withdrawal construct and proposed alternatives to the withdrawal model including a social model and a dispositional model. The social model takes into account demography, social networks, and normative and cultural mechanisms.

Theories and Models

Some of the theories and models related to the study are reviewed in this section.

Social Learning/Cognitive Theory

The social learning theory was propounded by Bandura (1977). Later the theory was modified as a social cognitive theory in 1986 by Bandura. Social learning theory expands on traditional behavioural theories, in which behaviour is governed solely by reinforcements, by placing emphasis on the important roles of various internal processes in the learning individual (Mineka & Zinbarg, 2006). According to Bandura (1977), much of human learning occurs in a social environment. Kauffman (2001) added that social learning theory is founded on the assumption that there are three primary influences that control human behaviour, the environment, the behaviour, and cognitive/affective characteristics of the individual. Thus, "whether or not a person exhibits adverse behaviour depends on the reciprocal effects of these three factors and the individual's social history" (Kauffman, 2001).

Therefore, Bandura posited that the central theme of the social cognitive theory has to do with observation, modelling, and imitation. In observation, Bandura (1989) intimated that people acquire skills, knowledge, rules, expectations, and strategies. Individuals also learn from models the usefulness and appropriateness of behaviours, and the consequences of modelled behaviour. In his view, Bandura stressed that not only do individuals observe and imitate but also, act in accordance with beliefs about their capabilities and the expected outcomes of their actions. People do not respond passively or automatically to external conditions around them (Bandura, 1999) but they plan, form expectations, set goals and imagine various outcomes before engaging in observed behaviours.

In Social Cognitive theory, Bandura (2000) posited that the information that people process from observing other people, things and events in the environment influences the way the people act. The social cognitive theory, therefore, assumes that people can learn by observing the behaviours of others, as well as by observing the outcomes of those behaviours, learning can occur without a change in behaviour, the consequences of behaviour play a role in learning and cognition also plays a role in learning. Thus, people do not just behave but observe and process what they have observed before engaging in any behaviour.

In the context of the current study, all the key concepts of the social cognitive theory such as observation, imitation, and cognition are relevant. For instance, when new people are employed in an institution, they observe how meetings and activities are carried out. For most new employees, they just blend in with the usual way of doing things. In terms of tardiness and delay of engagement schedules, if an employee observes that any form of delay and tardiness goes unpunished, he or she is more likely to resort to similar ways. Specifically, behaviours of institutional heads are likely to be imitated by subordinates as an institutional authority has high status and from the workers' point of view, has great power and influence over events during the working period.

When employees see high-status individuals engaging in responsible acts (particularly when there are apparent rewards for the behaviour), other employees are more likely to engage in similar behaviours (Kauffman, 2001). Banks (1997) added that if employees see that a colleague does not receive negative consequences as a result of lateness, based on social learning theory, it might be expected that more employees would be late to work. This happens because people learn in part by imitating (Delamater, Wagstaff, & Havens (1994). In spite of this, the role of cognition can influence whether employees will imitate any behaviours they observe.

Notwithstanding observation and imitation, Bandura's theory has particular relevance for the workplaces since they give information about the characteristics of desirable models and the personal features of workers, notably their self-efficacy. Once a behaviour is learned, the likelihood of it being performed depends on its consequences. Bandura (1982) suggested that successful experiences with an activity over time create a sense of competence at performing the activity or self-efficacy. Overall, the social learning/cognitive theory is deemed relevant to the current study. However, while social learning theory can add greatly to understanding responsible behaviour, it does not sufficiently address some of the more complex issues of employees' lateness and tardiness. This is because such issues are determined by several other factors.

Social Disorganisation Theory

Social disorganization theory grew out of research conducted in Chicago by Shaw and McKay (1942). Using spatial maps to examine the residential locations of juveniles referred to Chicago courts, Shaw and McKay discovered that rates of crime were not evenly dispersed across time and space in the city. Instead, crime tended to be concentrated in particular areas of the city, and importantly, remained relatively stable within different areas despite continual changes in the populations who lived in each area. They concluded from their results that the environment had a key influence on the misbehaviours of individuals.

The scope of the theory was adjusted and expanded to include constructs beyond the macro-level components originally specified by Shaw and McKay (i.e., low socio-economic status, residential mobility and racial heterogeneity). New concepts have been added that have enhanced its theoretical utility. These concepts include “intervening mechanisms” or mediating variables between the traditional social disorganization variables and rates of misbehaviour. The intervening mechanisms noted by researchers include the effect of social disorganization on rates of family disruption and collective efficacy, which, in turn, directly influence rates of misbehaviour (Sampson & Groves, 1989; Sampson, Raudenbush & Earls, 1997).

The Social Disorganisation Theory was linked to the concept of delay and lateness by Shoemaker (2000). Shoemaker posited that while social learning theory focuses on three factors which influence individuals (the environment, the behaviour, and the cognitive/affective feature), the social disorganisation theory expands the focus of these influences by widening the view on the environment to the social aspect of misbehaviour. The major assumption of social disorganisation theory is that a breakdown in institutional, community-based controls of society gives rise to several misbehaviours such as tardiness and delays among employees (Shoemaker, 2000). This means delays in engagement schedules can arise from the breakdown in the systems of society.

Individuals may live in harmony with their environment under normal conditions but when there is a drastic change in the system, they are thrown into disorganisation because they do not know how to interpret the new shape of their society (Kumpulainen & Wray, 2002). In such instances, individuals are likely to respond to the changes with several misbehaviours. For instance, when a married man gets divorced, he experiences a drastic change in his life which can affect his way of living. If in the past, his wife was performing household chores while he prepared to meet the timelines of engagements at work, he cannot do so in his divorced state. He would not have too much time to be able to be on time. Again, the breakdown of his family can affect his entire life such that his attitude towards work and meetings would be affected too. Such instances can lead to delays in engagement schedules at the workplace. Based on these, this theory was considered relevant to the current study.

Psychological Theory of Lateness

The Psychological Theory of Lateness was propounded by Koslowsky (2000). This theory was focused on the idea of 'withdrawal'. Koslowsky (2000) opined that lateness is a withdrawal behaviour which is a manifestation of 'neglect and disrespect' for the job or employer. Withdrawal behaviours are behaviours exhibited by employees at the workplace when they have some form of discontent or bad feeling toward their job. Withdrawal behaviours can include absenteeism, lateness and voluntary separation. In some instances, such behaviours occur independently of each other while in some cases they occur in progression. The theory assumes that employees who are dissatisfied with aspects of their job are those who are most likely to exhibit withdrawal behaviours including lateness and delays.

Withdrawal behaviours lie on a continuum with minor loafing at one end through lateness, serious shirking, and absenteeism through to turnover at the other end (Rosse & Miller, 1984). As the degree of withdrawal increases, workers progress along the continuum exhibiting increasingly serious forms of misbehaviours until a separation whether voluntary or involuntary occurs.

An important view of the psychological theory is the consideration given to individual characteristics and the situational characteristics. Relevant individual characteristics might include a person's job satisfaction and the extent to which they tend to be well organized. Relevant past experiences might also include punishments for being late. Situational features might include the distance of home from work, the simplicity or complexity of travel between home and work and the expectations of the person's workmates. They may also include factors which change day by day such as the weather. All these might directly influence the likelihood of lateness leading to delays in engagement schedules. However, these characteristics can also interact. For instance, a well-organized person may have no difficulty with complex engagement schedules between home and work while a poorly organized person may not be to cope with complex engagement schedules. For him or her, the complexity of travel to work could make a big difference to punctuality.

In summary, the psychological theory revolves around withdrawal behaviours of individuals and assumes that lateness and delays are signs of withdrawal which can be influenced by several personal factors and situational factors.

Steers and Rhode's Model

The Steers and Rhodes model was developed a year later after Nicholson, Brown, and Chadwick-Jones developed theirs in 1977. In the model of Nicholson et al., they assumed that personal characteristics, organizational commitment (attachment to the organization) and work involvement, random factors such as vehicle mechanical problems, attendance motivation do influence attendance and absence of employees at the workplace. On the basis of this, Steers and Rhodes developed a model on employee attendance deemed to be very influential (Harrison & Martocchio, 1998).

The model states that the capability of employees to meet deadlines is primarily dictated by how motivated they are as well as their ability to attend and perform their duties. From Figure 1, it can be realised that the nature and scope of the engagement influence the motivation of employees to attend. This influence, is however, mediated by the employees' value and expectations of the engagement. Further, the motivation of the employees is influenced by the pressure to attend which covers the employees' work ethics and organisational commitment. In influencing whether there is adherence or delay in engagement schedule, the motivation of employees is moderated by the ability to meet the timeline of the engagement (Steers & Rhodes, 1978). For instance, even if an employee is motivated to attend a meeting at 10:00am and has high expectations of the meeting, he or she cannot attend if there is an accident or illness. Again, the employee is likely to be late if there are transportation problems. This can result in delays in the engagement schedule. Overall, the ability to attend, the motivation to attend and the pressure to attend are all influenced by the personal characteristics of the individual such as gender and age (Rhodes & Steers, 1990). This is so because, age can be inversely related to meeting timelines (Rhodes & Steers, 1990). Thus, how old a person can affect whether he or she can be on time to meet engagement schedules. The model is shown in Figure 1.

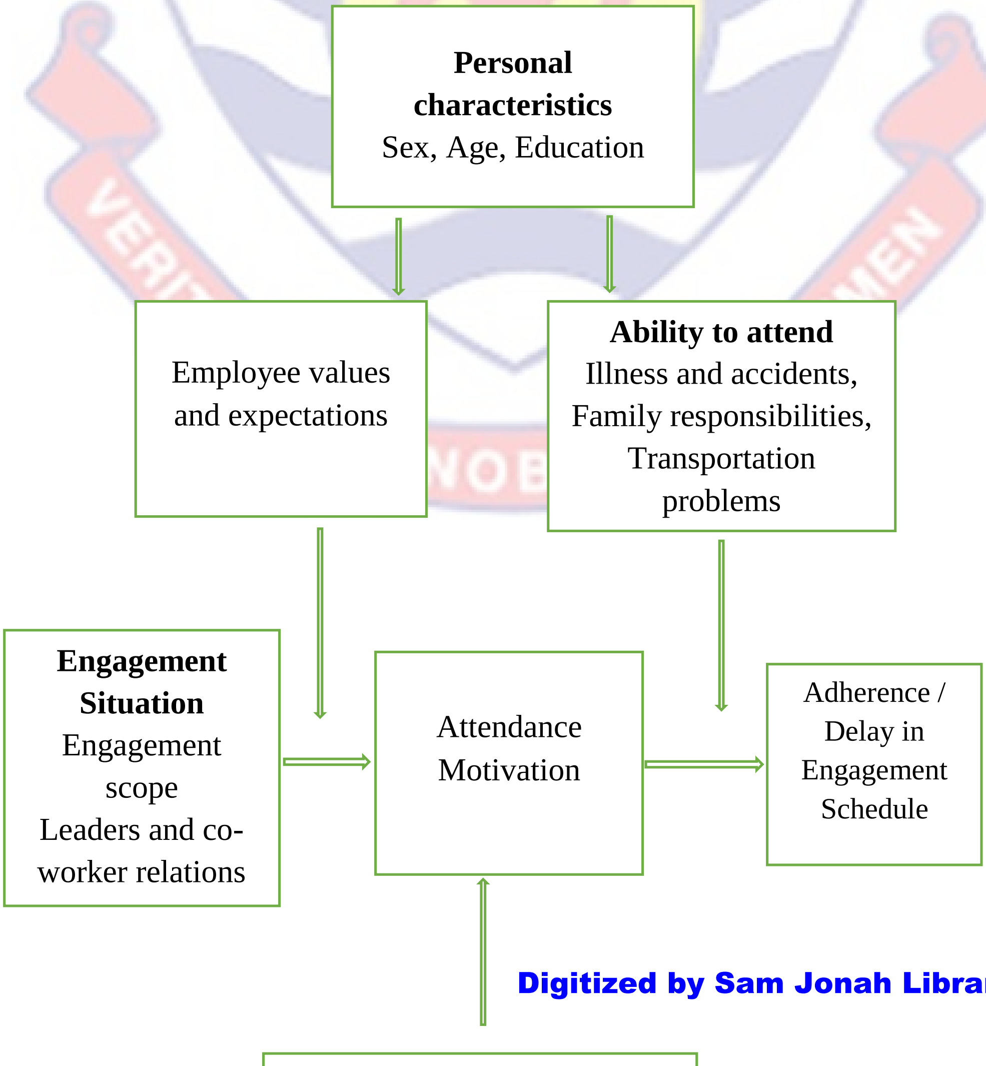


Figure 1: Adaptation of Steers and Rhodes' (1978) model of employee attendance.

In connection to the current study, it is necessary to point out that, delays in engagement schedules could be due to several factors. Among these factors are the variables delineated in the model of Steers and Rhodes (1978). However, the several variables in the model have made some researchers argue that it is a complex model (Gary, 2007). In spite of this, the model is deemed appropriate for the current study since it covers every pertinent variable or factor from the engagement situation to personal characteristics and the ability, pressure, and motivation to meet engagement schedules.

Chapter Summary

This chapter reviewed the literature relating to the current study. Concepts relating to punctuality and time adherence in engagement schedules, delays in engagement schedules, the pattern of delay in engagement schedules, causes of delays in engagement schedules, the incidence of delays in an engagement of various divisions of an identified government institution were reviewed. Models for explaining delays were also reviewed. Theories such as the social learning/cognitive theory, social disorganisation theory and psychological theory of lateness were reviewed. Overall, the literature review showed that there has not been any study in Ghana on the incidence of delays in engagement schedules. This study, therefore, seeks to bridge that gap in knowledge.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter deals with the methods used for data collection and analysis. It starts with an introduction followed by other sub-themes, including the study design, study area, sources of data, and statistical techniques.

Study Design

The study design was descriptive in nature. It aimed at collecting data, summarizing, analyzing, describing and drawing conclusions based on the secondary data collected and opinions from concerned staff of the University of Cape Coast (UCC).

Study Area

The study focused on some meetings of the University of Cape Coast (UCC). The University of Cape Coast is one of the rare seafront universities in the world. It was established in October 1962 as a University College and had a special relationship with the University of Ghana, Legon. On October 1, 1971, the College attained the status of a full and independent university, with the authority to confer its own degrees, diplomas and certificates by an Act of Parliament – The University of Cape Coast Act, 1971 (Act 390) and subsequently the University of Cape Coast Law 1992 (PNDC Law 278).

On August 1, 2014, the University of Cape Coast was organized into five (5) colleges. Each college has different schools/faculties and departments under them. The colleges are College of Agriculture and Natural Sciences

(CANS), College of Distance Education (CoDE), College of Education Studies (CES), College of Humanities and Legal Studies (CHLS), College of Health and Allied Sciences (CoHAS) and the School of Graduate Studies as an addition. Each college is headed by a Provost and has a College Registrar to oversee the administration of the college.

Per the 2016 Statutes of the University of Cape Coast, the major committees of the University were divided into two, namely, Council Committees and Academic Board Committees. The University of Cape Coast had about forty (40) major committees which had their own mandates. Out of the forty committees, six (6) of them are under Council and the remaining thirty-four (34) are under the Academic Board.

Apart from the forty major committees, there are other Sub-Council and Sub-Academic Board Committees. Departments, schools/faculties and colleges committees and meetings are also carried out as and when needed. The study focused on some meetings of committees of the five colleges of the University of Cape Coast.

Research Design

A Research design is a basic framework outlining the interrelationships between the various researches activities required in order to effectively address the research question (Maxwell, 2005). Hallebone and Priest (2009) opined that research design is the overall plan that determines the type of data to be collected, mode of collecting the data, the instrument to be used to collect the data, sampling procedures, and procedures for analysing the data. As a result, the research design dictates all aspects of a research study as each design has its own principles and guidelines that researchers must abide by. Neuman (2011) suggested that researchers should always be mindful of the principles surrounding a particular research design and how best it could be used to address the research problem. Nonetheless, the selection of a research design primarily conditions in the choice of the research paradigm (Creswell, 2009).

The study adopted a descriptive study design to evaluate the incidence of delay in engagement schedule in tertiary institutions in Ghana. Creswell (2009) defined descriptive study design as a design that involves compromise or contrast and attempts to discover relationships among existing variables. According to Neuman (2011), methods involved in a descriptive study design range from the survey which describes the status quo, the correlation study which investigates the relationship between variables, to developmental studies which seek to determine changes over time.

Data Collection

The data for the research was collected from one main source (i.e. secondary source). The secondary data was drawn from records of meetings held by the selected committees. The main sources data were the invitation and minutes records of the meetings held over two years at the University of Cape Coast. From the invitation and minutes records, the intended time and the actual time a meeting started were collected as our data.

Data Analysis

Information gathered from the research were screened, edited, summarized and presented in tables, graphs, and matrices. Microsoft Excel and Minitab Statistical Software were employed in analysing the data elicited from the minutes. The data collected was entered into Microsoft Excel and Minitab to enable different kinds of statistical tools to be employed in the analysis. Tables, graphs, and chart were used to summarise the data and this made possible the presentation of the various variables that influenced the phenomenon identified.

Statistical Techniques

The study employed three major statistical techniques (Stochastic processes, Regression analysis and Time series analysis) in addition some preliminary analytical techniques.

Regression Analysis

Regression is a statistical technique to determine the linear relationship between two or more variables (Campbell and Campbell, 2008). Ildike and Todeschini define regression analysis as a “collection of statistical methods using a mathematical equation to model the relationship among measured or observed quantities” (Ildike and Todeschini, 1994). The main goals of regression analysis are prediction and modelling. In its simplest (bivariate) form, regression shows the relationship between one independent variable (x) and a dependent variable (Y), as in the formula below:

$$Y = \beta_0 + \beta_1 X + \varepsilon \qquad \text{or} \qquad Y = f(x) + \varepsilon$$

The magnitude and direction of that relationship are given by the slope parameter (β_1), and the status of the dependent variable when the independent variable is absent is given by the intercept parameter (β_0). The function $f(x)$ is the systematic part of the equation and it is given by $\beta_0 + \beta_1 X$. An error term (ε) captures the amount of variation not predicted by the slope and intercept terms, it is also known as the model error. The regression coefficient (R^2) shows how well the model fits the data (Campbell and Campbell, 2008).

Campbell and Campbell (2008) defined the regression model as a mathematical (usually algebraic) equation, also called structural model, to describe the relationship among predictor and response variables. The graphical representation of a regression model is called regression curve. To obtain a regression model, one must select the structural form $f(x)$ (the most common is the linear regression model), the probabilistic model for the error term (the most common is to assume normality), and the estimator for the regression coefficients (the most common is the least squares) (Campbell and Campbell, 2008).

The linear regression model is defined as a model in which the response variable is a linear function of the regression coefficients, i.e. $\delta y / \delta x$ is not a function of x (Ildike and Todeschini, 1994). Examples of linear regression are ordinary least squares regression, ridge regression, stepwise regression, principal components regression, partial least squares regression. Linear least squares regression is by far the most widely used modelling method. It is what most people mean when they say they have used "regression", "linear regression" or "least squares" to fit a model to their data. Not only is linear least squares regression the most widely used modelling method, but it has been adapted to a broad range of situations that are outside of its scope. It plays a strong underlying role in many other modelling methods (Ildike and Todeschini, 1994).

Estimation of the least squares

Using a random sample of n observations $y_1, y_2, \ldots, y_n$ and the accompanying fixed values $x_1, x_2, \ldots, x_n$ we can estimate the parameters β_0 and β_1. To obtain the estimates β_0 and β_1, we use the method of least squares, which does not require any distributional assumptions. In the least-squares approach, we seek estimators $\hat{\beta}_0$ and $\hat{\beta}_1$ that minimize the sum of squares of the deviations $yi - \hat{y}_i$ of the n observed $y_i^{'}s$ from their predicted values $\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i$:

$$\hat{\varepsilon}'\hat{\varepsilon} = \sum_{i=1}^{n} \hat{\varepsilon}^2 = \sum_{i}^{n} (y_i - \hat{y}i)^2 \quad = \sum_{i=1}^{n} \left(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i\right)^2 \tag{3.1}$$

The quantity $\hat{y}_i$ is an estimate of the expectation of y (i.e. $E(y/x)$) and not y_i

Time series Analysis

Davies and Newbold (1979) describe time series as ‘‘a sequence of observations ordered by a time parameter.’’ Time series may be measured continuously or discretely. Continuous time series are recorded instantaneously and steadily, as an oscillograph records harmonic oscillation of an audio amplifier. Most measurements in the social sciences are made at regular intervals, and these time series data are discrete. Accumulations of rainfall measured discretely at regular intervals would be an example. Others may be pooled from individual observations to make up a summary statistic, measured at regular intervals over time. Some linear series that are not chronologically ordered may be amenable to time series analysis.

Ideally, the series used to consist of observations that are equidistant from one another in time and contain no missing observations. As a rule, a series should contain enough observations for proper parameter estimation but there seems to be no hard and fast rule about the minimum size. Some authors say at least 30 observations are needed. Others say 50, and others indicate that there should be at least 60 observations. (Yaffee & McGee, 2000)

Time series graph which includes cycles should span enough cycles to precisely model them. If the series possesses seasonality, it should span enough seasons to model them accurately; thus, seasonal processes need more observations than non-seasonal ones (Yaffee & McGee, 2000). If the parameters of the process are estimated with large-sample maximum likelihood estimators, these series will require more observations than those whose parameters are estimated with unconditional or conditional least squares. Clearly, the more observations, the better.

If the series comes from a sample of a population, then the sampling should be done so that the sample is representative of the population. The sampling should be a probability sample repeated at equal intervals over time. If a single sample is being used to infer an underlying probability distribution and the sample moments for limited lengths of the series approach their population moments as the series gets infinitely large, the process is said to be ergodic (Mills, 1990).

Stochastic Process

A stochastic process is defined as a collection of random variables defined on a common probability space (Ω, F, P), where Ω is a sample space, F is a δ-algebra, and P is a probability measure, and the random variables, indexed by some set T, all take values in the same mathematical space S, which must be measurable with respect to some δ-algebra Σ (Lamperti, 1977). In other words, for a given probability space (Ω, F, P) and a measurable space (S, Σ), a stochastic process is a collection of S-valued random variables, which can be written as $\{X(t) : t \in T\}$ (Florescu, 2014).Historically, in many problems from the natural sciences a point $t \in T$ had the meaning of time, so $X(t)$ is a random variable representing a value observed at time *t*. A stochastic process can also be written as $\{X(t) : t \in T\}$ to reflect that it is actually a function of two variables, $t \in T$ and $\omega \in \Omega$ (Borovkov, 2013).

There are others ways to consider a stochastic process, with the above definition being considered the traditional one (Lindgren, Rootzen, & Sandsten, 2013). For example, a stochastic process can be interpreted or defined as a S^T-valued random variable, where S^T is the space of all the possible S-valued functions of $t \in T$ that map from the set T into the space S (Rogers & Williams, 2000).

State space

The mathematical space S of a stochastic process is called its state space. This mathematical space can be defined using integers, real lines, n-dimensional Euclidean spaces, complex planes, or more abstract mathematical spaces (Doob, 1990). The state space is defined using elements that reflect the different values that the stochastic process can take (Doob, 1990; Gikhman & Skorokhod, 1969; Lamperti, 1977; Florescu, 2014; Bremaud, 2013).

Examples of Stochastic Processes

This section will highlight on some examples of stochastic processes. Some these examples are Markov Processes and Chains, Martingale, Lěvy Processes, Autoregressive Processes, Moving Average Processes, Random Field, and Point processes.

Markov Processes and Chains

Markov processes are stochastic processes, traditionally in discrete or continuous time that have the Markov property, which means the next value of the Markov process depends on the current value, but it is conditionally independent of the previous values of the stochastic process. In other words, the behaviour of the process in the future is stochastically independent of its behaviour in the past, given the current state of the process (Serfozo, 2009; Rozanov, 2012). The Brownian motion process and the Poisson process are both examples of Markov processes (Ross, 1996) in continuous time, while random walks on the integers and the gambler's ruin problem are examples of Markov processes in discrete time (Florescu, 2014; Karlin & Taylor, 2012).

A Markov chain is a type of Markov process that has either discrete state space or discrete index set (often representing time), but the precise definition of a Markov chain varies (Asmussen, 2003). For example, it is common to define a Markov chain as a Markov process in either discrete or continuous time with a countable state space (thus regardless of the nature of time), (Parzen, 2015; Karlin & Taylor, 2012; Lamperti, 1977 & Ross, 1996) but it is also common to define a Markov chain as having discrete time in either countable or continuous state space (thus regardless of the state space) (Asmussen, 2003).

Markov processes form an important class of stochastic processes and have applications in many areas (Karlin & Taylor, 2012). For example, they are the basis for a general stochastic simulation method known as Markov chain Monte Carlo, which is used for simulating random objects with specific probability distributions and has found application in Bayesian statistics (Rubinstein & Kroese, 2011; Gamerman & Lopes, 2006). The concept of the Markov property was originally for stochastic processes in continuous and discrete time, but the property has been adapted for other index sets such as n-dimensional Euclidean space, which results in collections of random variables known as Markov random fields (Rozanov, 2012; Synder & Miller, 2012; Bremaud, 2013).

Martingale

A martingale is a discrete-time or continuous-time stochastic process with the property that the expectation of the next value of a martingale is equal to the current value given all the previous values of the process. The exact mathematical definition of a martingale requires two other conditions coupled with the mathematical concept of a filtration, which is related to the intuition of increasing available information as time passes. Martingales are usually defined to be real-valued, (Klebaner, 2005; Karatzas & Shreve, 1991; Williams, 1991) but they can also be complex-valued (Doob, 1990) or even more general (Pisier, 2016).

A symmetric random walk and a Wiener process (with zero drift) are both examples of martingales, respectively, in discrete and continuous time (Klebaner, 2005; Karatzas & Shreve, 1991). For a sequence of independent and identically distributed random variables $X_1, X_2, X_3, \ldots$ with zero mean, the stochastic process formed from the successive partial sums $X_1, X_1 + X_2, X_1 + X_2 + X_3, \ldots$ is a discrete-time martingale (Steele, 2012). In this aspect, discrete-time martingales generalize the idea of partial sums of independent random variables (Hall & Heyde, 2014).

Martingales can also be created from stochastic processes by applying some suitable transformations, which is the case for the homogeneous Poisson process (on the real line) resulting in a martingale called the compensated Poisson process (Karatzas & Shreve, 1991). Martingales can also be built from other martingales (Steele, 2012). For example, there are martingales based on the martingale the Wiener process, forming continuous-time martingales

(Klebaner, 2005; Karatzas & Shreve, 1991; Williams, 1991; Doob, 1990; Pisier, 2016; Hall & Heyde, 2014).

Martingales mathematically formalize the idea of a fair game, (Ross, 1996) and they were originally developed to show that it is not possible to win a fair game (Steele, 2012). But now they are used in many areas of probability, which is one of the main reasons for studying them (Williams, 1991; Steele, 2012; Kallenberg, 2002). Many problems in probability have been solved by finding a martingale in the problem and studying it (Steele, 2012). Martingales will converge, given some conditions on their moments, so they are often used to derive convergence results, due largely to martingale convergence theorems (Hall & Heyde, 2014; Steele, 2012; Grimmett & Stirzaker, 2001).

Martingales have many applications in statistics, but it has been remarked that its use and application are not as widespread as it could be in the field of statistics, particularly statistical inference (Glasserman & Kou, 2006). They have found applications in areas in probability theory such as queueing theory and Palm calculus (Baccelli & Bremaud, 2013) and other fields such as economics (Hall & Heyde, 2014) and finance (Musiela & Rutkowski, 2006).

Lévy process

Lévy processes are types of stochastic processes that can be considered as generalizations of random walks in continuous time (Applebaum, 2004 & Bertoin, 1998). These processes have many applications in fields such as finance, fluid mechanics, physics, and biology (Applebaum, 2004). The main defining characteristic of these processes is their stationarity property, so they were known as processes with stationary and independent increments. In other words, a stochastic process X is a Lévy process if for n non-negative numbers, the corresponding increments are all independent of each other, and the distribution of each increment only depends on the difference in time (Applebaum, 2004).

A Lévy process can be defined such that its state space is some abstract mathematical space, such as a Banach space, but the processes, in general, are often defined so that they take values in Euclidean space. The index set is the non-negative numbers, so $I = [0, \infty)$, which gives the interpretation of time. Important stochastic processes such as the Wiener process, the homogeneous Poisson process (in one dimension), and subordinators are all Lévy processes (Applebaum, 2004 & Bertoin 1998).

Autoregressive and moving average processes

The autoregressive and moving average processes are types of stochastic processes that are used to model discrete-time empirical time series data, especially in economics. The autoregressive process or model treats a stochastic variable as depending on its own prior values and on a current independently and identically distributed stochastic term (Yaffee & McGee, 2000). The moving average model treats a stochastic variable as depending on the current and past values of an identical independent distributed (iid) stochastic variable (Applebaum, 2004 & Bertoin 1998).

Random field

A random field is a collection of random variables indexed by a n-dimensional Euclidean space or some manifold. In general, a random field can be considered an example of a stochastic or random process, where the index set is not necessarily a subset of the real line (Adler & Taylor, 2009). But there is a convention that an indexed collection of random variables is called a random field when the index has two or more dimensions (Gikhman & Skorokhod, 1969; Lamperti, 1977; Koralov & Sinai, 2007). If the specific definition of a stochastic process requires the index set to be a subset of the real line, then the random field is considered as a generalization of a stochastic process (Applebaum, 2004).

Point process

A point process is a collection of points randomly located on some mathematical space such as the real line, n-dimensional Euclidean space, or more abstract spaces. Sometimes the term point process is not preferred, as historically the word process denoted an evolution of some system in time, so a point process is also called a random point field (Chiu, Stoyan, Kendall, & Mecke, 2013). There are different interpretations of a point process, such as a random counting measure or a random set (Chiu, Stoyan, Kendall, & Mecke, 2013; and Haenggi, 2013). Some authors regard a point process and stochastic process as two different objects such that a point process is a random object that arises from or is associated with a stochastic process, (Daley & Vere-Jones, 2006; Cox & Isham, 1980) though it has been remarked that the difference between point processes and stochastic processes is not clear (Cox & Isham, 1980).

Other authors consider a point process as a stochastic process, where the process is indexed by sets of the underlying space on which it is defined, such as the real line or dimensional Euclidean space (Karlin & Taylor, 2012; Schmidt, 2014). Other stochastic processes such as renewal and counting processes are studied in the theory of point processes (Daley & Vere-Jones, 2006; Cox & Isham, 1980).

Markov Chain

Many aspects of life are characterized by randomly occurring events. It seems as though the world just doesn't work as perfectly as we hope it would. In an effort to help quantify, model, and forecast the randomness of our world, the theory of probability and stochastic processes was developed and may help answer some questions about how the world works (Felman & Valdez-Flores, 2010).

The theory of Markov chains was developed during the early 20th Century by a Russian mathematician named Andrei Andreyevich Markov. Learning mathematics under some famous Russian mathematicians such as Aleksandr Korkin and Pafnuty Chebyshev. Markov advanced his knowledge particularly in the fields of algebraic continued fractions and probability theory. His early work was dedicated mostly to number theory and analysis, continued fractions, limits of integrals, approximation theory and the convergence of series. Later in his life, however, he applied the method of continued fractions to probability theory guided by the influence of his teacher Pafnuty Chebyshev. Markov's interest in the Law of Large Numbers and its extensions eventually led him to the development of what is now known as the theory of Markov chains, named after Andrei Markov himself.

A Markov chain is simply a sequence of random variables that evolve over time. It is a system that undergoes transitions between states in the system and is characterized by the property that the future is independent of the past given the present (Gikhman & Skorokhod, 1969). What this means is that the next state in the Markov chain depends only on the current state and not on the sequence of events that preceded it. This type of "memoryless" property of the past is known as the Markov property.

The changes between states of the system are known as transitions, and probabilities associated with various state changes are known as transition probabilities. A Markov chain is characterized by three pieces of information: a state space, a transition matrix with entries being transition probabilities between states, and an initial state or initial distribution across the state space (Felman & Valdez-Flores, 2010). Doob, (1990) defined a state space as the set of all values which a random process can take. Furthermore, the elements in a state space are known as states and are the main component in constructing Markov chain models. With these three pieces, along with the Markov property, a Markov chain can be created and can model how a random process will evolve over time.

Markov chains have many interesting applications to other academic disciplines and industrial fields. For example, it has been used in Mendelian genetics to model and predicts what future generations of a gene will look like. Another example of where Markov chains have been applied to is in the popular children's board game Chutes and Ladders. At each turn, a player is residing in a state in the state space (one square on the board), and from there the player has transition probabilities of moving to any other state in the state space (Felman & Valdez-Flores, 2010). In fact, the transition probabilities are fixed since they are determined by the roll of a fair die. Nevertheless, the probability of moving to the next state is determined only by the current state and not how the player arrived there and is therefore capable of being modelled as a Markov chain. In addition to both of these examples, Markov chains have been applied to areas as disparate as chemistry, statistics, operations research, economics, finance, and music. The application that we will focus on in this paper, however, is in baseball and the numerous aspects of the game that can be analysed using Markov chains (Felman & Valdez-Flores, 2010).

Delay of events can also be represented as a stochastic process by augmenting each event with a probability distribution for the delay. Such probability distributions are typically determined from historical data. The idea is to model how the real-time information affects the uncertainty of event delays by means of Markov property. We assume that the delay of a certain event in the future can be fully predicted based on the currently known delay. Therefore, a meeting delay in the future depends only on the current delay and not on the delay of events that preceded it. This assumption limits the model to a "memoryless" approach where the past delays of a meeting cannot be used to predict the future. Consequently, the assumption of Markov character of the process does not reduce the validity of the model.

Stochastic process of a meeting delay can be represented as a sequence of random variables $X_1, X_2,..,X_n$. Each random variable represents a delay of event i, where $i = 1,2,..,n$. The Markov property is formally given in equation

(3.2) where $x_i \in S$ the value of the corresponding random variable and S is the state space.

$$P\{X_{i+1} \mid X_i = x_i, X_{i-1} = x_{i-1}, X_{i-2} = x_{i-2}, \ldots\} = P\{X_{i+1} \mid X_i = x_i\} \qquad (3.2)$$

The Probability of transition from state x_i to state x_{i+1} in the time interval i, $i+1$, $\forall_i \in 1,\ldots,n-1$ is given by:

$$P\{X_{i+1} = x_{i+1} \mid X_i = x_{i;i,i+1}\} = P_{(i,i+1)}\{x_i, x_{i+1}\} \qquad (3.3)$$

A Markov chain model was utilized because it is a model that describes, in probabilistic terms, the dynamic behaviour of certain types of systems over time (Noble & Daniel, 1988; Robert, Gelman & Gilks, 1997; Daellenbach & George, 1978). This model utilizes a state matrix or "now" matrix which describes the state of the meeting delay category and a transitional matrix which describes by percentage the category of delay of the meeting. The main assumption in the Markov chain model was that knowledge of the current state occupied by the process was sufficient to describe the future probabilistic behaviour of the process. Another unique property of this Markov chain model is the existence of a steady state matrix (Daellenbach & George, 1978). This Markov chain model was developed to take probabilities derived from the current meeting delays and forecast future trends in engagement schedules.

Transition Matrix and Steady-State Probabilities

Markov chains are often described by a directed graph (see Figure 2). In this graphical representation, there is one node for each state and a directed arc for each non-zero transition probability.

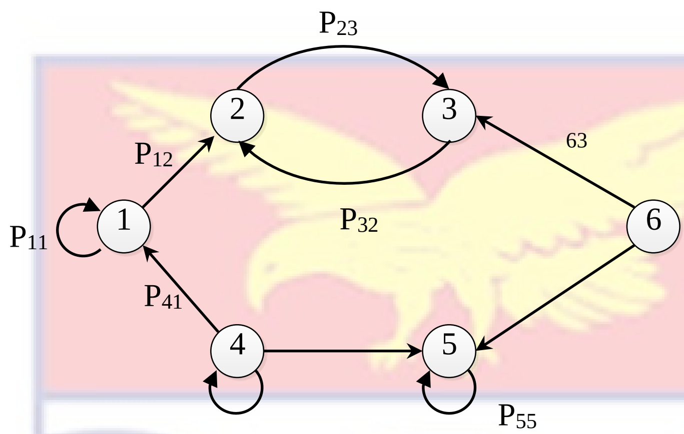


Figure 2: Markov Chain

If $P_{ij} = 0$, then the arc from node i to node j is omitted, so the difference between zero and non-zero transition probabilities stands out clearly in the graph. A finite-state Markov chain is also often described by a matrix $[P]$ (see Equation 3.4). If the chain has M states, then $[P]$ is an M by M matrix with elements P_{ij}. The matrix representation is ideally suited for studying algebraic and computational issues.

$$P = \begin{bmatrix} P_{11} & P_{12} & \cdots & P_{16} \\ P_{21} & P_{22} & \cdots & P_{26} \\ \vdots & \vdots & \vdots & \vdots \\ P_{61} & P_{62} & \vdots & P_{66} \end{bmatrix} \tag{3.4}$$

To derive the state matrix and transition matrix the raw data was changed into percentages. For the state matrix, raw data information was changed into percentages by dividing each delay category population by the total sample size. For the transition matrix, each row represents a particular delay category and each column represents the delay at the next meeting (Robert, Gelman & Gilks, 1997). The percentage was derived by dividing the number of delay category x_{ij} by the total number of delay category x_{ij} .

$$P_{ij} = \frac{X_{ij}}{\sum_{j}^{n} X_{ij}} \tag{3.5}$$

Where n was the sample size, in this model $n = 24$. These percentages are then placed into matrix form.

To find the steady state probabilities or the long-run behaviour of the Markov chain, Let P be the transition matrix for an s-state ergodic chain, then there exists a vector $\pi = [\pi_1 \pi_2 \pi_3 .. \pi_s]$ such that

$$\lim_{n \to \infty} P_{ij} = \pi_j \tag{3.6}$$

But for large n, P^n approaches a matrix with identical rows. This means that after a long time, the Markov chain settles down, and (independent of the initial state i) there is a probability P_j that we are in state j. from the above, we observe that for large n and all i,

$$P_{ij}(n+1) \approx P_{ij}(n) \approx \pi_j \tag{3.7}$$

Since $P_{ij}(n+1) =$ (row i of P^n) (column j of P), we may write equation (3.7) as

$$P_{ij}(n+1)=\sum_{k=1}^{s}P_{ik}(n)P_{kj} \tag{3.8}$$

If n is large, substituting (3.7) into (3.8) yields;

$$\pi_j=\sum_{k=1}^{s}\pi_j P_{kj} \tag{3.9}$$

In matrix form, (3.9) may be written as;

$$\pi_j=\pi P \tag{3.10}$$

The system of equations specified in (3.10) has an infinite number of solutions because the rank of the P matrix always turns out to be $\leq S-1$. Therefore to obtain unique values of the steady-state probabilities, note that for any n and any I;

$$P_{i1}(n)+P_{i2}(n)+\ldots+P_{is}(n)=1 \tag{3.11}$$

Letting n approach infinity in (3.9), we obtain;

$$\pi_1+\pi_2+\pi_3+\ldots+\pi_s=1 \tag{3.12}$$

Thus, after replacing any of the equations in (3.10) with (3.12), we may use (3.10) to solve for the steady-state probabilities as;

$$(\pi_1,\pi_2,\pi_3)=(\pi_1,\pi_2,\pi_3)\begin{bmatrix}P_{11} & P_{12} & P_{13}\\ P_{21} & P_{22} & P_{23}\\ P_{31} & P_{32} & P_{33}\end{bmatrix}$$

$$\pi_1 = \pi_1 P_{11} + \pi_2 P_{21} + \pi_3 P_{31} \qquad \text{(A)}$$

$$\pi_2 = \pi_1 P_{12} + \pi_2 P_{22} + \pi_3 P_{32} \qquad \text{(B)}$$

$$\pi_3 = \pi_1 P_{13} + \pi_2 P_{23} + \pi_3 P_{33} \qquad \text{(C)}$$

$$\pi_1 + \pi_2 + \pi_3 = 1 \qquad \text{(D)}$$

Classification of States in a Markov Chain

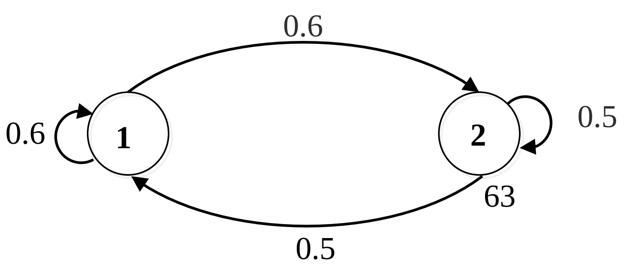
A good deal of the practical importance of Markov chain theory attaches to the fact that the states can be classified in a very distinctive manner according to certain basic properties of the system (Bailey, 1964).

$$A = \begin{bmatrix} 0.4 & 0.6 & 0.0 & 0.0 & 0.0 \\ 0.5 & 0.5 & 0.0 & 0.0 & 0.0 \\ 0.0 & 0.0 & 0.3 & 0.7 & 0.0 \\ 0.0 & 0.0 & 0.5 & 0.4 & 0.1 \\ 0.0 & 0.0 & 0.0 & 0.8 & 0.2 \end{bmatrix}$$

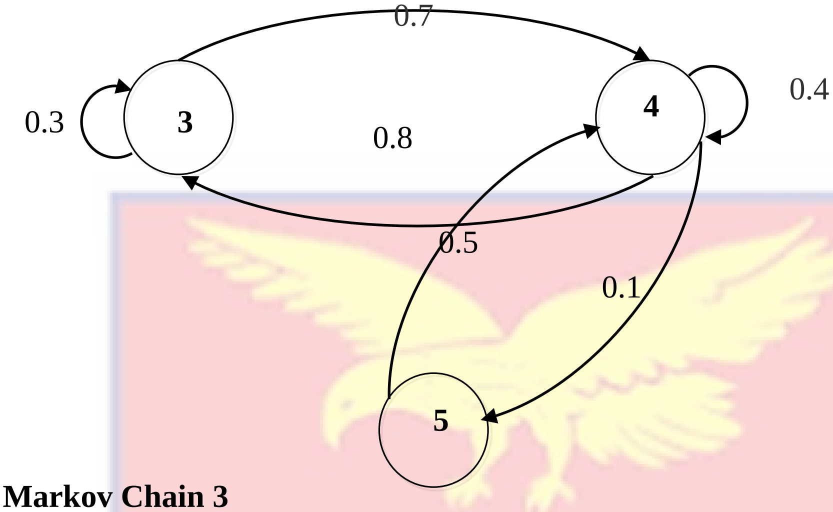
$$B = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 0.5 & 0.8 \\ 0 & 1 \end{bmatrix}$$

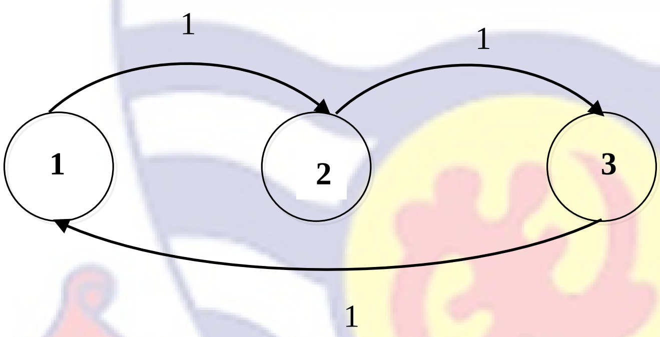
Markov Chain 1



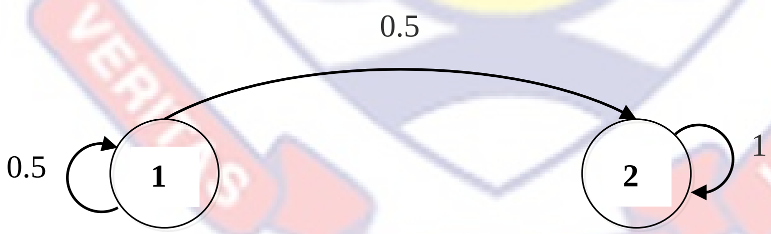
Markov Chain 2



Markov Chain 3



Markov Chain 4



Given the matrices A, B, C and Markov chains 1, 2, 3 and 4, the following classification can be made in a Markov Chain:

I. Reachable

II. Communicate

III. Close Set

IV. Absorbing State

V. Transient State

VI. Recurrent State

VII. Periodic and Aperiodic

VIII. Ergodic

Given two states i and j, a path from i and j is a sequence of transitions that begins in i and ends in j, such that each transition in the sequence has a positive probability of occurring.

Reachability: a state j is reachable from state i if there is a path leading from i to j. From the transitional Matrix A, state 5 is reachable from state 3 (via the path 3-4-5), but state 5 is not reachable from state 1.

Communication: two states i and j are said to communicate if j is reachable from i, and i is reachable from j. From the Matrix A, State 1 and 2 do communicate because state 1 is reachable from state 2 and state 2 is also reachable from state 1. Again, state 3, 4 and 5 communicate because state 3 can be reached from 5 (via the path 5-4-3) and state 5 can also be reached from 3 (via the path 3-4-5). However, state 5 and 1 do not communicate because state 1 cannot be reached from state 5 and vice versa.

Closed Set: A set of states S in a Markov chain is a closed set if no state outside of S is reachable from any state in S. The Matrix A and Markov chains 1 and 2 shows that state 1 and 2, and state 3, 4, 5 are both closed state. That is,

$S_1 = \{1, 2\}$ and $S_2 = \{3, 4, 5\}$. We can observed that once you enter state S_1 and S_2 you cannot leave the closed set.

Absorbing state: A state i is an absorbing state if $Pij = 1$. From Matrix C, state 2 is an absorbing state. It must be noted that once you enter an absorbing state you cannot leave it. An absorbing state is also a closed set

Transient state: A state i is a transient state if there exists a state j that is reachable from i, but state i is not reachable from state j. This simply means that there is a way to leave state i but there is no way to return from j to i. It must be noted that each time you enter state i, there is a positive probability that we will leave i forever and end up in the state j without returning. From Matrix C state 1 is a transient state. This is because state 2 can be reached from state 1 (via the path 1-2) but state 1 cannot be reached from state 2.

Recurrent State: a recurrent state is a state which is not transient. In other words once you enter a recurrent state there is always a positive probability that you can leave the state. From matric A, all the states are recurrent states.

Periodic state: a state i is periodic with period $k > 1$ if k is the smallest number such that all paths leading from state i back to state i have a length that is a multiple of k. If a recurrent state is not periodic, then it is referred to as aperiodic. From matric B, each state has a period of 3. From state 1, the only way to return to state 1 is to follow the path $1-2-3-1$ for some number of times (say $3n$). Hence, any return to state 1 would require $3n$ transitions.

Ergodic: if all states in a chain are recurrent, aperiodic, and communicate with each other, then the Markov chain is said to be ergodic.

Absorbing Markov Chain

A Markov chain is an Absorbing chain if and only if the following two conditions are satisfied:

- the chain has at least one absorbing state; and
- it is possible to go from any non-absorbing state to an absorbing state (perhaps in more than one step)

An absorbing Markov chains have the following properties:

- Regardless of the original state of an absorbing Markov chain, in a finite number of steps the chain will enter an absorbing state and then stay in that state.
- The powers of the transition matrix get closer and closer to some particular matrix
- The long-term trend depends on the initial state, but chaining the initial state can change the final result.

The third property distinguishes an Absorbing Markov chain from a regular Markov chain where the final results is independent of the initial state.

Construction of Markov chains

To construct a Markov chain from the data set, the start of meetings were categorised and converted into sets of on-time (O), small delays (S) and large delays (L) in the following way:

- if $0 \leq \text{delay} \leq 5$, delay = 'on-time'

- if $5 < \text{delay} \leq 10$, delay = 'small'
- if delay > 10, delay = 'large'

Chapter Summary

This chapter reviewed the methods to carry out the current study. In this chapter the study design, study area, data collection, data analysis and statistical techniques were discussed. The data was collected from the minutes records of past meetings form the colleges, Academic and council committees. The major statistical techniques employed in this study (i.e. Markov chain which is an example of a stochastic process) were discussed in detail.

CHAPTER FOUR

ANALYSIS AND RESULTS

Introduction

This chapter presents the analysis and results of the study under various headings. It starts with the descriptive statistics, followed by regression models for the various Colleges, Academic Board and Council Meetings. It also provides the results of the Markov Chain Model for the various Colleges, Academic Board and Council meetings and finally the Long-run (steady state) probabilities of the various meetings will also be looked at.

Preliminary Analysis

This section highlighted on some preliminary results from the data obtained. It focused on descriptive statistics, box plot analysis, model adequacy checking, and ANOVA analysis of time delay to start a meeting among the Colleges, Academic Board and Council meetings of the University of Cape Coast.

Descriptive Statistics

From Table 1, it can be seen that the average delay in starting a meeting for the College of Agriculture and Natural Sciences was 12.13 minutes whereas that of College of Education Studies was 18.92 minutes. It was clear from Table 1 that the highest average delay in starting a meeting was recorded by Council with 21.20 minutes and the second highest recorded among the five colleges and the two major meetings of the University under investigation College of

Education Studies (CES) with an 18.92 minutes average in the delay in starting a meeting.

Table 1: Means and Standard Deviations of delays in the Start of Meetings

COLLEGE	Total	MEAN (mins.)	Standard Deviation
CANS	24	12.13	8.44
CES	24	18.92	6.78
CHLS	24	14.79	8.17
CoHAS	24	10.25	8.21
CoDE	8	16.25	10.07
COUNCIL	10	21.20	5.77
ACADEMIC BOARD	11	7.64	4.46

Source: Fieldwork (2018)

The least recorded delay was from the Academic Board. It recorded an average of 7.64 minutes. Per the Academic Board's nature, composition and mandate the average time delay was not surprising as members of this Board are within the University and of higher rank. Unlike Academic Board, Council had some of its members outside the University and Cape Coast, therefore recording the highest average delay in starting of their meetings was expected.

Among the colleges, College of Education Studies recorded the highest average delay in starting of their meetings whiles College of Health and Allied Sciences recorded the least. The highest average delay for the College of

Education may be due to factors beyond the control of the members of the meeting.

Box Plot Analysis

From Figure 3, it could be seen that the mean delay for the College of Agriculture and Natural Sciences (CANS) was a little above ten (10) minutes and the majority of the data set for CANS was between five (5) to twenty (20) minutes. It would also be worth noting that from the figure, the College of Education Studies (CES) had an average meeting delay of about (20) minutes. It was also obvious from Figure 3 that an unusual delay of about thirty-five (35) minutes occurred at the College of Education Studies during the years under review.

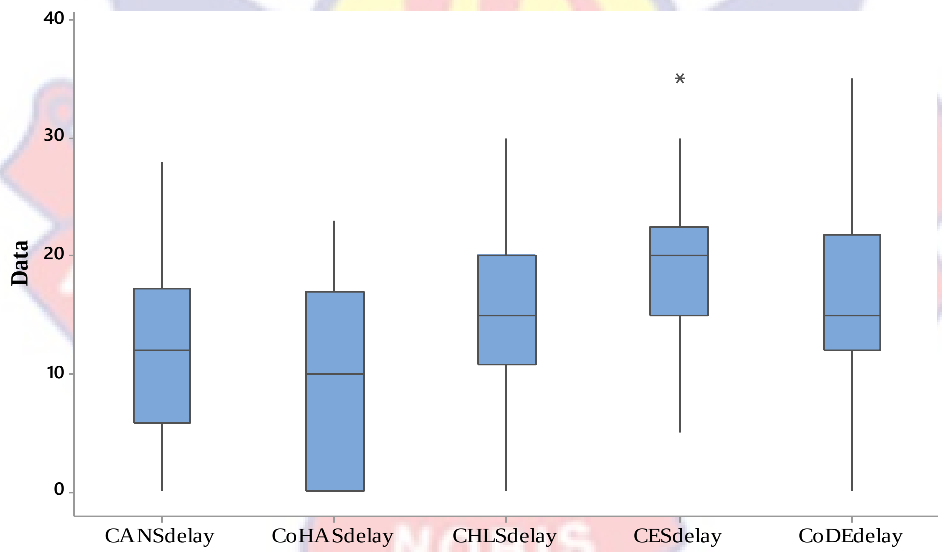


Figure 3: Box plot for the delays of the various colleges.

This unusual delay may be due to some circumstance such as members of the meeting being engaged in other meetings. The average delay for the College of Education Studies may be due to the extreme delay of 35 minutes recorded. The majority of the time, delay for College of Education Studies lied between fifteen (15) and twenty-five (25) minutes. The figure also shows that the lower quartile for College of Education Studies was higher than the remaining colleges of the university. The lower quartile of College of Education Studies is almost the same as the mean as that of the College of Humanities and Legal Studies and College of Distance Education. This shows that for seventy-five percent (75%) of meetings organized by the College of Education Studies, the delay in the start of the meeting was higher than fifty percent (50%) of meetings organized by the remaining colleges of the University of Cape Coast.

The College of Humanities and Legal Studies (CHLS) recorded an average time delay a little above ten (10) minutes. Most of the data recorded on the delays ranged between ten (10) and twenty (20) minutes. Whereas the aforementioned colleges had the majority of the time delay in start of their meeting lying between five (5) and twenty-five (25) minutes, the data collected from the College of Health and Allied Sciences (CoHAS) had majority of the data lying between zero (0) and about fifteen (15) minutes. The average delay time recorded for CoHAS was about ten (10) minutes.

The mean and median of the College of Health and Allied Sciences (CoHAS) was lower than the first quartile of the colleges of Education Studies, Humanities and Legal Studies, and Distance Education. It was, however, a little above the first quartile of the College of Agriculture and Natural Sciences. This result showed that fifty percent (50%) of the time, the delays in the start of meeting at the College of Health and Allied Sciences is lower than the remaining Colleges. This evidence backs the claim of Table 1 where the College of Health and Allied Sciences recorded the least average in starting meeting late among the colleges.

Comparing all the box plots, it can be put on record that all the delays in the start of a meeting at the colleges do not exceed fifteen (15) minutes although CES recorded the highest among the colleges. It can also be concluded that sometimes meetings do delay for about thirty minutes.

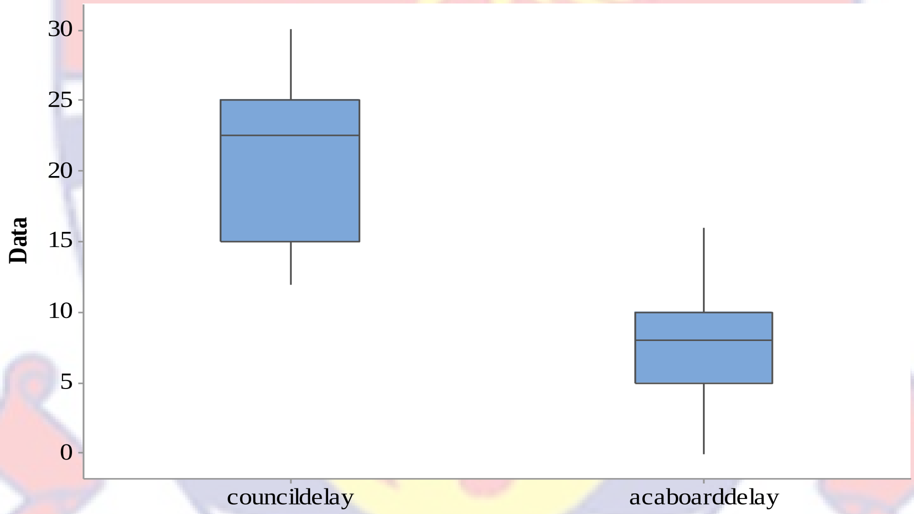


Figure 4: Box plot for the delays for Council and Academic Board.

The box plot for the Academic Board and Council meeting provided interesting results. From Figure 4, the mean and median for the Academic Board meeting was less than five (5) minutes whereas the mean and median for the Council meeting was a little above twenty (20) minutes. A Comparison of the two meeting shows that the Academic Board meetings always delay for some few minutes while Council meetings delay more than twice that of Academic Board meetings.

The Figure 4 also shows that the lower quartile for Council delay in the start of meetings was higher than the third quartile of that of Academic Board meetings. This shows that about seventy-five percent (75%) of meetings organized by Council, the delay in the start of the meeting was higher than seventy-five percent (75%) of meetings organized by the Academic Board of the University of Cape Coast.

Model Adequacy Checking

Fitting an appropriate model for a data set using regression analysis requires that the data must be normally distributed. To check for normality assumption in any data set requires the use of plotting a histogram or a normal probability plot. From Figure 5, the normal probability plots showed that the data is normally distributed.

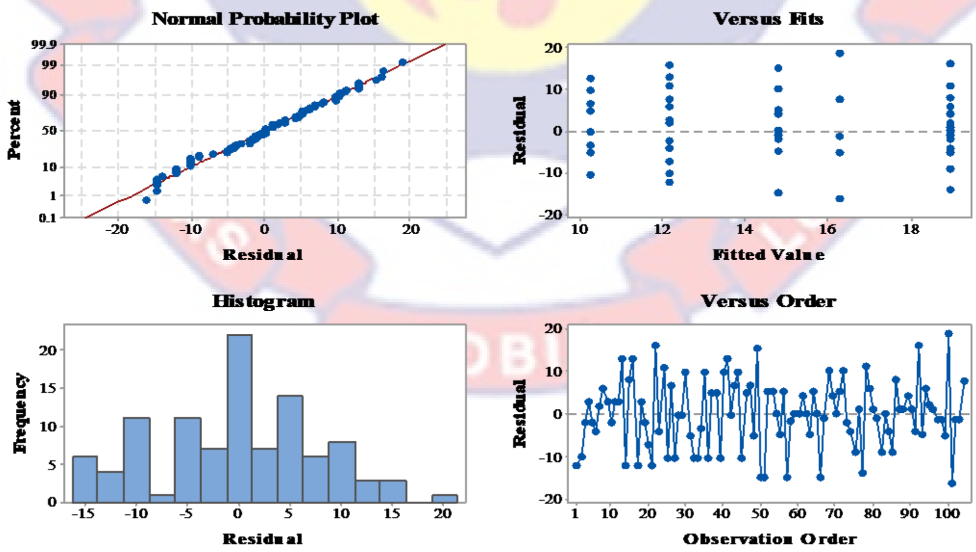


Figure 5: Residual Plots for Delays for the Colleges.

The left side of the probability plot bending slightly downwards and the right side of the plot bending slightly upwards imply that the tails of the error distribution are somewhat thinner than anticipated. Figure 5 continued to suggest that the error term has a constant variance when residual was plotted against fitted value. From the residual against observation in order, it can be concluded that the error is independent since the plots are random. It can be concluded that the data set did not violate any of the assumptions of the model when regression analysis and Analysis of Variance (ANOVA) can be analysed.

From Figure 6, the normal probability plots showed that the data is normally distributed. The left side of the probability plot bending slightly downwards and the right side of the plot bending slightly upwards imply that the tails of the error distribution are somewhat thinner than anticipated.

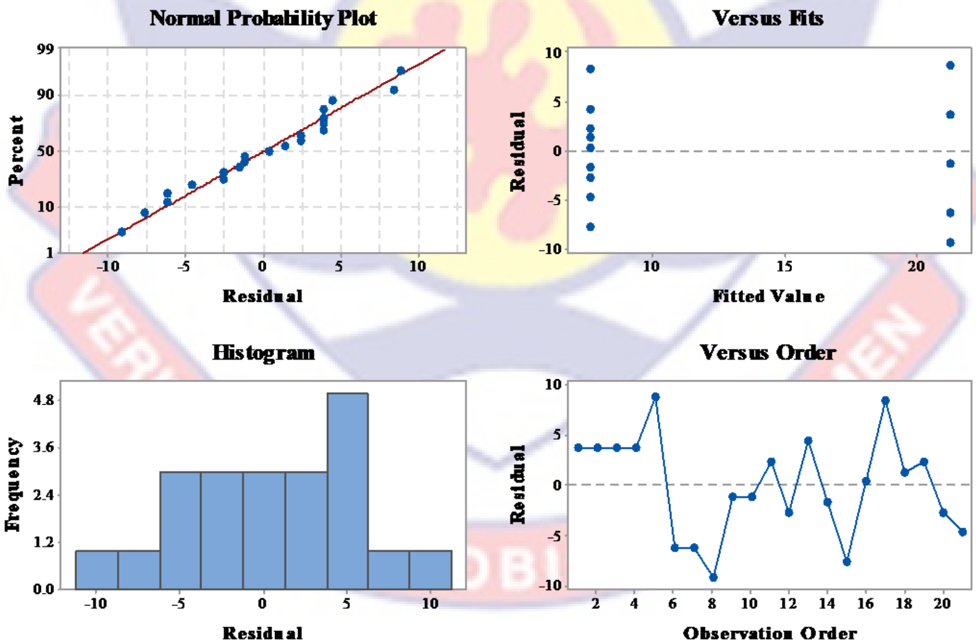


Figure 6: Residual Plots for Delays for Council and Academic Board meetings.

Figure 6 continued to suggest that the error term has a constant variance when residual was plotted against fitted value. From the residual against observation in order, it can be concluded that the error is independent since the plots are random. It can be concluded that the data set did not violate any of the assumptions of the model when regression analysis and Analysis of Variance (ANOVA) can be performed.

From Figure 7, it can be observed that the width of the interval plot for the College of Distance Education Studies had a larger spread compared to the other college. This was as a result of the sample size of the data.

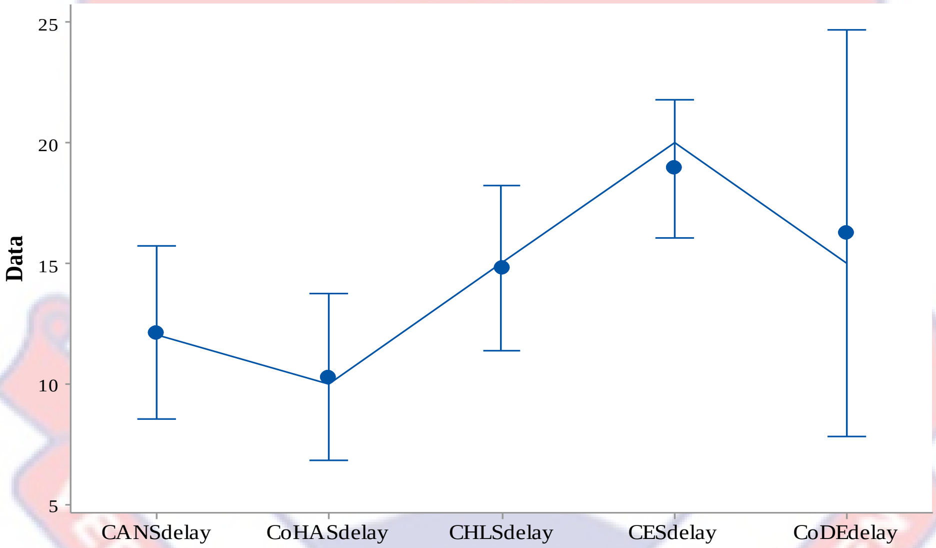


Figure 7: Interval Plots for Delays for the Colleges of the University of Cape Coast.

From Figure 7, at ninety-five percent (95%) confidence, we can conclude that the estimated delay means of 12.125 minutes for College of Agriculture and Natural Sciences was between 8.5630 and 15.6870. The College of Education Studies had an estimated delay mean of 18.9167 minutes and at ninety-five percent (95%) confidence, we can conclude that the estimated mean lied between 16.0557 and 21.7777. It can also be seen from Figure 7 that the estimated delay mean for the College of Health and Allied Sciences was 10.25 minutes. This estimated mean lied between 6.78523 and 13.7148 at ninety-five percent (95%) confidence.

Interestingly, from Figure 7, the estimated means for the College of Agriculture and Natural Sciences, and the College of Education Studies does not overlap. This means that the estimated means for these colleges are statistically different. Again, the estimated means for the College of Education studies and College of Health and Allied Sciences overlap which suggests that the means of these two colleges are statistically different. With the exception of the above mentioned paired colleges, the remaining interval plots overlap with each other. This means that the estimated means for the colleges are not significantly different from each other.

From Figure 8, at ninety-five percent (95%) confidence, we can conclude that the estimated delay means of 21.2 minutes for Council meeting was between 17.0726 and 25.3274.

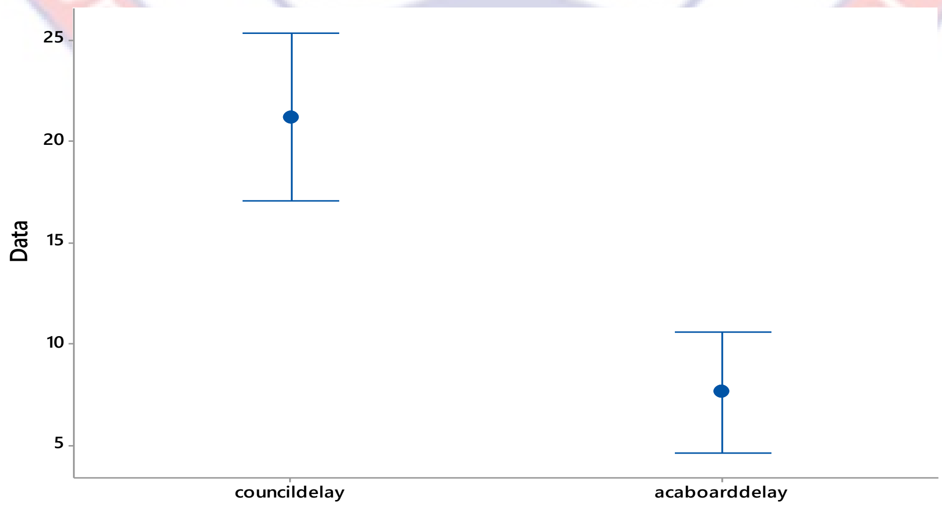


Figure 8: Residual Plots for Delays for Council and Academic Board meetings.

The Academic Board meeting had an estimated delay mean of 7.6363 minutes and at ninety-five percent (95%) confidence we can conclude that the estimated mean lied between 4.64289 and 10.6298. It can also be seen from Figure 8 that the interval plots for Council meeting and Academic Board meeting do not overlap. This means that the means for the two meetings are statistically different.

Analysis Of Variance (ANOVA) for the various college meetings under investigation

An analysis of variance to find out if there exist an equal means in the delays in the start of meetings within the five colleges under investigation was performed. From Table 2, we reject the null hypothesis and conclude that at least one mean is significantly different. This means that at least one of the colleges' average time delay in start of meetings differs from the other colleges.

Table 2: ANOVA Table for the Colleges

Source of Variation	DF	Sum of Squares	Mean Sum of Squares	F	Sig.
College	4	1054	263.43	4.02	0.005
Error	66	6486	65.52		
Total	103	7540			

Source: Fieldwork (2018)

Follow-up test of means among the Colleges

Since the null hypothesis from the Analysis of Variance (ANOVA) was rejected, we investigate which paired college means were significantly different. From Table 3 and Figure 9, at 95% Confidence Interval the means for the following paired colleges does not include zero (0).

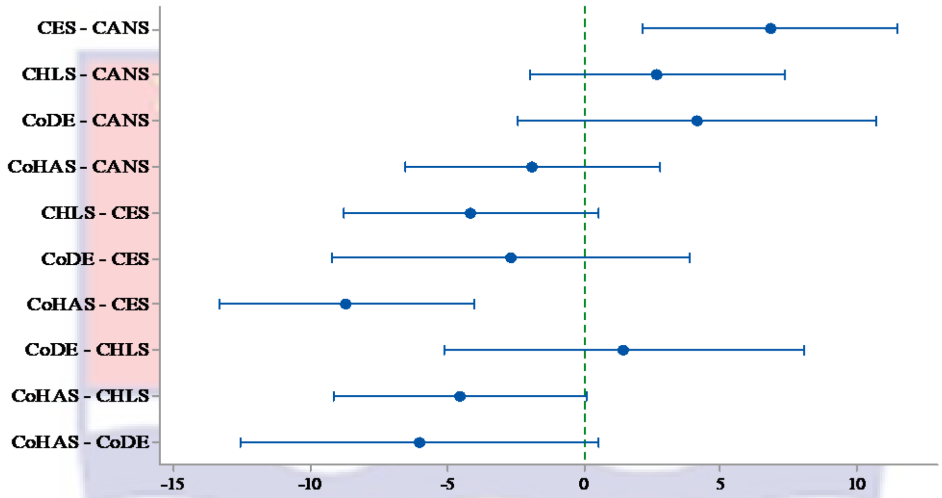


Figure 9: Fisher Pairwise Comparisons for the Colleges.

i. College of Education Studies and College of Agriculture and Natural Sciences

ii. College of Health and Allied Science and College of Education Studies

Since the confidence interval of the above-mentioned pairs of colleges does not include zero, we conclude that there was a significant difference in the means of the paired colleges mentioned above.

Table 3: Fisher Individual Tests for Differences of Means

Colleges	Difference of Means	Standard Error of Difference	95% Confidence Iinterval	T-Value	P-Value
CES-CANS	6.79	2.34	(2.25, 11.33)	2.97	0.005
CHLS-CANS	2.67	2.34	(-1.97, 7.30)	1.14	0.257
CoDE-CANS	4.13	3.30	(-2.43, 10.68)	1.25	0.215
CoHAS-CANS	-1.88	2.34	(-6.51, 2.76)	-0.80	0.424
CHLS-CES	-4.13	2.34	(-8.76, 0.51)	-1.77	0.081
CoDE-CES	-2.67	3.30	(-9.22, 3.89)	-0.81	0.422
CoHAS-CES	-8.67	2.34	(-13.30, -4.03)	-3.71	0.000
CoDE-CHLS	1.46	3.30	(-5.0, 8.02)	0.44	0.660
CoHAS-CHLS	-4.54	2.34	(-9.18, 0.09)	-1.94	0.055
CoHAS-CoDE	-6.00	3.30	(-12.56, 0.56)	-1.82	0.072

Source: Fieldwork (2018)

Test of means among Council and Academic Board meetings

An analysis of variance to find out if there exist an equal means in delays in the start of meetings for Council and Academic Board meetings was performed. From Table 4, we reject the null hypothesis and conclude that the means for the Academic Board and Council meetings were significant different from each other. These findings corroborate the assertion from the interval plots for Council and Academic Board meeting (Figure 7).

Table 4: ANOVA Table for Council and Academic Board Meetings

Source	DF	Sum of Squares	Mean Sum of Squares	F	Sig.
College	1	963.7	963.66	36.76	0.000
Error	19	498.1	26.22		
Total	20	1461.8			

Source: Fieldwork (2018)

The pattern of the delay in engagement schedules using Time Series Plot Analysis

From Figure 10, the graph showed that the pattern of the data for the College of Humanities and Legal Studies exhibit no trend and cyclic patterns. The data show some form of stationarity. The figure also does not show any form of seasonality.

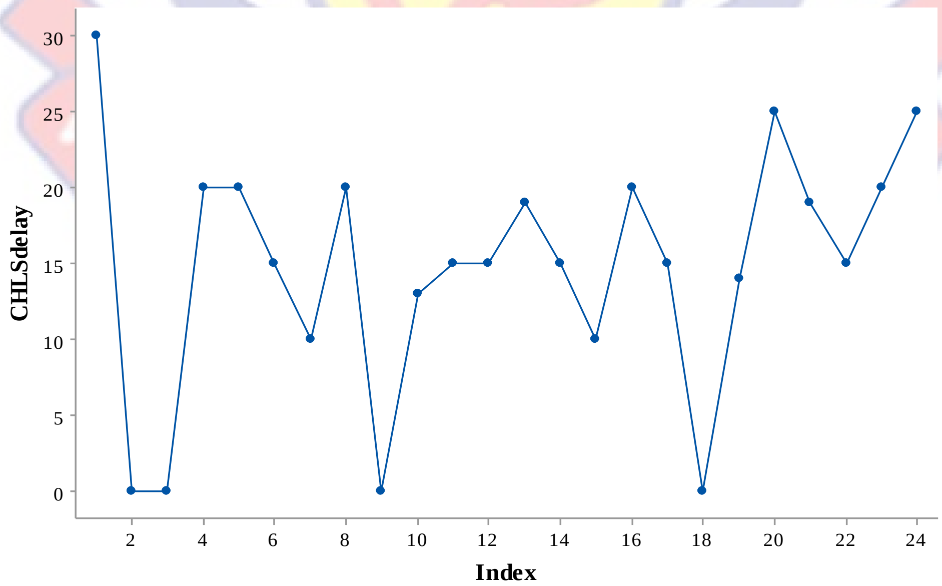


Figure 10: Time Series plot for the College of Humanities and Legal Studies.

Furthermore there exist some forms of irregularities in the data set. Again, Figure 10 suggest that the data is a pure random walk data and hence a stochastic trend existed in the data.

From Figure 11, it can be seen that the data shows an increasing trend in the first year but exhibits no trend in the second year. This means in the second year the delays in the start of meetings were stationary. The figure continues to exhibit a seasonal pattern in the data set.

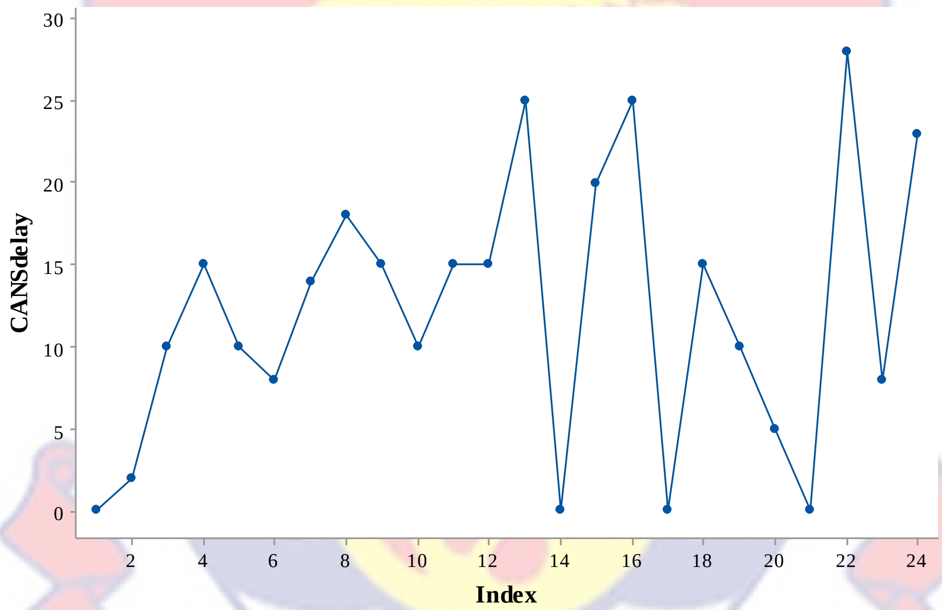


Figure 11: Time Series plot for College of Agriculture and Natural Sciences.

From Figure 12, it can be shown that the pattern of the data for the College of Health and Allied Sciences exhibits no trend and cyclic patterns. The figure also showed some form of seasonality in the data set. Furthermore, there exists some form of irregularities in the data set.

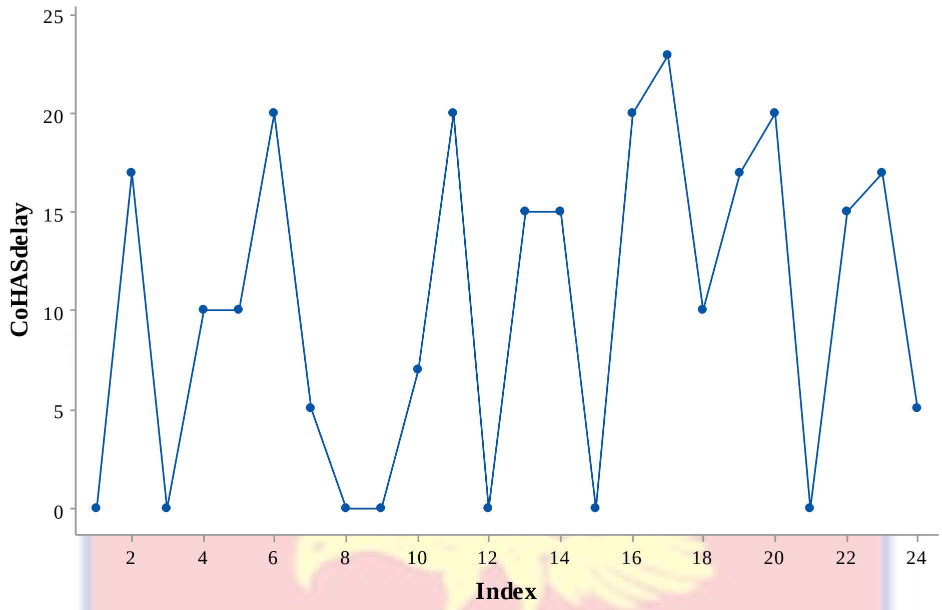


Figure 12: Time Series plot for the College of Health and Allied Sciences.

From Figure 13, it can be seen that the data shows an increasing trend. The figure continues to exhibit a seasonal pattern in the data set. Figure 13 also continued to exhibit some irregularity in the dataset, but there was no cyclic pattern.

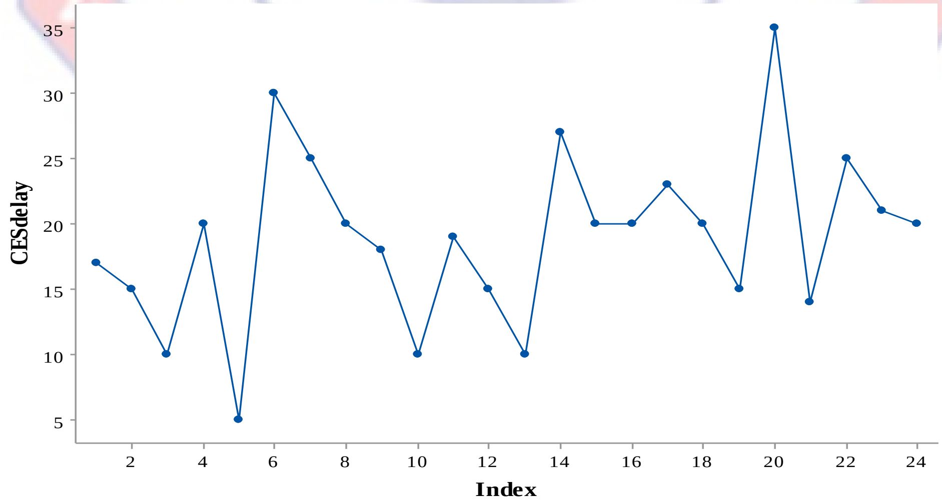


Figure 13: Time Series plot for the College of Education Studies.

From Figure 14, it can be seen that the data shows an increasing trend in the data set. Furthermore, Figure 14 exhibits a seasonal pattern. The figure also exhibit some irregularity in the data set. Figure 14 also shows a cyclic pattern.

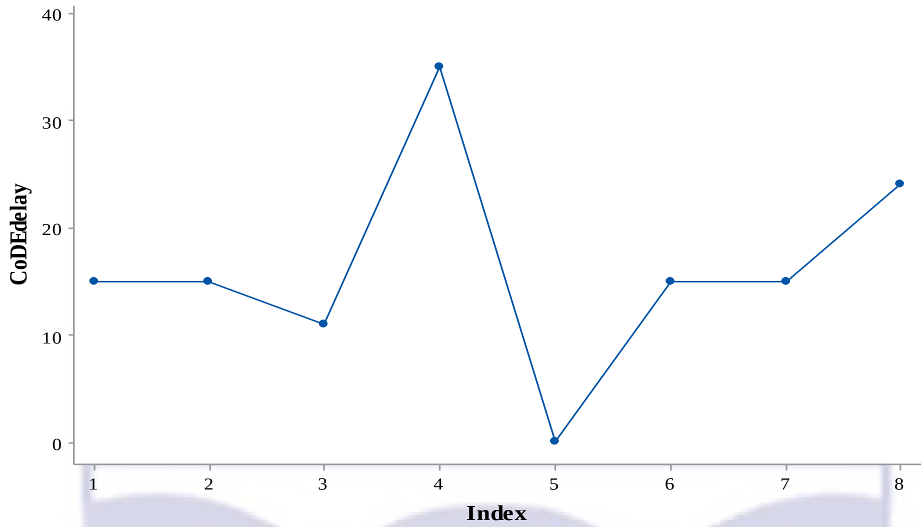


Figure 14: Time Series plot for the College of Distance Education.

From Figure 15, it can be seen that the data for Council meeting showed a decreasing trend. Figure 15 suggests that in the first year the data was stationary but in the second year there were fluctuations. These fluctuations were in a decreasing trend. The figure does not exhibit any seasonal pattern in the data set. The figure also does exhibit one irregularity in the data set.

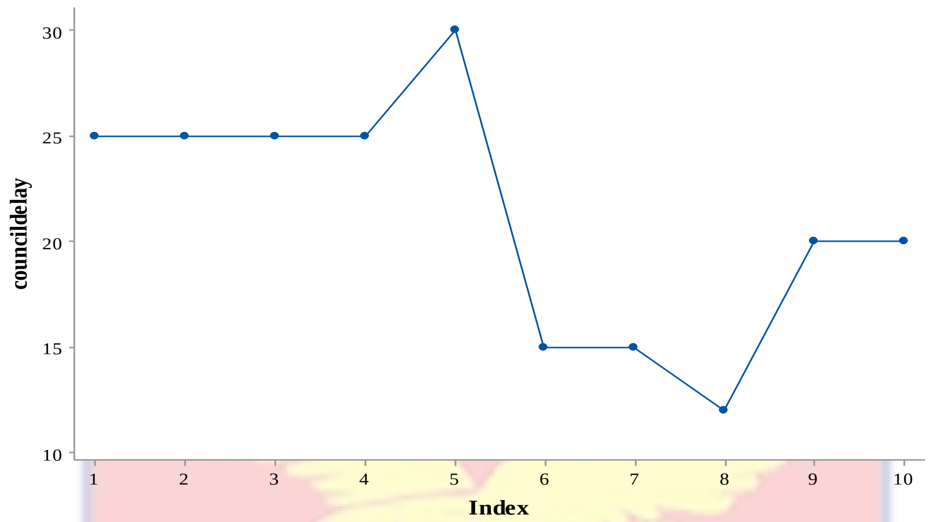


Figure 15: Time Series plot for the Council meetings.

From Figure 16, it can be shown that the pattern of the data for the Academic Board meeting exhibited no trend and cyclic patterns. The data show some form of stationarity. Figure 16 also showed some form of seasonality in the data set. Furthermore there exist some form of irregularities in the data set. Again, Figure 16 suggested that the data is a pure random walk data and hence a stochastic trend exists in the data.

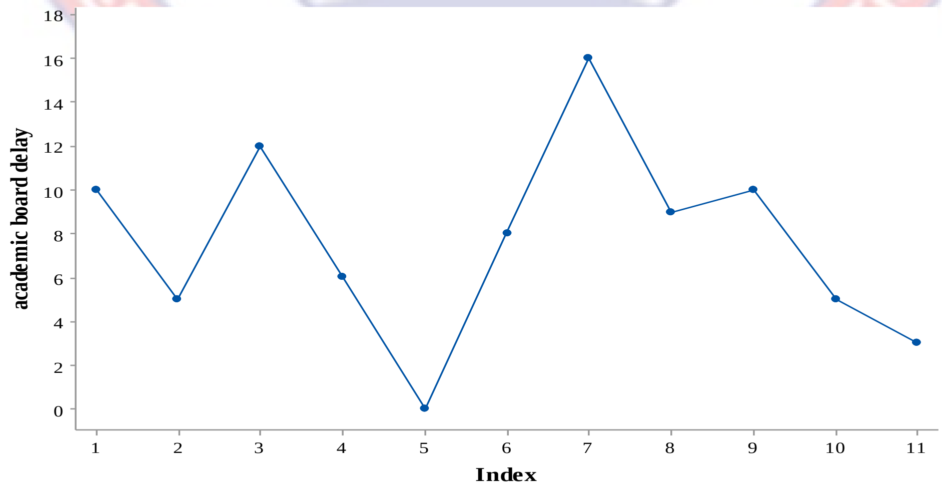


Figure 16: Time Series plot for Academic Board meetings.

Scatter plot for the delay and time span of an engagement schedule

A scatterplot shows the relationship between two quantitative variables measured for the same individuals. The values of one variable appear on the horizontal axis, and the values of the other variable appear on the vertical axis. Each individual in the data appears as a point on the graph. On the other hand regression models make use of relationships between the variable of interest and one or more related predictor variables. Sometimes regression models are called causal forecasting models because the predictor variables are assumed to describe the forces that cause or drive the observed values of the variable of interest. In this study, the researcher made use of both scatter plots and simple linear regression model to predict the number of minutes it would take for a meeting to end when there was a sufficient amount of delays.

Scatter plots for College of Agriculture and Natural Sciences (CANS) and College of Health and Allied Sciences (CoHAS)

From Figure 17, the plot for College of Agriculture and Natural Sciences describe a decreasing trend. The plot shows that the slope of the data is a negative. This means that as the delays in starting a meeting increase, the time span of the meeting decreases. The P-Value for the CANS was found to be 0.295 which is greater than 0.05. This means that there is no relationship between time delay of a meeting and the time span for College of Agriculture and Natural Sciences. However, the Pearson correlation for the College of Agriculture and natural Sciences was -0.223 which showed a weak negative correlation between the delay in start of a meeting and the time span of that meeting.

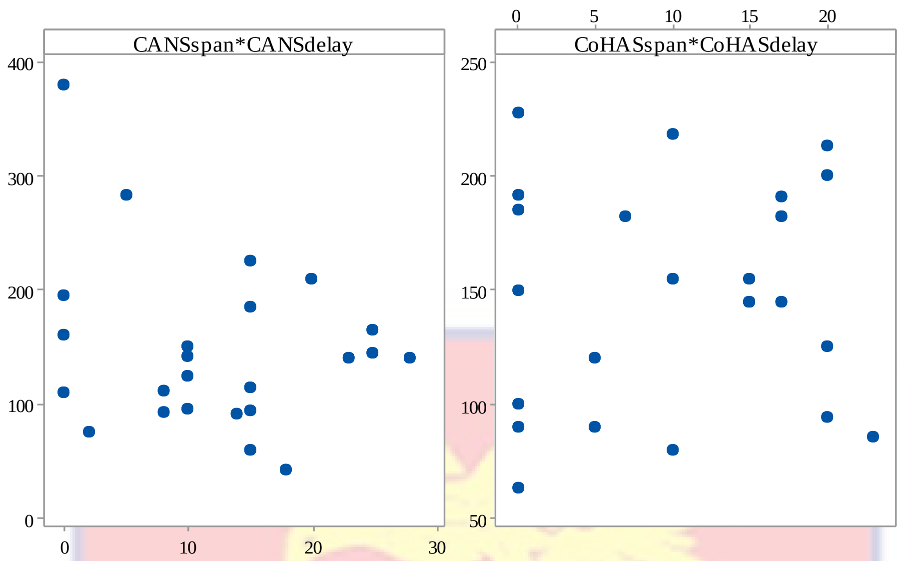


Figure 17: Scatter plots for College of Agriculture and Natural Sciences, and College of Health and Allied Sciences.

From the plot, it could be concluded that if the meeting delays for an hour or more, then the time span for the meeting would be decreasing and approaching zero (0) hence the meeting may be called off and re-scheduled. Again, from Figure 17, the scatter plot for College of Health and Allied Sciences describe an increasing trend, in that the slope of the data was a positive.

The plot shows that the slope of the data is a positive. This means that as the delays in starting a meeting increase, the time span of the meeting increases. The P-Value for the CoHAS was found to be 0.713 which is greater than 0.05. This means that there is no relationship between time delay of a meeting and the time span for College of Health and Allied Sciences. However, the Pearson correlation for the College of Agriculture and natural Sciences was 0.079 which showed a weak positive correlation between the delay in start of a meeting and the time span of that meeting. From the model, it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would approach a positive infinity or in other worlds the meeting would last for more hours before it comes to a close.

Scatter plots for College of Humanities and Legal Studies and College of Education Studies

From Figure 18, the scatter plot for the College of Humanities and Legal Studies describe a decreasing trend. The plot shows that the slope of the data is a negative. This means that as the delays in starting a meeting increase, the time span of the meeting decreases. The P-Value for the CHLS was found to be 0.485 which is greater than 0.05. This means that there is no relationship between time delay of a meeting and the time span for College of Humanities and Legal Studies.

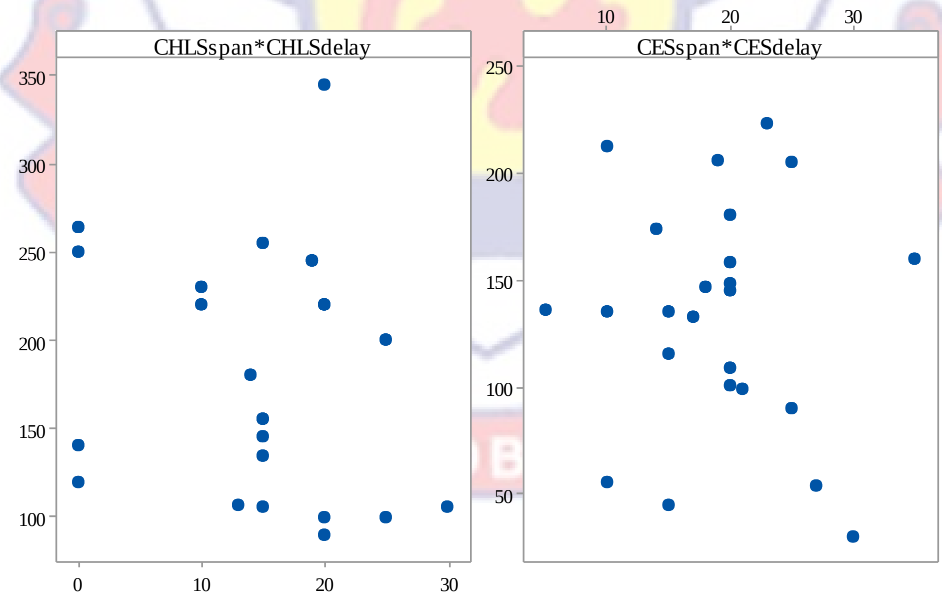


Figure 18: Scatter plots for College of Humanities and Legal Studies, and College of Education Studies.

However, the Pearson correlation for the College of Agriculture and natural Sciences was -0.150 which showed a weak negative correlation between the delay in start of a meeting and the time span of that meeting. From the plot it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would be decreasing and approaching zero (0) hence the meeting may be called off and re-scheduled.

From Figure 18, the scatter plot for the College of Education Studies also describe a decreasing trend. The plot shows that the slope of the data is a negative. This means that as the delays in starting a meeting increase, the time span of the meeting decreases. The P-Value for the CES was found to be 0.699 which is greater than 0.005. This means that there is no relationship between time delay of a meeting and the time span for College of Education Studies. However, the Pearson correlation for the CES was -0.083 which show a weak negative correlation between the delay in start of a meeting and the time span of that meeting. Yet again, this model ascertained that the average hours of every meeting at the college when there were no delays was about two (2) hours. From the model above it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would be decreasing and approaching zero (0) minutes hence the meeting may be called off and re-scheduled.

Scatter plot for College of Distance Education

From Figure 19, the scatter plot describe an increasing trend. The plot shows that the slope of the data is a negative. This means that as the delays in starting a meeting increase, the time span of the meeting decreases. The P-Value for the

CoDE was found to be 0.728 which is greater than 0.005. This means that there is no relationship between time delay of a meeting and the time span for College of Agriculture and Natural Sciences.

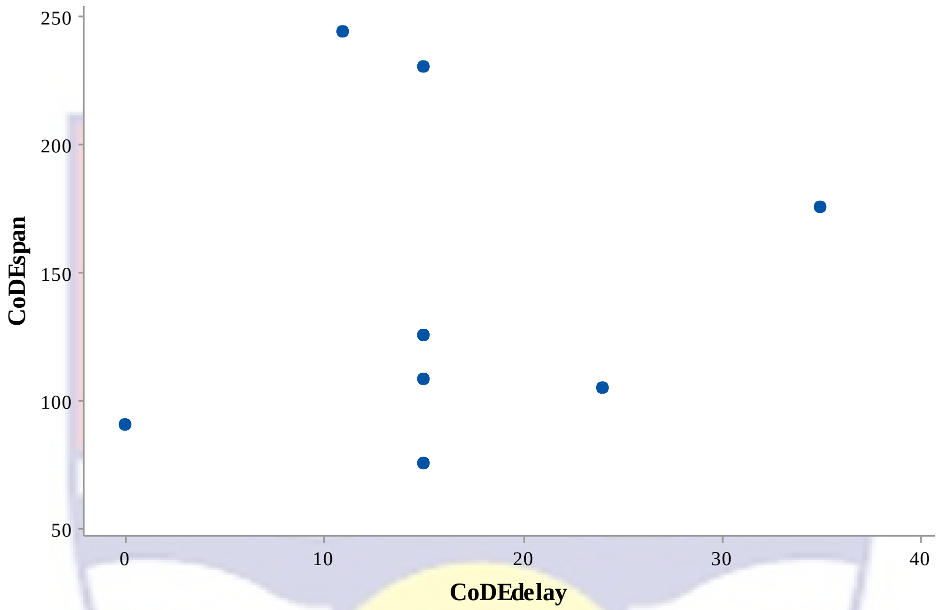


Figure 19: Scatter plot for College of Distance Education (CoDE).

However, the Pearson correlation for the College of Agriculture and natural Sciences was 0.147 which show a weak positive correlation between the delay in start of a meeting and the time span of that meeting. Once more, this model showed that the average hours of every meeting at the college when there were no delays was about two (2) hours. From the model, it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would also increase.

Scatter plots for the Academic Board and Council meeting

From Figure 20, the scatter plot for Council describe an increasing trend. This means that as the time delayed in the start of their meeting increases, the span of the meeting also increases. The plot shows that the slope of the data is a positive. This means that as the delays in starting a meeting increase, the time span of the meeting increases.

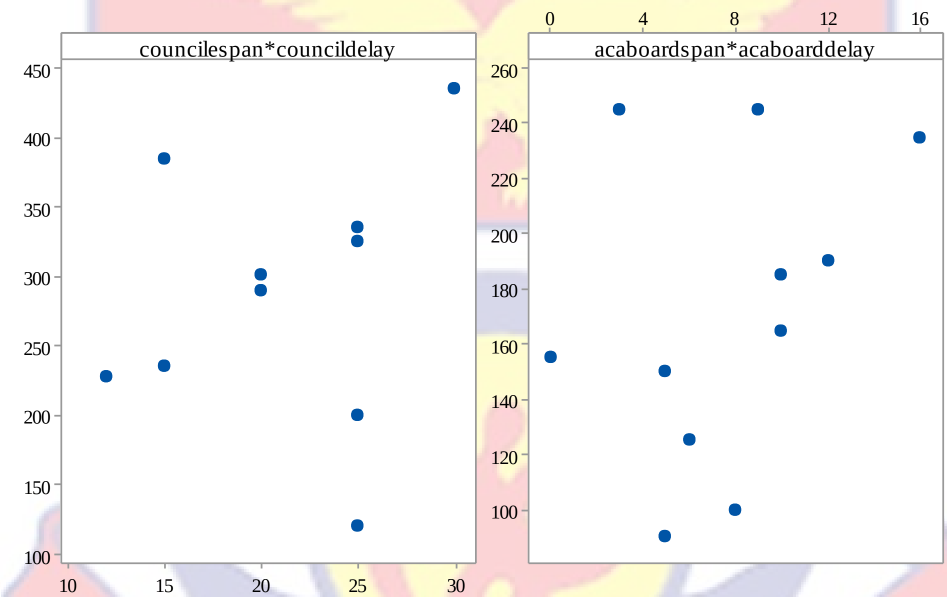


Figure 20: Scatter plot for Council and Academic Board meetings.

The P-Value for Council meeting was found to be 0.604 which is more than 0.005. This also means that there is no relationship between time delay of a meeting and the time span for Council meetings. However, the Pearson correlation was found to be 0.188 which show a weak positive correlation between the delay in start of a meeting and the time span of that meeting. For a second time, from the model, it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would also increase.

From Figure 20, the plot for the Academic Board committee describe a increasing trend. The plot shows that the slope of the data is a negative. This means that as the delays in starting a meeting increase, the time span of the meeting decreases. The P-Value for the Academic Board meetings was found to be 0.303 which is greater than 0.005. This means that there is no relationship between time delay of a meeting and the time span for Academic Board meetings. However, the Pearson correlation for the College of Agriculture and natural Sciences was 0.342 which show a weak positive correlation between the delay in start of a meeting and the time span of that meeting. From the model, it can be concluded that if the meeting delays for an hour or more, then the time span for the meeting would be decreasing.

Comparing the plots among the colleges and the two major Committees of the University of Cape Coast (Council and Academic Board), it could be said that with the exception of College of Health and Allied Sciences (CoHAS) and College of Distance Education (CoDE) which presented a positive trend in the time span of a meeting with respect to the delays in starting of the meeting the remaining colleges showed a downward trend. This means that with the exception College Health and Allied Sciences and College of Distance Education that would still go on to carry out their scheduled meeting in spite of the delays, the remaining colleges may call off or reschedule their scheduled meeting since the time span for the meeting would approach zero (0) minutes as the time to start the meeting delayed for longer minutes. Comparing the two major meeting of the University of Cape Coast, it could be said that when the delays of Council meetings increases the time span for the meeting also increases whereas that of Academic Board decreases when there is an incidence of delay in starting their meeting.

Markov chain and Transitional matrix for the delays of meetings under investigation

Markov chain is a special type of discrete-time stochastic process. To simplify our exposition, we assume that at any time, the discrete-time stochastic process can be in one of a finite number of states labelled 1, 2 . . . , *s*. The states for this research was given as On-time (O), Small delay (S) and Large delay (L)

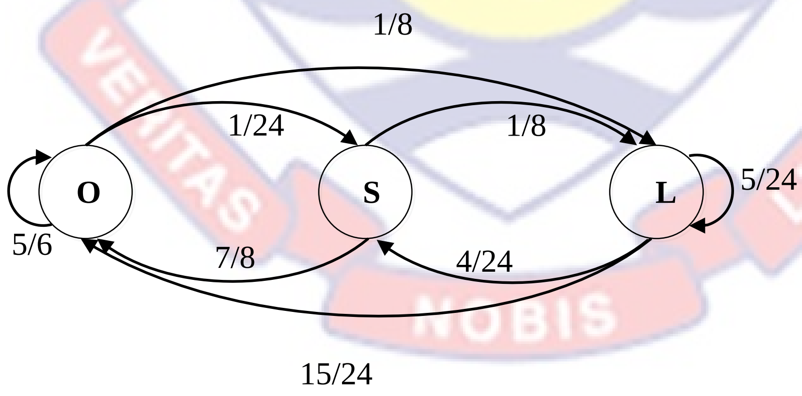
Markov Transitional Matrix for College of Agriculture and Natural Sciences (CANS)

$$P = \begin{array}{c} \\ O \\ S \\ L \end{array} \begin{array}{c} \begin{array}{ccc} O & \quad S & \quad L \end{array} \\ \begin{bmatrix} 0.8333 & 0.0417 & 0.1250 \\ 0.8750 & 0.0000 & 0.1250 \\ 0.6250 & 0.1667 & 0.2083 \end{bmatrix} \end{array}$$

From the Transitional Matrix for CANS, the probability that the next meeting would be started on-time given that the current meeting started on-time was 0.833 (83.33%) whereas it would start with a small and a large delay was 0.0417 (4.17%) and 0.125 (12.50%) respectively. From the matrix above the probability that the next meeting would start on-time and with a large delay given that the current meeting started with a small delay was 0.875 (87.5%) and 0.125 (12.50%) respectively. Again, the probability that the next meeting would start with a small delay given that the current meeting started with a small delay was zero (0). This meant that the next meeting would never ever start with a small delay when the current meeting starts with a small delay. Furthermore, if the current meeting started with a large delay the probability that the next meeting would start on-time or with a small delay or with a large delay was given as 0.625 (62.50%), 0.167 (16.77%) and 0.2083 (20.83%) respectively. From the above probabilities, it can be concluded that the College of Agriculture and Natural Sciences had the tendency of starting meetings on-time.

Markov chain for College of Agriculture and Natural Sciences

From the Markov chain for the above college, it could be said that the three states do communicate. The chain can also be classified as a closed set. Again, the Markov chain can be classified as a recurrent state. This means that at any particular time there was a positive probability of leaving any state to another. However, none of the states can be classified as absorbing.



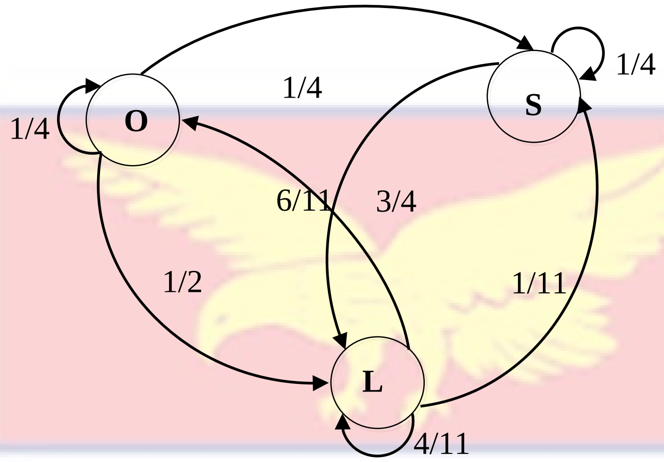
Markov Transitional Matrix for College Health and Allied Sciences (CoHAS)

$$
\begin{array}{cc}
 & \begin{array}{ccc} O & S & L \end{array} \\
P = \begin{array}{c} O \\ S \\ L \end{array} & \begin{bmatrix} 0.2500 & 0.2500 & 0.5000 \\ 0.0000 & 0.2500 & 0.7500 \\ 0.5454 & 0.0909 & 0.3636 \end{bmatrix}
\end{array}
$$

From the Transitional Matrix for College of Health and Allied Sciences, the probability that the next meeting would be started on-time given that the current meeting started on-time was 0.25 (25.00%) whereas it would start with a small and a large delay was 0.25 (25.00%) and 0.50 (50%) respectively. This means that whenever a scheduled meeting starts on-time, the probability that the next meeting would start with large delay is high. The probability of the next meeting starting on-time and with a large delay given that the current meeting started with a small delay was 0.0 (0.00%) and 0.75 (75.00%) respectively. From the transitional matrix the probability that the next meeting would start with a small delay given that the current meeting started with a small delay was 0.25 (25.00%). Additionally, when the current meeting started with a large delay the probability that the next meeting would start on-time or with a small delay or with a large delay was given as 0.5454 (54.54%), 0.0909 (9.09%) and 0.3636 (36.36%) respectively. From the above probabilities, it can be established that whenever the current meeting starts on-time the next meeting has a greater chance of starting with a larger delay and the vice versa.

Markov chain for College of Health and Allied Sciences

From the Markov chain for the College of Health and Allied Sciences, it could be said that the three states do communicate. The chain can also be classified as a closed set. Again, the Markov chain can be classified as a recurrent state. In other words, none of the states was transient. This means that at any particular time there was a positive probability of leaving any state to another. However, none of the states can be classified as absorbing.



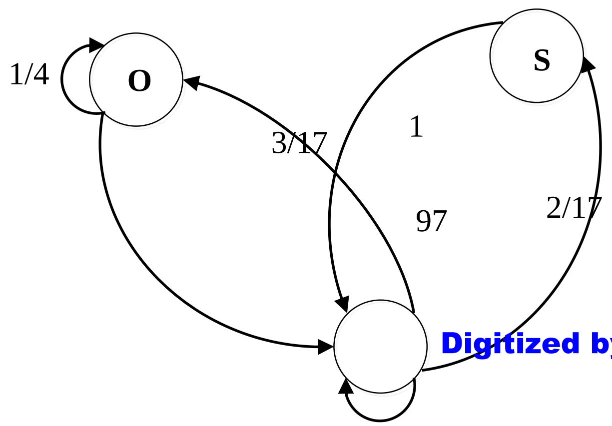
Markov Transitional Matrix for College Humanities and Legal Studies (CHLS)

$$P = \begin{array}{c} \\ O \\ S \\ L \end{array} \begin{array}{c} \begin{array}{ccc} O & S & L \end{array} \\ \begin{bmatrix} 0.2500 & 0.0000 & 0.7500 \\ 0.0000 & 0.0000 & 1.0000 \\ 0.1765 & 0.1176 & 0.7059 \end{bmatrix} \end{array}$$

From the Transitional Matrix for CHLS, the probability that the next meeting would be started on-time given that the current meeting started on-time was 0.25 (25.00%) whereas it would start with a small and a large delay was 0.00 (00.00%) and 0.75 (75.00%) respectively. This means that whenever a scheduled meeting starts on-time, the probability that the next meeting would start with large delay is high. The probability of the next meeting starting on-time and with a large delay given that the current meeting started with a small delay was 0.0 (0.00%) and 1 (100.00%) respectively. Moreover, the probability that the next meeting would start with a small delay given that the current meeting started with a small delay was 0.00 (00.00%). This proved that whenever a scheduled meeting starts with a small delay, the probability that the next meeting would start with a large delay was a sure event. From the matrix, when the current meeting starts with a large delay the probability that the next meeting would start on-time or with a small delay or with a large delay was given as 0.1765 (17.65%), 0.1176 (11.76%) and 0.7059 (70.59%) respectively. From the above probabilities, it could be established that no matter the state of the current meeting, the next meeting had the tendency of starting with a large delay.

Markov chain for College of Humanities and Legal Studies

From the Markov chain for the College of Humanities and Legal Studies, it could be said that the three states do communicate. However, state 'O' and state 'S' do not communicate directly. This confirms the assertion of the transitional matrix for the College of Humanities and Legal Studies. The Markov chain could also be classified as a closed set. Again, the Markov chain can be classified as a recurrent state. In other words, none of the states was transient. Again, none of the states can be classified as absorbing.



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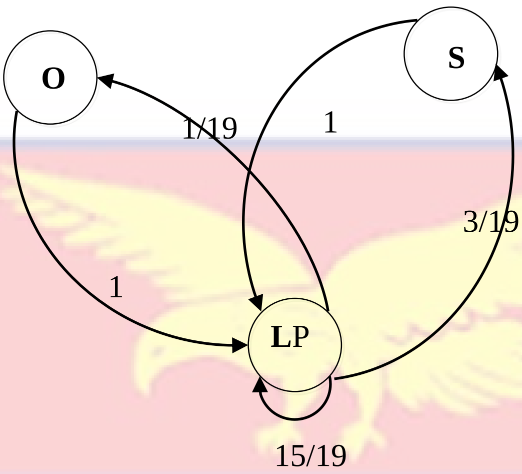
Markov Transitional Matrix for College of Education Studies (CES)

$$P = \begin{array}{c} \\ O \\ S \\ L \end{array} \begin{array}{c} \begin{array}{ccc} O & S & L \end{array} \\ \begin{bmatrix} 0.0000 & 0.0000 & 1.0000 \\ 0.0000 & 0.0000 & 1.0000 \\ 0.0526 & 0.1579 & 0.7897 \end{bmatrix} \end{array}$$

From the above transitional matrix, the probability of the next meeting would start with a large delay despite the current meeting starting either on-time or with a small delay was a sure event (100.00%). However, when the current meeting starts with a large delay, the probability that the next meeting would start on-time or with a small delay or with a large delay was given as 0.0526 (5.26%), 0.1579 (15.79%) and 0.7895 (78.95%) respectively. From the above probabilities, it may conclude that no matter the state of the current meeting, the next meeting had the tendency of starting with a large delay. This tends to confirm from Table 1 that the College of Education Studies had the great average of delay than the other colleges.

Markov chain for College of Education Studies

From the Markov chain for the College of Education Studies, it could be said that the three states do communicate. However, state ‘O’ and state ‘S’ do not communicate directly.



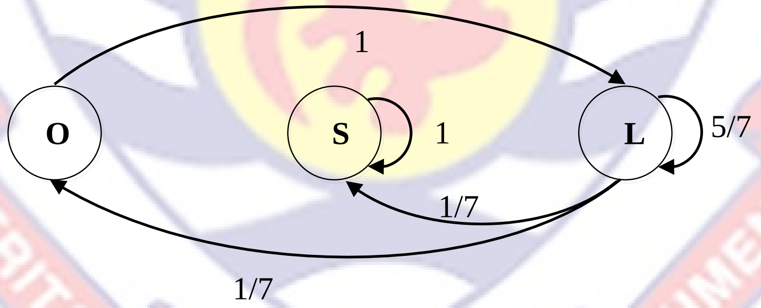
In other words, there is no director path from the state ‘O’ to state ‘S’ and vice versa. This confirms the assertion of the transitional matrix for the College of Education Studies. The Markov chain could also be classified as a closed set. Once more, the Markov chain can be classified as a recurrent state. In other words, none of the states was transient. Again, none of the states can be classified as absorbing.

Markov Transitional Matrix for College of Distance Education (CoDE)

$$P = \begin{array}{c} \\ O \\ S \\ L \end{array} \begin{array}{c} \begin{array}{ccc} O & S & L \end{array} \\ \begin{bmatrix} 0.0000 & 0.0000 & 1.0000 \\ 0.0000 & 1.0000 & 0.0000 \\ 0.1429 & 0.1429 & 0.7143 \end{bmatrix} \end{array}$$

From the transitional matrix, the probability that the next meeting would start with a small and large delay despite the current meeting starting on-time was a sure event (100.00%). However, when the current meeting starts with a small delay, the probability that the next meeting would start on-time was zero (0). Likewise, the probability that the next meeting would start with a large delay was also zero (0). However, when the current meeting starts with a small delay then the probability that the meeting would also start with a small delay was a sure event. Again, from the transitional matrix, the probability that the next meeting would start on-time and with a small delay given that the current meeting started with a large delay was 0.1429 (14.28%) each but the probability that the next meeting would start with a large delay was 0.7143 (71.43%).From the probabilities, we may possibly conclude that no matter the state of the current meeting, the next meeting had the tendency of starting with a large delay.

Markov chain for College of Distance Education



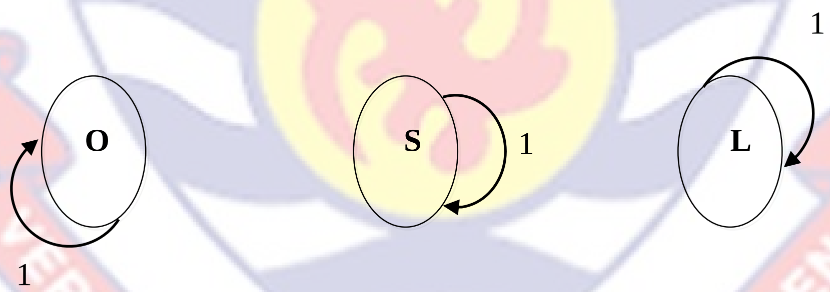
From the Markov chain for the College of Distance Education, it could be said State 'O' and 'L' communicate. However, state 'S' could be reached from the state 'O' and 'L' respectively. From the Markov chain, we could also classify state 'S' as a closed set. Again, we may classify O and L as a recurrent state. However, state 'S' could be classified as a transient and an absorbing state.

Markov Transitional Matrix for Council Meeting

$$P = \begin{array}{c} \\ O \\ S \\ L \end{array} \begin{array}{c} \begin{array}{ccc} O & S & L \end{array} \\ \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

From the transitional matrix, the probability that the next meeting would start with a small and large delay despite the current meeting starting on-time was a sure event (100.00%). Also, when the current meeting started with a small delay the probability that the next meeting would start with a small delay was a sure event (100%) as well. The trend was the same for meetings starting with a large delay.

Markov Chain for Council Meeting



From the Markov chain for Council meeting, it can be said that the states do not communicate with each other. In other words, none of the states could be reached from any of the states. Each state may be classified absorbing state and a closed a set. This kind of Markov chain is known as an Irregular Markov Chain.

Markov Transitional Matrix for Academic Board

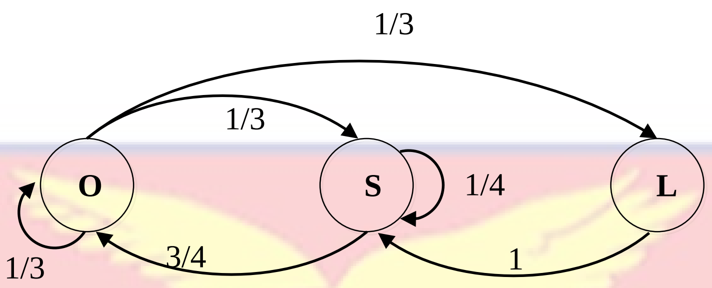
From the transitional matrix, the probability that the next meeting would start on-time, with a small, and large delay despite the current meeting starting on-time was 0.3333 (33.33%) each. However, when the current meeting starts with a small delay, the probability that the next meeting would start on-time was 0.75 (75%). Similarly, the probability that the next meeting would start with a large delay was zero (0%).

$$\begin{array}{cc} & \begin{array}{ccc} O & S & L \end{array} \\ P = \begin{array}{c} O \\ S \\ L \end{array} & \begin{bmatrix} 0.3333 & 0.3333 & 0.3333 \\ 0.7500 & 0.2500 & 0.0000 \\ 0.0000 & 1.0000 & 0.0000 \end{bmatrix} \end{array}$$

However, when the current meeting starts with a small delay then the probability that the meeting would also start with a small delay was 0.25 (25%). Again, from the transitional matrix, the probability that the next meeting would start on-time given that the current meeting started with a large delay was zero (0). However, the probability that the next meeting would start with a small delay given that the current meeting started with a large delay was a sure event (100%).From the probabilities, we may possibly conclude that no matter the state of the current meeting, the next meeting had the tendency of not starting with a large delay.

Markov chain for Academic Board meeting

From the Markov chain for the Academic Board, it could be said that all the three states do communicate. From the Markov chain, we may infer that all the three states are closed set. The Markov chain can also be classified as a recurrent state. In other words, none of the states was absorbing and none was a transient state. Interestingly, state 'L' does not communicate directly with the state 'O'



Steady State Probabilities

From Equations (3.10) and (3.12), the steady-state probabilities or steady-state distribution can be solved using the equations (1), (2), (3), and (4).

$$(\pi_1, \pi_2, \pi_3) = (\pi_1, \pi_2, \pi_3)\begin{bmatrix} P_{11} & P_{12} & P_{13} \\ P_{21} & P_{22} & P_{23} \\ P_{31} & P_{32} & P_{33} \end{bmatrix}$$

$$\pi_1 = \pi_1 P_{11} + \pi_2 P_{21} + \pi_3 P_{31} \qquad (1)$$

$$\pi_2 = \pi_1 P_{12} + \pi_2 P_{22} + \pi_3 P_{32} \qquad (2)$$

$$\pi_3 = \pi_1 P_{13} + \pi_2 P_{23} + \pi_3 P_{33} \qquad (3)$$

$$\pi_1 + \pi_2 + \pi_3 = 1 \qquad (4)$$

Making use of the Equations (1), (2), (3), and (4) the steady-state probabilities of the five colleges and the two major committees meeting under investigation were found as follow;

College of Agriculture and Natural Sciences

$$(\pi_1,\pi_2,\pi_3)=(\pi_1,\pi_2,\pi_3)\begin{bmatrix}0.8333 & 0.0417 & 0.1250\\ 0.8750 & 0.0000 & 0.1250\\ 0.6250 & 0.1667 & 0.2083\end{bmatrix}$$

$\pi_1 = 0.8333\pi_1 + 0.8750\pi_2 + 0.6250\pi_3$ (1)

$\pi_2 = 0.0417\pi_1 + 0.1667\pi_3$ (2)

$\pi_3 = 0.1250\pi_1 + 0.1250\pi_2 + 0.2083\pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation above indicated that in the long run the probability that the Markov chain would enter a particular state was given as; On-time (π_1) = 0.8119 (81.19%), Small delay (π_2) = 0.0711 (7.11%) and Large delay (π_3) = 0.1170 (11.70%). From the above steady-state probabilities, it could be seen that in the long-run the probability that College of Agriculture and Natural Science would start a meeting on-time is 81.19%. This tends to confirm the outcome of the Markov transitional matrix that no matter the state of the current meeting (i.e. on-time, small delays or large delays) the next meeting would start on-time. However, the average delays to start a meeting for the College of Agriculture and Natural Science suggest that the mean delays for the College were large (12.13 minutes). This figure may have resulted from the dispersion (i.e. highly dispersed) of the college data or may have been influenced by the extreme value in the data set (Figure 2).

College of Health and Allied Sciences

$$(\pi_1, \pi_2, \pi_3) = (\pi_1, \pi_2, \pi_3)\begin{bmatrix} 0.2500 & 0.2500 & 0.5000 \\ 0.0000 & 0.2500 & 0.7500 \\ 0.5454 & 0.0909 & 0.3636 \end{bmatrix}$$

$\pi_1 = 0.2500\pi_1 + 0.5454\pi_3$ (1)

$\pi_2 = 0.2500\pi_1 + 0.2500\pi_2 + 0.0909\pi_3$ (2)

$\pi_3 = 0.5000\pi_1 + 0.7500\pi_2 + 0.3636\pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation above showed that in the long run the probability that the Markov chain would enter a particular state was given as; On-time (π_1) = 0.3478 (34.78%), Small delay (π_2) = 0.1739 (17.39%) and Large delay (π_3) = 0.4783 (47.83%). This means that the probability that the College of Health and Allied Sciences would start a meeting on-time, in the long run is 38.50%. This outcome also confirms that more than fifty percent of the time, the college would start their meetings after ten (10) minutes.

College of Humanities and Legal Studies

$$(\pi_1, \pi_2, \pi_3) = (\pi_1, \pi_2, \pi_3)\begin{bmatrix} 0.2500 & 0.0000 & 0.7500 \\ 0.0000 & 0.0000 & 1.0000 \\ 0.1765 & 0.1176 & 0.7059 \end{bmatrix}$$

$\pi_1 = 0.2500\pi_1 + 0.1765\pi_3$ (1)

$\pi_2 = 0.1176\pi_3$ (2)

$\pi_3 = 0.7500\pi_1 + \pi_2 + 0.7059\pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation above specifies that in the long run the probability that the Markov chain would enter a particular state was given as; on-time (π_1) = 0.1739 (17.39%), Small delay (π_2) = 0.0870 (8.70%) and Large delay (π_3) = 0.7391 (73.91%). From the steady-state probabilities of the College of Humanities and Legal Studies, the probability that a meeting would start on-time was 17.39% whereas the probability that the meeting would start late was 73.91%. This means that the college meetings have a higher tendency towards starting with a large delay no matter the current state of the meeting.

College of Education Studies

$$(\pi_1, \pi_2, \pi_3) = (\pi_1, \pi_2, \pi_3)\begin{bmatrix} 0.0000 & 0.0000 & 1.0000 \\ 0.0000 & 0.0000 & 1.0000 \\ 0.0526 & 0.1579 & 0.7897 \end{bmatrix}$$

$\pi_1 = 0.0526\pi_3$ (1)

$\pi_2 = 0.1579\pi_3$ (2)

$\pi_3 = \pi_1 + \pi_2 + 0.7897\pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation indicated that in the long run the probability that the Markov chain would enter a particular state was given as; On-time (π_1) = 0.0435 (4.35%), Small delay (π_2) = 0.1304 (13.04%) and Large delay (π_3) = 0.8261 (82.61%). From the steady-states for College of Education Studies, the probability that a meeting would start on-time is 4.35% whereas the probability that the meeting would start late is 82.61%. The College of Education Studies seems to have the highest tendency towards starting their meetings with a large delay. This can be confirmed from the averages calculated and the box plot.

College of Distance Education

$$(\pi_1, \pi_2, \pi_3) = (\pi_1, \pi_2, \pi_3)\begin{bmatrix} 0.0000 & 0.0000 & 1.0000 \\ 0.0000 & 1.0000 & 0.0000 \\ 0.1429 & 0.1429 & 0.7143 \end{bmatrix}$$

$\pi_1 = 0.1429\pi_3$ (1)

$\pi_2 = \pi_2 + 0.1429\pi_3$ (2)

$\pi_3 = \pi_1 + 0.7143\pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation showed that in the long run the probability that the Markov chain would enter a particular state was given as; On-time (π_1) = 0.000 (0%), Small delay (π_2) = 1 (100%) and Large delay (π_3) = 0 (0%). From the steady-states for College of Distance Education, the probability that a meeting would start on-time was not meant to happen whereas the probability that the meeting would start very late was also not possible. From the long run probabilities, College of Distance Education would always start their meetings between five (5) to ten (10) minutes after the intended time to start the meeting.

Council Meeting

$$(\pi_1,\pi_2,\pi_3)=(\pi_1,\pi_2,\pi_3)\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$$

$\pi_1 = \pi_1$ (1)

$\pi_2 = \pi_2$ (2)

$\pi_3 = \pi_3$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

From the equation, the long-run probabilities would depend on the initial state. This is because the Markov chain was an absorbing Markov chain.

Academic Board meeting

$$(\pi_1,\pi_2,\pi_3)=(\pi_1,\pi_2,\pi_3)\begin{bmatrix}0.3333 & 0.3333 & 0.3333\\ 0.7500 & 0.2500 & 0.0000\\ 0.0000 & 1.0000 & 0.0000\end{bmatrix}$$

$\pi_1 = 0.3333\pi_1 + 0.7500\pi_2$ (1)

$\pi_2 = 0.3333\pi_1 + 0.25000\pi_2 + \pi_3$ (2)

$\pi_3 = 0.3333\pi_1$ (3)

$\pi_1 + \pi_2 + \pi_3 = 1$ (4)

The solution to the equation showed that in the long run the probability that the Markov chain would enter a particular state was given as; on-time (π_1) = 0.45 (45%), Small delay (π_2) = 0.40 (40%) and Large delay (π_3) = 0.15 (15%). From the steady-states for Academic Board meeting, the probability that a meeting would start on-time was 0.45 whereas the probability that the meeting would start with a small delay was0.40. From the steady-state probabilities, the probability that the next meeting would start with a large delay was just 0.15. From the long run probabilities, Academic Board meetings had a smaller chance of starting after 10 minutes of the intended time to start the meeting.

Chapter Summary

This chapter elaborated on the analysis and results of the study. The preliminary analysis on the descriptive of the study were discussed. These analysis were residual plots, box plots, interval plots and Analysis of Variance. The major statistical techniques were employed to examine the pattern of the delay in engagement schedule. Markov chain, transitional matrix and steady-state probabilities were employed to analysis the data. The Markov chain, transitional matrix and steady-state probabilities were used to compare the delays among the Colleges, Academic Board and Council committee. From the analysis, Council meetings exhibited a unique transitional matrix. It continue to show a purely Absorbing Markov chain such that all states in the chain was absorbing. There exist a significant difference in the means of time delay between the Academic Board and Council meeting from the analysis. However, with the exception of "College of Education Studies, and College of Agriculture and Natural Sciences", and "College of Health and Allied Sciences, and College of Education Studies", there was no significant difference in the means of time delay among the remaining paired colleges.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents the summary, conclusions, recommendations and suggested areas for further research. The first section deals with the summary of the study. The second section contains the conclusions of the study. The third is dedicated to the recommendations aimed at improving the emerging issues identified by the study and the last section provides suggested areas for further study.

Summary

The objective of the study was to examine the incidence of time delay in engagement schedules on campus. The researcher studied past records of time delays from five colleges and the two major committees meetings at the University of Cape Coast.

From the study, the pattern of the delays to start a meeting for all the five colleges were of random nature which suggested a stochastic trend. The College of Education Studies had the highest average of delays (18.92 minutes) in starting a meeting among the colleges of the University. Again, between the Academic Board Council meeting, Council meeting had the highest (21.20 minutes) average delay in starting a meeting.

Moreover, there was a significant difference in the means of the delays among these colleges: College of Education Studies and College of Agriculture and Natural Sciences, and College of Health and Allied Sciences and College of Education Studies. There was also no significant difference in the means of

Academic Board and Council meetings. With the exception of the College of Distance Education and the College of Health and Allied Sciences which had a positive slope, the remaining colleges had a negative slope in their scatter plots.

Additionally, among Academic Board and Council Committee meetings, Council meeting showed a positive slope while that of Academic Board showed a negative slope in the scatter plots. The College of Agriculture and Natural Sciences also had the highest probability (0.8119) of always starting their meetings on-time in the long-run. Likewise, the College of Education Studies, on the other hand, had the highest probability (0.8261) of always starting their meetings after 10 minutes. The College of Humanities and Legal Studies followed the College of Education Studies with a probability of 0.7391 of starting meetings after 10 minutes.

The College of Distance Education had a zero (0) probability of starting a meeting on-time in the long-run. However, in the long-run, the college would start a meeting between 5 to 10 minutes after the intended time to start the meeting. The College of Humanities and Legal Studies also had a high probability (0.7391) of starting their meetings after 10 minutes of the intended time in the long-run. The College of Health and Allied Sciences, however, had a probability of 0.4783 of starting their meetings after 10 minutes in the long-run.

After a long trend the probability that a meeting for the Council committee would start on-time or with a small delay or after 10 minutes rested on the current state of the meeting. However, the Academic Board meetings had a 0.45 chance of starting on-time in the long run. With the exception of Council Committee meeting, the remaining colleges and Academic Board meetings showed a regular Markov Chain properties. Nevertheless, the states for Council Committee meetings were all absorbing states and hence showed Absorbing Markov chain properties.

Conclusions

To conclude, the results from the scatter plots showed a downward trend among most of the colleges. The delays in starting a meeting were random in nature. Also, the College of Education Studies had the highest average of delays (18.92 minutes) in starting a meeting among all the colleges. The Council committee meeting had the highest (21.20 minutes) average delay in starting a meeting compared to Academic Board meetings.

Also, members of the College of Agriculture and Natural Sciences were more prompt to attending meetings on-time than their counterparts from the other Colleges. As compare to their counterparts from the other colleges, members of the College of Education Studies were also not prompt to attending meetings.

Again, the time to start a meeting for Council Committee depend on the time the previous meeting was started. Members of the Academic Board however, were more prompt to attending meetings on-time than their counterparts on the Council Committee, although the time to start a meeting would depend on the time the previous meeting started for council meetings.

Recommendations

From the objectives of the study, the University Management should come out with a policy that when a meeting delays for more than an hour that meeting should be re-scheduled. This is because such meetings would eventually last relatively shorter than if it were started on time. The University Management should encourage members of committees to honour meetings on-time. Also, members of Council should make it a custom to start their meetings on time, because such a habit would continue in their subsequent meetings. Likewise, Committees at the College of Education should make it a practice to start their meetings on time so that it would continue in their subsequent meetings.

The finding of this study was based on some committee meetings of the University of Cape Coast. Indeed, for a comparative view and analysis as well as a comprehensive improvement in honouring engagement schedules on time, there is the need for further studies on; factors that influence the delays in honouring an engagement schedule on time, the economic and productive cost of delay in starting a meeting late using steady-state probabilities, and the time allocation for each item on the agenda for every engagement schedule.

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APPENDICES

APPENDIX A

TUKEY PAIRWISE COMPARISONS FOR THE COLLEGES

Grouping Information Using the Tukey Method and 95% Confidence

College	N	Mean	Grouping
CES	24	18.92	A
CoDE	8	16.25	A B
CHLS	24	14.79	A B
CANS	24	12.13	B
CoHAS	24	10.25	B

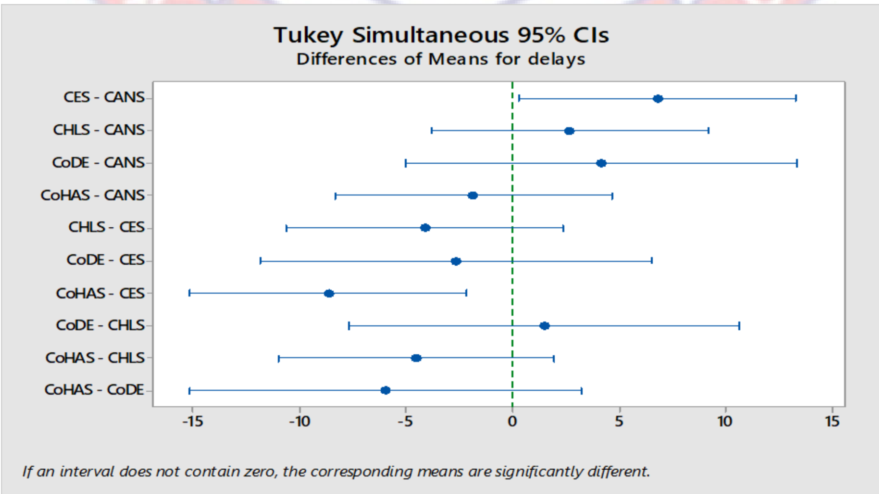
Means that do not share a letter are significantly different.

Tukey Simultaneous Tests for Differences of Means

Difference of Levels	Difference of Means	SE of Difference	95% CI	T-Value	Adjusted P-Value
CES - CANS	6.79	2.34	(0.30, 13.29)	2.91	0.036
CHLS - CANS	2.67	2.34	(-3.83, 9.16)	1.14	0.784
CoDE - CANS	4.13	3.30	(-5.06, 13.31)	1.25	0.723
CoHAS- CANS	-1.87	2.34	(-8.37, 4.62)	-0.80	0.929
CHLS - CES	-4.13	2.34	(-10.62, 2.37)	-1.77	0.400
CoDE - CES	-2.67	3.30	(-11.85, 6.52)	-0.81	0.928
CoHAS - CES	-8.67	2.34	(-15.16, -2.17)	-3.71	0.003
CoDE - CHLS	1.46	3.30	(-7.72, 10.64)	0.44	0.992
CoHAS - CHLS	-4.54	2.34	(-11.04, 1.95)	-1.94	0.302
CoHAS- CoDE	-6.00	3.30	(-15.18, 3.18)	-1.82	0.370

Individual confidence level = 99.35%

Tukey Simultaneous 95% CIs



APPENDIX B

TUKEY PAIRWISE COMPARISONS FOR ACADEMIC BOARD AND COUNCIL MEETINGS

Grouping Information Using the Tukey Method and 95% Confidence

Board	N	Mean	Grouping
Council	10	21.20	A
Academic Board	11	7.64	B

Means that do not share a letter are significantly different.

Tukey Simultaneous Tests for Differences of Means

Difference of Levels	Difference of Means	SE of Difference	Adjusted 95% CI	T-Value	P-Value
council - academicboar	13.56	2.24	(8.88, 18.25)	6.06	0.000

Individual confidence level = 95.00%