



**COLLABORATIVE INFORMATION BEHAVIOUR  
(CIB) OF UNDERGRADUATES IN SELECTED  
UNIVERSITIES IN TANZANIA**

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# **COLLABORATIVE INFORMATION BEHAVIOUR (CIB) OF UNDERGRADUATES IN SELECTED UNIVERSITIES IN TANZANIA**

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Supervisor: **Prof. Stephen Mutula**

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## DECLARATION

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## ABSTRACT

This study investigated collaborative information behaviour (CIB) of undergraduate students through collaborative learning assignments in selected Tanzanian universities. The study also examined the challenges that undergraduate students encountered during collaborative information seeking, sharing and use and the applicability of Wilson's (1996) model of information behaviour in collaborative learning context. The study population comprised of second year students from the departments of Botany and Zoology of University of Dar es Salaam, fourth year students of architecture from Ardhi University and second year students studying forestry from Sokoine University of Agriculture. Teaching staff from respective departments and academic librarians from respective university libraries were also polled. Purposive sampling technique was used to select the sample for the study.

The findings indicated that students' CIB is highly contextualized and is shaped by learning tasks objectives, tasks requirements, students' domains of study and collaborative learning environments. Interactions with human sources of information as well as, observation of natural and human-made information objects are the dominant information behavioural seeking practices of students. Furthermore, findings revealed that students' information sharing behaviour is both voluntary and involuntary and is motivated by geographic proximity, trust among group members, shared learning goals, tasks division and group norms. The research findings also suggest that information use in collaborative learning involved processing of raw information, making sense of information, applying and sharing of information and collaborative construction of new knowledge.

The study makes contributions in terms of theory, policy and practice. The contributions include a proposed model of students' collaborative information behaviour, providing policy directions to policy makers to create programs and guidelines that can be used to strengthen Academic-Community-Partnership for information and knowledge sharing and introduction of a blended focus group discussion technique that combines information literacy and group interview.

In light of the results of the study recommendations for universities, university libraries, academic librarians and members of teaching staff are provided. The recommendations are related to developing information infrastructure that supports different collaborative information behavioural activities, the effective use of indigenous knowledge of local people during students' field work and the establishment and strengthening of Academic-Community-Partnership (ACP). The recommended future research areas include collaborative information behaviour (CIB) in virtual collaborative learning environment and how students use natural environment as the source of information during collaborative learning.

## **DEDICATION**

This thesis is dedicated to my late parents, Daniel Damas Ndumbaro and Odwina Alexander Mbunda. Thank you for sending me to school. May God rest your souls in Eternal Peace.

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## **LIST OF ABBREVIATIONS**

ARU	Ardhi University
B. Arch.	Bachelor of Architecture
BSc.	Bachelor of Science
CIB	Collaborative Information Behaviour
CIS	Collaborative Information Seeking Behaviour
IT	Information Technology
LIS	Library and Information Science
MDGs	Millennium Development Goals
SUA	Sokoine University of Agriculture
TAFORI	Tanzania Forest Research Institute
TCU	Tanzania Commission for Universities
UDSM	University of Dar es Salaam

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## CHAPTER ONE: INTRODUCTION

*“All people seek information, yet for some people and in some situations the stakes are much higher. Higher stakes are more likely to create situations that attract research.”* (Case, 2012:10)

### **1.1 Introduction**

This study investigated collaborative information behaviour of undergraduate students in three Tanzanian universities. This chapter introduces the research problem and research questions which form the basis for this study. Additionally, the chapter outlines some limitations encountered in the research process, delimitations of the study and significance of the study. The chapter further outlines theory and provides overview of the current literature and methods. Finally, an outline of the thesis roadmap and a summary of the chapter are provided.

The concept of information behaviour is used in literature to refer to the totality of human behaviour in relation to sources and channels of information, including information needs, active and passive information seeking, information processing and information use (Wilson, 2000). Case (2012) asserts that information behaviour encompasses information seeking as well as the totality of other intentional or passive behaviours such as glimpsing or encountering information and purposive behaviour such as active avoidance of information.

For more than 60 years researchers in library and information science have been researching into different aspects of human information behaviour trying to uncover human relationships with information (Bates, 2010). From some of these researches, different models have been proposed and used to describe various processes of information behaviour (Wilson, 1981, Ellis, 1993, Kuhlthau, 1991, Ingwersen, 1996 and Wilson, 1996). The common assumption in these models is that the information seeker is an individual who interacts with information systems or sources to satisfy his or her information need (Karunakaran, Spence and Reddy, 2010, Shah, 2010a and Saleh, 2011).

Recently, researchers have developed interests in studying human information behaviour in a group context (Prekop, 2002, Reddy, 2003, Lazonder, 2005, Hyldegård, 2006a, Poteri, 2007, Harrison, 2009, Paul, 2010, Shah, 2010a, Saleh, 2012, Pirolet, 2012 and Kim, 2013). These studies have challenged the reductionist view of previous studies on human information behaviour and existing models of information behaviour (Hyldegård, 2006b, Hertzum, 2008 and Saleh and Large, 2011). Shah (2010a and 2010c) for example states that it is natural for human beings to collaborate particularly when they face a complex information problem. From this assumption, information seeking and use activities are described as processes which are inherently collaborative (Spence, 2005, Saleh, 2012, Shah, 2010a, Shah, 2010c and Shah, 2013).

With the increasing interests among researchers to study human information behaviour from group context, there have been emergences of new concepts. These concepts describe various information behavioural activities that take place when individuals work collaboratively in solving information problems. Collaborative information behaviour (CIB) is a concept which is described as a totality of behaviour exhibited when two or more individuals collaborate in identifying information needs, seeking, evaluating, sharing and applying information in solving a problem (Saleh, 2012). Other related sub-processes include collaborative information need, collaborative information seeking, collaborative information searching, collaborative information retrieval, collaborative information evaluation and collaborative information use.

The study of collaborative information behaviour of different information user communities, have not only led researchers to question why and how people work together in finding information and use information but also the importance of contextual and situational factors in which collaborative activities are taking place (Karunakaran, Spence and Reddy, 2010). Hertzum (2008), Saleh and Large (2011) argued that studies of human information behaviours have to be contextually and conceptually inclusive by focusing not only on the information seeking and using processes, but also on collaborative tasks that group of users wish to accomplish. Studies also have focused on understanding the role of users' knowledge domain, nature of collaborative tasks undertaken (Saleh, 2012) and influence of personal traits in shaping collaborative information behaviour (Hyldegård, 2006a).

## **1.2 Statement of research problem**

In the global context, research in library and information science has generated a number of models that are used to describe various stages and processes of human information behaviour. These models either focus on specific aspects of information behaviour (Elli's, 1993 and Kuhlthau, 1991), or general aspects of information behaviours (Wilson, 1996, Niedźwiedzka, 2003 and Lakshminarayanan, 2010). Within collaborative context, different models of collaborative information behaviour have also been developed. These include Blake and Pratt's (2006) model of collaborative information synthesis, Reddy and Jansen's (2008) model for understanding collaborative information seeking behaviour, Karukaran, Spence and Reddy's (2010) model of collaborative information behaviour, Yue and He's (2009) model of understanding collaborative information behaviour in e-discovery and Shah's (2010a) model of collaborative information seeking.

Collaboration has been a vital part of academic life (Poteri, 2007 and Walsh and Kahn, 2009). In the Tanzanian context for example, there are different levels of collaboration across universities, colleges and other academic units. At the lower level, students collaborate among themselves on different academic activities such as learning based assignments. In some universities such as the University of Dar es Salaam, Sokoine University of Agriculture and Ardhi University few departments require their undergraduate students to engage in group credit-earning assignments. These credit based collaborative assignments require students to work together and interact with different sources of information. Undergraduate students' involvement in group based learning especially in the fields of forestry, architecture, botany and zoology provide rich and suitable environment for studying collaborative information behaviours in education setting.

The applicability of solitary models of information behaviour in group context has not been extensively tested. Similarly, despite the fact that recently established models of collaborative information behaviour have been instrumental in addressing problems of lack of models and conceptual clarity on collaborative information behaviour, these models have been developed in both non-African context and in knowledge domains different from education. Despite the existence of collaborative information practices among undergraduates in Tanzania, research has

focused mainly on individual information users. Many researchers who study human information behaviour in education portray information users as individuals who work in solitude to satisfy their information needs. Such portrayal of “lonely information users” has been extensively covered in a number of studies of information behaviour in academic context (Msuya, 2003, Ndenje-Sichwale, 2004, Mughairi, 2006, Malekani, 2006, Al-Muomen, 2009, Lwoga, Ngulube and Stilwell, 2010, Bitso, 2011, Chaura, 2015). The gap in collaborative information behaviour has been implicitly underscored by Stilwell (2010) who in her review of 30 years of research on information behaviour from South African perspective pointed out a knowledge gap in our understanding of collaborative information behaviour. This study therefore investigated collaborative information behavioural patterns of undergraduate students in selected public universities in Tanzania, examine the challenges that undergraduates encounter during collaborative information seeking, sharing and use, and also find out the applicability of Wilson’s (1996) model of information behaviour in collaborative learning context.

In an attempt to fully address the research problem, this study extended to cover broader issues around collaborative information behaviour which included scholarly collaboration, information behaviour and collaborative information behaviour. In this regard the study also sought to understand shared information needs, collaborative information seeking behaviour, collaborative information evaluation, information sharing and information use. These aspects of information behaviour provide an overarching framework within which specific aspects of information behaviour such as information searching, information retrieval, information sources, information transfer and channel of information communication among others are studied.

### **1.3 The aim of the study**

The aim of this study is to explore Collaborative Information Behaviour (CIB) of undergraduates in three Tanzanian universities in an attempt to explain how students collaboratively seek, share and use information.

### **1.4 Objectives of the study**

The objectives of this study are threefold:

- To investigate collaborative information behavioural pattern of undergraduate students.
- To examine the challenges that undergraduates encounter during collaborative information seeking, sharing and use.
- To determine the applicability of Wilson's (1996) model of information behaviour in collaborative learning context
- To develop a model of students' collaboration collaborative information behaviour for higher learning institutions.

### **1.5 Research questions**

The major research question that this study sought to address was what are the information behavioural patterns of undergraduates working in collaborative context to seek, share and use information?

Within the framework of the main research problem, the following specific research questions were addressed:

1. What are the information needs of undergraduate students working in collaborative academic assignments?
2. What sources of information do undergraduate students use when seeking information to accomplish group learning assignments?
3. What factors shape information behaviour of undergraduate students working in collaborative learning tasks?
4. How do undergraduates share information when engaging in collaborative learning tasks?
5. How do undergraduates evaluate information during collaborative information seeking and use?
6. What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
7. To what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

## **1.6 Assumptions of the study**

Assumptions or scientific assumptions are statements based on empirical or ordinary observations. The assumptions of this study are based on both theoretical framework and methodological orientation of the study. This study was therefore based on the following research assumptions:

- Students' collaborative learning tasks and collaborative learning environment are the key factors influencing students' information behaviour in a group context.
- Students' information behaviour during collaborative learning process can be understood through prolonged observations and interpretations of students' interactions among themselves and with information sources within their learning environment.
- Extended data collection process and the use of multiple data collection techniques are the best ways to ensure that detailed and in-depth data are collected to enable the researcher to provide both analytic generalization and conclusions.

## **1.7 Scope and limitations of the study**

This study was limited to the nature of domains in which study was conducted, forms of collaboration and methodological approach used. Firstly, Universities in Tanzania provide different academic programmes ranging from engineering and applied sciences, natural and human sciences to social science and humanities. This study is domains' specific as it is limited to an academic context where the focus was on natural and applied sciences. The study therefore excludes other disciplines such as life sciences, humanities and social sciences. It may be possible that while the results of this study could be analytically generalized to other academic disciplines; however, it is not prudent to generalize the findings to other settings in non-academic environments.

Secondly, the study focused on students' collaborative information behavioural activities. These activities are externally initiated, interactive and explicit. The findings and conclusions drawn

from this study may differ from other studies which focused on forms of collaboration which are implicit, hierarchical and self-initiated as well as those which do not concern with students' credit based learning assignments.

Thirdly, the presence of the researcher might have some influence on the observed patterns of information behaviour. In an attempt to overcome this limitation, extended data collection process and multiple techniques of data collection were used. This technique enabled the researcher to confirm, complement and verify data that were collected. Fourthly, the researcher also encountered some technical and logistic limitations. These limitations included changing of students' field sites in the case of Sokoine University of Agriculture (SUA) and unnecessary bureaucratic procedures in securing research permit at SUA.

This study was delimited by parameters such as setting, population and methodological design. The research was confined to 3 out of 37 registered universities in Tanzania. The research focused on five aspects of collaborative information behaviour namely; shared information needs, collaborative information seeking, information sharing, collaborative information evaluation and collaborative information use. The unit of analysis was undergraduate students working in collaborative credit based assignments. The study adopted Shah's (2010a) model of effective collaboration which views collaboration as interactive, explicit and a mutually beneficial process. Methodologically, the study used qualitative design and ethnographic multiple case study approach.

### **1.8 Significance and contribution of the study**

This study is significant and contributes in various ways. It investigates collaborative information behaviour of students and seeks to explain how students collaboratively seek, share and use information. Such understanding would provide insights into the roles of contextual attributes such as collaborative learning tasks, discipline specific and group members' characteristics in shaping students' information behaviour. This understanding would assist information system and information service developers in designing and supporting systems and services that take into consideration collaborative information behaviours. Additionally,

information service providers would be strategic in the provision of information services which meet the needs of information users who work in collaborative information activities. The higher learning institutions are enabled to have better insights into how to reorient existing curriculum. The aim of which is to better accommodate the process of studying and evaluating collaborative information activities.

The study contributes and proposes a model of collaborative information behaviour for students in higher learning institutions. Such a model could be used to describe and model various students' collaborative information behavioural activities. The model could be used to deepen the understanding of collaborative information behaviour of undergraduate students and improve best practices in collaborative information activities among students.

### **1.9 Theoretical framework**

Various models and theories of information behaviour have been developed and used to investigate various human information behavioural related activities. Burnett and Jaeger's (2008) theory of information worlds focuses on both information seeking and use. The theory is based on three fundamental key concepts: Context of information behaviour, situations of the context and social networks (Sonnenwald, 2005). This theory asserts that human information behaviour is shaped by and shapes individuals, social networks, situations, and contexts (Sonnenwald, 1999, 2005). The theory also holds that human information behaviour may be ideally viewed as collaboration among individuals and information sources within an information horizon.

The other commonly used models of information behaviour are those of Wilson's (1996) general model of information behaviour, in Wilson and Walsh (1996) and Niedźwiedzka (2003) models of information behaviour. These two are among the general models of human information behaviour that have wider applicability in investigating information seeking and use. Within the stream of collaborative information behaviour different models exist (Shah, 2008, Reddy and Jensen, 2008, Yue and He, 2009 and Karunakaran, Spence and Reddy, 2010). These models are domain specific in that they have been developed from specific domains such as medical domain (Reddy and Jansen, 2008), legal domain (Yue and He, 2009) and online collaboration Shah



(2010a). These models cover various aspects of collaborative information behaviour such as: shared information needs, collaborative information seeking, collaborative information evaluation, information sharing and use.

Models of collaborative information behaviour are still in their infant stage although they provide a foundation for both conceptual and theoretical discussions of different aspects of collaborative information behaviour. One of the shortcomings of the existing collaborative information behaviour models is that they have been developed in the context of developed countries and non-academic domains.

This study is underpinned by the theory of information worlds developed by Burnett and Jaeger, (2008). Information behaviour according to this theory is shaped by immediate influences of friends, family, co-workers and the trusted information sources within which individuals live (Burnett and Jaeger, 2011). According to Burnett and Jaeger, (2008) and Burnett and Jaeger, (2011), the theory of information worlds focuses on five elements which are: a) social norms or shared sense of appropriateness of observable behaviours, b) individual roles and their perceptions, c) information values or shared sense of importance of information, d) information behaviour, e) settings in which actors work and communicate or exchange of information. The theory of information worlds, views information behaviour a result of interactions among various agents, forces and processes including people and their environment. Being a cross disciplinary social theory, the theory of information worlds emphasizes the importance of understanding information behaviour in multilayered contexts such as social, environmental and technological forces (Burnett and Erdelez, 2010). Information behaviour is understood as a result of multiple factors and forces inside and outside a particular social group in which information behaviour is investigated. This theory has been used in studies on human information behaviour including Burnett, Marty, Burnett, Stvilia, Worrall, Kazmer and Hinnant (2011) and Worrall, Burnett, Kazmer, Marty, Burnett, Stvillia, Roberts, Hinnat, and Wu (2013), and Worrall (2013).

### **1.10 An overview of the current literature**

This section presents preliminary literature review. The detailed literature review is provided in chapter three of this thesis. The reasons for including preliminary literature are to introduce the reader to the issues that further elaborated on chapter three of the thesis. The preliminary literature covers the following aspects: a) information needs, b) collaborative information behaviour, c) sources of information, d) factors shaping users' collaborative information behaviour, e) information sharing and collaborative information evaluation. The review also includes: f) challenges encountered during collaborative information behavioural practices and g) applicability of solitary models of information behaviour in collaborative context.

Studies of collaborative information behaviour are numerous and fall under two broader categories. These categories are user centric studies of collaborative information behaviour (Poteri, 2007, Hertzum, 2008, Saleh and Large, 2011) and technical aspects of collaborative information behaviour (Shah, 2008, Shah, 2010a Paul, 2010, Paul and Morris, 2011 Golovchinsky, Diriye and Pickens, 2011). The user centric approach focuses on understanding users' CIB so as to provide support to their collaborative information activities. On technical aspect of CIB, researchers are interested in understanding how technology can be used effectively to support collaborative information behavioural activities. This study is undergirded by social stream of CIB which focuses on understanding collaborative information behaviour from user's perspective.

Researchers are also interested in understanding collaborative information needs of different user communities. Poltrock, Grudin, Dumais, Fidel, Bruce and Pejtersen (2003), Shah (2010a), Paul (2010) and Saleh (2011) view the existence of common information need among information users as the motivation for people to work together in collaborative information work. Lin, Eisenberg and Marino (2010) and Rieh, Robert and You (2013) state that shared information need is not the only condition for activating collaborative information activities. Rieh *et al.*, (2013) noted that individuals may initiate a task and then they realize the need for diverse expertise to resolve the problem. This results in the engagement in collaborative information behavioural activities later after collecting preliminary information on how to accomplish a task.

The question of why individuals collaborate during information behavioural practices has been dealt with extensively in the previous studies (Spence, 2005; Reddy and Jensen; 2008, Shah, 2010a; Saleh and Large, 2011 and Saleh, 2012). These studies have identified numerous factors including: a) presence of shared information need (Spence, 2005; Shah, 2010a; Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013), b) complexity of information need (Meyers, 2010, Reddy, Bernard and Spence, 2010; Shah, 2010b and Saleh, 2012) c) and project's requirements (Saleh and Large, 2011; Saleh, 2012). Other factors include: d) the need for multiple expertise (Paul and Reddy, 2010 and Saleh, 2012), e) lack of immediate accessible information (Paul and Reddy, 2010 and Reddy, Bernard and Spence, 2010), f) complexity of searching process and g) the need to improve their search efficiency (Harrison, 2009).

The reviewed literature suggests that in collaborative information activities, people need information not only for satisfying information needs, but also, for facilitating collaborative information activities such as informing group members on various processes, decisions and situations (Hertzum, 2010). Information is also needed for creating shared understanding of what other group members have accomplished (Zhou and Stahl, 2007). Research on information behaviour has also focused on information sources from different points of views such as: a) types of information sources most preferred by users (O'Farrel, and Bates, 2009 and Saleh and Large, 2011), b) availability, access and accessibility of information sources (Mtanda, 2008 and Nwagwu, 2012) c) and perceived usefulness of information sources (O'Farrel and Bates, 2009). Saleh and Large (2011) and Saleh (2012) noted that undergraduate students prefer to use people within and outside their groups as sources of information while O'Farrel and Bates (2009) found that LIS students preferred to use both electronic and printed sources of information when working in group projects. Studies also suggest that users' are influenced by different factors such as accessibility and access of information sources (Wilson, 1997 and Mutula, 2013), affordability, availability, and perceived usefulness of information sources (Wilson, 1997), lack of skills to access sources of information (Rugezea, 2002 and Elia, 2006).

Other studies focused on the factors that shape individuals information behaviour when working in group (Hyldegård, 2006a; Reddy and Jensen and Bernard, 2010; Yue and He, 2009; Harrison,

2009 and Saleh, 2012). Different factors have been identified including characteristics of group members (Hertzum, 2002 and Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013), nature and complexities of collaborative work and tasks (Yue and He, 2009, Saleh, 2012) and domain in which work is done (Yue and He, 2009). Other factors include group members' proximity (Poteri, 2007, Harrison, 2009 and Spence and Reddy, 2012), division of task and task stages (Hyldegård, 2006b), and personal factors such as differences in level of skills and experiences (Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013).

Another important aspects of collaborative information behaviour is information sharing. Talja (2002) links information sharing to the process of sharing relevant documents, sharing information about the content of relevant information and sharing efficient strategies of finding relevant information. Sonnenwald (2006) views information sharing as sharing of both physical documents and coordinating information that is used to facilitate collaborative process. During collaborative information seeking and use, information is shared so as to avoid duplication and overlapping of activities (Mishra, Allen and Pearman, 2011). Group members may also be motivated by existence of formal and informal network structures, trust and open communication (Haeussler, 2010) and desire to share expertise (Mishra, Allen and Pearman, 2011). Other factors that motivate people to share information include the extent to which collaborators are dispersed or co-located (Poteri, 2007 and Haeussler, 2010) and division of tasks among group members (O'Farrell and Bates, 2010). From these factors it is evident that information sharing may be self-initiated (Capra, Valasco-Martin and Sams, 2010), intentional or accidental (Saleh, 2012).

During collaborative evaluation process group members assess and relate the value of information with task requirements (Saleh, 2012), the reputation of information sources and the relevance of information to the topic (Harrison, 2009) and comparing multiple sources that report similar results (Harrison, 2009 and Saleh, 2012). The evaluation process may also include making evaluations of information sources based on recommendation from friends or superiors (Twait, 2005, Rieh and Hilligoss, 2008 and Head and Eisenberg, 2010). Collaborative information evaluation also involves group discussions, reviews, agreement and disagreement,

assessing the usefulness of information against information need and comparing information with other group members (Harrison, 2009 and Rieh, *et al.*, 2013).

Research has been done on synergic relationship to collaboration. Synergic relationship relates to the conventional wisdom that people working together produce greater results than the sum of the individual results (Shah and González-Ibáñez, 2011). Evidence from studies revealed that collaboration information activities enable collaborators to accomplish more, benefit from each person experiences and expertise (Shah, 2010a) and pool resources by bringing knowledge and skills together (Meyers, 2010). Despite such benefits, collaboration has also proved to be challenging undertaking. There are challenges that collaborators encounter when working in seeking, sharing and using information. These challenges include the fact that collaboration is time consuming with additional cognitive load (Meyer, 2010 Shah, 2009 and 2010a). Collaborators also may face challenges of how to deal with “free riders” who contribute little or nothing in group (Campbell and Li, 2006), establishing and maintaining trust among members (Sonnenwald, 2006) and creating shared understanding of both acquired information and collaborative activities (Campbell and Li, 2006).

Information use is essentially the ultimate goal of information seeking process. There are multiple dimensions that focus on different aspects of information use (Wilson, 2000, Kari, 2007 and Davies, 2013). These include cognitive dimension of information use potential use of information sources and social use of information (Spink and Cole, 2006, Davies, 2013). Kari (2007) developed a framework that describes different dimensions of information use including: a) Information practices dimension, b) information searching dimension, c) information use dimension, d) knowledge creation dimension, e) information production dimension, f) information application dimension and g) effects of information use dimension.

Research has been done with the intention of examining the applicability of existing solitary models of information behaviour in group context (Hyldegård, 2006b; Kubmann *et al.*, 2013 and Wilson, 2010). Generally, these studies have noted that existing solitary models of information behaviour either cannot or can partially be used to model collaborative information behaviour in

group context (Hyldegård, 2006b Hyldegård, 2009a, Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013). In contrast, Shah and González-Ibáñez (2010) found that Kulthau's model of information behaviour is a reasonable model that can be used to explore various activities taking place during collaborative information search.

Preliminary review of literature has identified three major theoretical and empirical research gaps in studies of collaborative information behaviour. These gaps include lack of understanding on: a) the challenges that university students encountered when accomplishing different collaborative information behavioural activities b) how students evaluate information during collaborative learning process and c) how Wilson's (1996) model of information behaviour can be used to represent and predict different students' collaborative information behavioural activities. Table 1.1 below summarizes research gaps and identifies corresponding research questions which address the gaps.

**Table 1.1 Previous researches, research gaps and corresponding research questions**

<b>S/No</b>	<b>Previous research</b>	<b>Research gaps</b>	<b>Research questions addressing the gaps</b>
1	Spence, Reddy and Hall, 2005 Harrison, 2009	Challenges that university students encounter during collaborative learning process in a natural setting	How do undergraduates evaluate information during collaborative information seeking and use?
2	Byström, 1999, Rieh and Hilligoss, 2008 and Rieh <i>et al.</i> , 2013	How students collaboratively evaluate information in different stages of collaborative learning process	What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
	Hyldegård, 2006b, 2009 and Kubmann, Elbeshausen, Mandal, and Womser-Hacker,	Lack of understanding of the extent to which existing single models of information behaviour can be used to represent and predict different	To what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information

	2013 and Kim, 2013	collaborative information behavioural activities	sharing and use?
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## 1.11 Definition of key terms

The following key terms are defined to clarify how they are used in this study:

### 1.11.1 Collaboration

In relation to information behaviour collaboration is defined as interaction among individuals for the purpose of sharing meaning, knowledge, or information resources to accomplish common goals and solve complex problems (Iivonen and Sonnenwald, 2000). According to Shah (2008) collaboration is a complex process which constitutes multiple levels. These levels are: (a) cooperation (b) contribution (c) coordination (d) communication. Collaboration involves working together in accomplishing common goal (Hyldegård, 2006; Shah, 2008; Lee, 2013).

### 1.11.2 Collaborative information behaviour (CIB)

Collaborative information behaviour is a generic term which encompasses all implicit and/or explicit information behavioural activities in which information users interact each other either physically or remotely, to accomplish information related problem. Saleh (2012) defines collaborative information behaviour as a totality of behaviour exhibited when two or more individuals collaborate in identifying information needs, seeking, evaluating, sharing and applying information in solving a problem. Collaborative information behaviour includes other processes such as collaborative information seeking, collaborative information evaluation, collaborative information retrieval, collaborative information use and information sharing. From information sharing perspective Foster (2010) defines collaborative information behaviour as “the study of collaboration with, through, and in relation to information along with the systems and practices that support.

### **1.11.3 Collaborative information seeking (CIS)**

Collaborative information seeking is defined by Shah (2014) as an information seeking process that involves small group of people working together in collaborative project. From this definition collaborative information seeking is viewed as an information behavioural activity in which individuals work together in information related tasks to seek information that facilitate them to accomplish common goal.

### **1.11.4 Collaborative grounding**

Collaborative grounding is a sub component of collaborative information seeking. According to Hertzum (2008) collaborative grounding is a collaborative process in which collaborators are actively involved in construction of a shared understanding that assimilates and reflects available information. The ultimate goal of collaborative grounding is creation of common understanding among group members.

### **1.11.5 Information worlds**

Burnett and Jaeger's (2008) define information worlds as a social environment where people live and work, bounded together by shared interests, expectations, information behaviour and geographical or virtual proximity. There are other terms which have been used in this study interchangeably with information worlds. These terms are: (a) Information horizon (b) information ground (c) social environment. In this regards information worlds encompasses social setting in which individuals seek, share and use information for various purposes.

### **1.11.6 Library and information practitioners**

The term library and information practitioners is an umbrella term which has been used to include professionals who are actively practicing and involved in creation, preservation, conservation, organization and dissemination of information. Library and information practitioners include: librarians, information managers, records managers, archivists and information professionals.



### **1.12 Research methodology**

There are different research paradigms that are used in scientific enquiry. The main paradigms used in library and information science research are positivism, post-positivism and interpretivism (Pickard, 2007). The positivist paradigm is based on the belief that authentic knowledge originates from senses and positive verification (Premlata, 2013). This paradigm is based on realistic ontology where social reality is considered to be tangible, single and independent from researcher (Corbetta, 2003, Hjørland, 2004, Krauss, 2005 and Pickard, 2007). The post-positivist paradigm on the other hand, is based on critical realist ontology and modified dualism epistemology (Corbetta, 2003). Unlike positivism which embraces theory confirmation, post positivism embraces theory falsification where theories are considered to be provisional and open to revision.

This study is oriented towards interpretive research paradigm, where reality is understood from subjective meanings that people attach to their experiences within the contexts in which they live or work (Hennink, Hutter and Bailey, 2011). Interpretative paradigm is consistent with both the research problem and purpose of the study. It offers an understanding of the collaborative information behaviour of students within the context of their learning in the naturalistic settings. The paradigm allowed the researcher to observe and construct meanings out of interactions with human and non-human subjects (Creswell, 2002, Bashir and Afzal, 2008, Tracy, 2013).

Given the nature of the research problem, research questions and research paradigm adopted in this study, qualitative research design was found appropriate. The choice of qualitative research design enabled the researcher to observe processes, interactions and events that contribute to the understanding of students' collaborative information behaviour. The researcher used ethnographic multiple case studies research method. The use of multiple ethnographic case studies aims at collecting contextualized data enabled the researcher to conduct detailed and more authentic interpretation and hence be able to test existing model of information behaviour and develop framework for evaluating collaborative information behaviour of undergraduates. Ethnographic case study also allows the researcher to study undergraduate students while working in real life setting and hence gathered context specific data. This research method is in

compliance with the philosophical assumptions adopted in this study that require interpretative meaning from the perspective of respondents.

This study, confines itself to three public universities namely, University of Dar es Salaam (UDSM), Ardhi University (ARU) and Sokoine University of Agriculture (SUA). The study population comprised all second year BSc students in Botanical sciences and Applied zoology (UDSM), fourth year students studying B. Arch. (ARU) and second year students studying BSc. Forestry (SUA). The rationale for choosing different levels of study is that in each University students are involved in long term field works at different years of their degree programmes. The study population also includes the following persons: a) academic staff in respective schools and faculty, b) librarians and library officers in respective university libraries.

The purposive sampling techniques was used to select the sample this includes universities and subjects of study. Three universities out of thirty seven accredited universities in the country were selected. The rationale for using purposive sampling techniques is that these universities are among the oldest institutions in the country. They are well established in the areas of teaching, research and consultancies and for many years they have provided extended group based field assignments to some of their students. The Purposive sampling technique was used to select academic units within the universities. This technique was also used in selecting undergraduate degree programmes within selected academic units as well as groups of students. The researcher purposively selected these academic units and their corresponding undergraduate degree programmes as they provide extended group based field works for their students. In addition the same sampling technique has been used to select faculty members. These include members who are responsible for the supervision of students' group work and librarians who provide services to this cohort of undergraduate students. The purposive approach ensured that rich information sources and key informants who have great deal of knowledge are included in the study.

Triangulation of methods was used to collect data. These methods included a) semi participant observation, b) focused group discussion, c) face to face interview and review of related literature. The Semi Participant Observation Method was used to observe various group work

activities by undergraduate students in the field. Focus group discussion was conducted with groups of undergraduate students during the last week of their field work. This method was intended to clarify some issues, events and behavioural practices that were noted during the observation process. Face to face semi structured interview was used to collect data from faculties supervised students' group field work and reference or readers' service librarians from respective university's libraries. Triangulation of data collection techniques yielded rich and in-depth data. This data enabled the researcher to provide both analytic generalization and conclusions.

Data analysis process involved three levels namely: Preliminary data analysis, detailed data analysis and cross case studies data analysis. Data analysis process was also interwoven with interpretation of research findings. The research findings included a comparison of observed phenomena with the existing literature and theoretical lens. Data collected from interview, focus group discussion and observation were transcribed and typed using Microsoft Word Processing. The transcripts were then imported to Nvivo10 for Qualitative Data Analysis. This was followed by coding and creation of themes and the presentation of the findings in narrative, episodes and cases format. Vignettes, quotes, figures and photos were used to support and illustrate different cases, issues and points.

Different measures were taken to ensure both trustworthiness and dependability of research findings. These include the use of replication logic in multiple case studies, appropriate selection of sample that best represents the knowledge of research topic, prolonged engagement with research subjects in the field and accurate interpretation and presentation of research findings. The interview guide was tested using faculties previously involved in supervision of students' field work and librarians of respective university libraries. Similarly, focused group discussion guide was pretested to two groups of students who previously participated in fieldwork. These include one group from SUA and one group from UDSM. Due to the flexibility of the observation method, the observation guide was modified as the observation process continued.

Ethical standards and various ethical measures were observed. These measures included: a) informed consent during research process, b) avoidance of any kind of harm to the subjects of research, c) maintenance of confidentiality and anonymity and d) abiding by the principle of reciprocity where both researcher and respondents are to benefit from the study.

### **1.13 Structure of the thesis**

This thesis is organized in seven chapters. Chapter one provides a brief introduction of the study, chapter two outlines theoretical framework covering theories and models of information behaviour in general and collaborative information behaviour in particular.

Chapter three is dedicated to a review of related literature organized along the line of main thematic areas reflecting key research questions, variables derived from the related theories and models of human information behaviour and broader issues related to the topic under investigation.

Methodological and philosophical issues related to this study are discussed in chapter four. These include research paradigm, research design and research method. The chapter also discusses population of the study, sampling procedures and sample size, data collection methods, ethical issues, trustworthiness and dependability.

Chapter five discusses data analysis procedures and presentation of the research findings. Chapter six discusses and interprets research findings using relevant theories, models and literature. Chapter seven provides a summary of the key issues discussed including the research problem, objectives of the study, key findings, recommendations, study contributions and suggestions for further areas of research.

### **1.14 Summary of the chapter**

This chapter introduced the study of collaborative information behaviour of undergraduate students in the domains of natural sciences and applied science in selected universities in Tanzania. The chapter includes the following sub-sections: introduction, statement of the

research problem, research questions, limitations and scope of the study, significance and contributions of the study and theoretical framework. Other sub-sections include: an overview of literature review, research gaps, research methodology, structure of the thesis and summary of the chapter.

## CHAPTER TWO: THEORETICAL FRAMEWORK

*“Ultimately, a theory will only be a genuine scholarly and social value if it is used ... through applications in various scholarly contexts.”* (Burnett and Jaeger, 2008:143).

### 2.1 Introduction

The purpose of this study is to investigate Collaborative Information Behaviour (CIB) of undergraduates in selected universities in Tanzania. The selected universities are University of Dar es Salaam (UDSM), Ardhi University (ARU) and Sokoine University of Agriculture (SUA). The following research questions are addressed:

- What are the information needs of undergraduates working on collaborative learning assignments?
- What sources of information do undergraduates use when seeking information to accomplish group learning assignments?
- What factors shape information behaviour of undergraduates working in collaborative learning tasks?
- How do undergraduates share information when engaging in collaborative learning tasks?
- How do undergraduates evaluate information during collaborative information seeking and use?
- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
- To what extent is Wilson’s (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

There are wide varieties of models, and theories of information behaviour that have been developed and used to model various studies of human information behaviour. This chapter does not intend to provide an extensive and exhaustive review of all models and theories of human information behaviour but, rather discusses few selected theories and models relating to the

objectives of the study. Two theories of information behaviour have been discussed. These theories are Sonnenwald's (1999) theory of information horizon Jaeger and Burnett's (2010) theory of information worlds. The chapter also reviews six models of individual and collaborative information behaviour. Individual based models are Wilson's (1996) general model of information behaviour in Wilson and Walsh (1996) and Niedźwiedzka's (2003) general model of information behaviour. The discussion also includes four newly established models of CIS and CIB. These include : a) Reddy and Jensen's (2008) model of collaborative information behaviour in context, b) Shah's (2008) model of collaborative information seeking behaviour, c) Karunakaran, Spence and Reddy's (2010) model of collaborative information behaviour, d) Yue and He's (2009) model of understanding collaborative information behaviour in e-discovery. Rationale for selecting these models and theories vary. First, models of CIS and CIB have been chosen to provide theoretical, conceptual and terminological discussions of various stages and processes in collaborative information behaviours. Second, Wilson's (1996) model and Niedźwiedzka's (2003) model are among the general models of human information behaviour. The models present wider applicability as they describe various aspects of human information behaviour. In addition to these models, this study focuses on multiple aspects of collaborative information behaviour including: shared information needs, collaborative information seeking, information sharing and use. Sonnenwald's (1999) theory of information horizon and Jaeger and Burnett's (2010) theory of information worlds describe information behaviour from the contextual dimension which is also the focus of this study. These theories also have variables that relate to the research questions and objectives. The theoretical framework used for this study is Burnett and Jaeger's (2008) theory of information worlds. This theory is associated with the main objective and specific research question addressed by this study. A detailed description of the theory of information worlds and its relationship to the research objectives and questions is provided in section 2.3.8.

The chapter begins with conceptual and terminological discussion where three key concepts: theory, model and theoretical framework are discussed. This is followed by a thorough discussion of the use of theories and models in research. The chapter also presents detailed

review of various theories and models of information behaviour that relate to the current study. Finally, a summary of key issues discussed in the chapter is presented.

### **2.1.1 Theory, model and theoretical framework**

Etymologically, the term theory originates from the term "*theoria*" which was used in ancient philosophical writings, particularly writings of Greek philosophers. Initially the term "theoria" was literally used to mean watching or looking at (Rutherford, 2012). In the works of Plato and Aristotle, the term "*theoria*" was used to mean activity of intellect of higher value (Bonazzi, 2009), speculative freedom", "higher vision or knowledge" (Nightingale, 2004) or "pure contemplation which remains bound only to its object in its fullness and in its demands" (Bestegui, 2005:26).

In modern times, the meaning and even the use of the term theory in research is highly contentious (Gorman and Clayton, 2005, Ellis and Swoyer, 2008). In a logical positivist view for example, which is still a predominant paradigm in natural and applied science, a theory is defined as an axiomatized deductive system that consists of few basic principles and law (Ellis and Swoyer, 2008). In social science, a theory may be defined as a "system of assumptions, principles, and relationships posited to explain a specified set of phenomena" (Bates, 2005:2).

In the field of library and information science, the term model is used to refer to graphical description of actual or theoretical relationships and interactions among users of information, information, the environment or context in which information practices are taking place and tools used to access, acquire and share information (Wilson, 2009). The relationships between models and theories have been discussed extensively in previous studies (Wilson, 1999, Bates, 2005, Wilson, 2005, Jamali, 2013). Wilson (2012) holds that models are not theories though, sometimes in an attempt to explain phenomena models may incorporate theories. In human information behaviour studies, models and theories are used to assist researchers in unveiling different factors that influence human information behaviour (Jamal, 2013). Both models and theories of information behaviour play an important role in enriching our understanding of phenomena (Bates, 2005).



There are different types of models of information behaviour that have been developed over years. Some models focus on sub-sets of information behaviour such as information seeking behaviour (Leckie *et al.*, 1996), information searching (Evans and Chi, 2008) and information retrieval (Spink and Wilson, 1999). Other models focus on general aspects of information behaviour (Wilson, 1996, Niedźwiedzka, 2003 and Godbold, 2006).

Models are also clustered and based on the perspectives towards human information behaviour. In this taxonomy, there are models which describe information behaviour from a collaborative perspective (Shah, 2008 and Reddy and Jensen, 2010) and those which focus on individualistic perspective (Wilson, 1981, Marchionini, 1995, Wilson, 1996 and 1999). Wilson (2005) on his account of evolution of models of human information behaviour classifies models into four categories: descriptive, cognitive-psychology, stage process and casual models.

Theoretical framework is described as a thread that gives coherence to each part of a research. It begins with the research problem to be investigated, research questions to be asked, types of literature to be reviewed, methods and methodology, data analysis, discussion and conclusion (Merriam, 2009, Alkin and Wallece, 2012). Ocholla and Le Roux (2011) argue that theoretical framework provides a lens through which a researcher examines a particular aspect of study. Theoretical framework facilitates both practical and theoretical aspect of research. Having a theoretical framework in research is considered as the “mark of research seriousness and respectability” (Pettigrew and Mckechnie, 2001).

### **2.1.2 The role and importance of theory in research**

The questions whether theory should be used in research and what role the theory should play in research have been the matter of debate that reflects not only nature of fields of study, but also methodological, ontological and epistemological differences underlying research practices. The choice of theory to be used in research and how it should be used is highly influenced by underlying research paradigm (Babbie, 2012). Research paradigm provides frame of reference used to organize our observations and reasoning while, a theory explain and guide our observations (Babbie, 2012).

In qualitative research, the role of theory in research varies considerably (Creswell, 2009). There are different perspectives that explain the role of theory in research and the relationship between theory and research. Theory provides parameters for studying and analyzing phenomena. This helps the researchers to understand and interpret observed events (Gorman and Clayton, 2005 and Creswell, 2009). Theories are used to a) predict events, b) provide logical explanations of observed patterns, shape and direct research efforts and c) provide background information for empirical analysis (Babbie, 2012). From research paradigm perspective, Pettigrew and McKechnie (2001) describe the relationship between theory and research. The theory guides a researcher to approach a world with a set of ideas (ontology) that specifies set of questions (epistemology) that are examined in specific ways (methodology).

Dobson (1999) proposes four approaches to the use of theories in interpretative, in-depth case study. These approaches are: no theory or grounded theory approach, single theory approach, multiple theory approach and context dependent approach. In grounded theory approach, researcher uses no pre-defined theory at the initial stage, but on the contrary a theory is developed inductively from the data collected in the field (Dobson, 1999). The rationale for not using theories at the beginning of a research process is to avoid the potential of a theory to “contaminate” research (Dobson, 1999) and enable researcher to focus on empirical world rather than abstract world (Dobson, 1999, Selden, 2005). This approach is criticized for being theoretical insensitive (Selden, 2005) and for forcing researchers to investigate virtually everything related to the situation under study (Dobson, 1999). Despite these criticisms, this approach has been widely used in a number of qualitative studies in Library and Information Science (Gonzalez-Teruel and Abad-Garcia, 2012, Vasconcelos, Sen, Rosa and Ellis, 2012).

The second approach is a single theory approach where a theory is used at the beginning of a research to guide a study. The theory approach is influenced by factors such as: researcher’s intellectual familiarity to the theory, preferences and emotional attachment to the theory as well as the extent to which the theory is authentic and meets the objectives of a study (Dobson, 1999). The third approach involves the use of multiple theories. This approach allows researchers to use multiple theories as there is no best, correct or incorrect theory. Each theory provides a different

and not necessarily a better perspective on similar phenomenon (Dobson, 1999). The last approach is Context dependent or Realistic approach. This approach suggests that in each scientific enquiry there are best theories. The choice of a theory to guide a research should be based on reality and nature of research (Dobson, 1999). In library and information science, different approaches have been used including grounded theory approach (Musoke, 2007 and Dancan and Holtlander, 2012), single theory approach (Seyama, 2009) and multiple theory approach (Hyldegård, 2006a). The choice and rationale for using different theoretical approaches in library and information science reflect both the interdisciplinary and multidisciplinary nature of the field.

## **2.2 Theories and models of information behaviour**

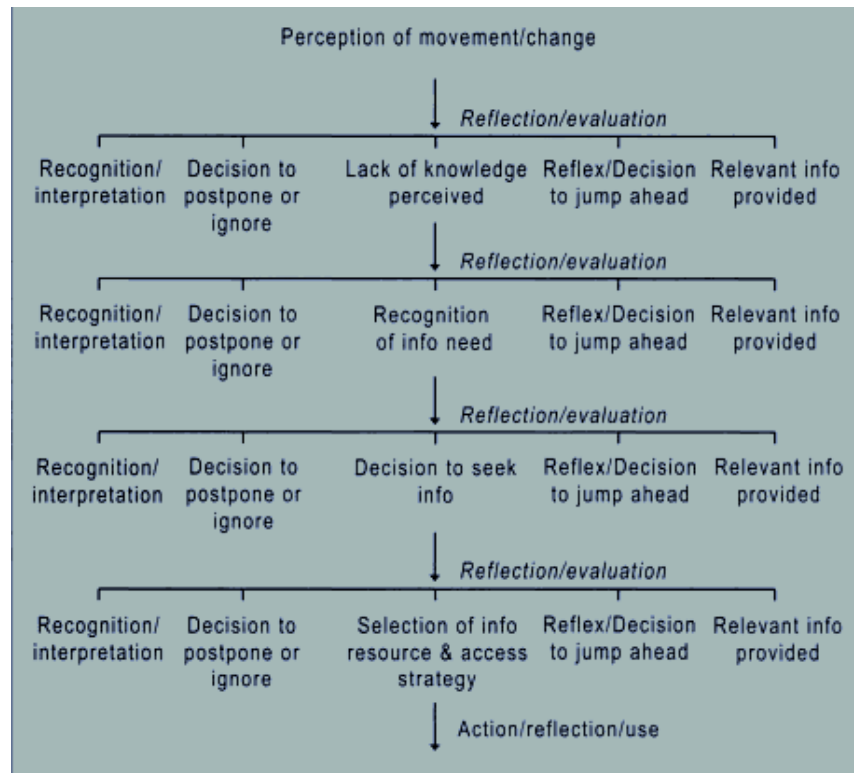
Different models and theories of information behaviour have been developed to explain actual or theoretical relationship or ideal interaction with information (Wilson, 2005). The following section reviews specific theories and models of information behaviour that relates to the problem and objectives of the study.

### **2.2.1 Sonnenwald's theory of information horizon**

Theory of information horizon was developed by Sonnenwald (1999). The theory provides a theoretical framework for studying human information seeking and use behaviour in context (Sonnenwald, 2005). The theory has been built upon the foundation of different discipline including information science, psychology, sociology and communication (Sonnenwald, 1999, 2005).

The theory of information horizon is based on three fundamental concepts and five propositions. The key concepts are: context of information behaviour, situations of the context and social networks (Sonnenwald, 2005). Sonnenwald (1999) defines context of information behaviour as a multidimensional entity that provides source of meanings to human information behaviour or the quintessence of a set (group) of past, present and future situations. Contexts of information behaviour are not distinctive entities, as individual may experience multiple contexts at a time. Examples of contexts include a university, academia, military or family. Figure 2.1 below

illustrates processes of reflections and different stages of information behaviour processes including perception of lack of knowledge, recognition of information needs, decision to seek and selection of information sources.



**Figure 2.1: (Source: Theory of information horizon, Sonnenwald, 2005)**

The theory holds that within each context there are multiple situations which include set of related activities that occur over certain period of time (Sonnenwald, 2005). Situation of the context is an attribute of context of information behaviour which all together influence information behaviour (Sonnenwald, 1999). Examples of context of situation include: information seeking situation, information sharing situation or task situation. The concept social network has been also used in the theory to mean communication among individuals, in particular, patterns of connection and resonance interaction (Sonnenwald, 1999, Tsai, 2010). There is a reciprocal relationship between three concepts of context, situation and social network, where social network helps construct situations and contexts, and at the same time social networks are constructed by situations and contexts (Sonnenwald, 1999).

The theory of information horizon is also build on five propositions. The first proposition suggests that “human information behaviour is shaped by, and shapes individuals, social networks, situations, and contexts” (Sonnenwald, 2005: 192). Based upon this proposition the theory insists on the importance of context and situation in determining information needs. Additionally, the role of information horizon in facilitating identification and exploration of information needs (Sonnenwald, 2005).

The second proposition states that individuals or systems within a particular context and situation may perceive, reflect or evaluate changes in others, self or environment concerning lack or gap in knowledge (Sonnenwald, 1999, 2005). The process of reflecting and evaluating changes result into further actions. These actions include ignoring changes, interpretation of changes or recognition of lack of knowledge about the changes (Sonnenwald, 1999). Human information behaviour is described as a process that involves reflection and evaluation at different stages of information behaviour activities. The activities include identification of lack of knowledge, recognition of information need, decision to seek and use information.

The third proposition suggests that, within a context and situation there is an information horizon in which we act. The concept information horizon or information sources horizon is defined as a mental imaginary map in which individual positions various information sources according to personal preferences (Sonnenwald, 1999; Tsai, 2012). Information horizon is populated with information sources. These sources include documents, web pages, and information retrieval tools, individuals such, as colleagues, subject experts, librarians, information brokers, as well as experimentation and observation of the world (Sonnenwald, 1999, 2005; Sonnenwald, Wildemuth and Harmon, 2001). Information horizon is shaped by social factors such as societal norms and beliefs as well as individual factors such as personal knowledge and preferences about information sources (Pálsdóttir, 2005). Depending on individual or group preferences, information horizon can be divided into centre or peripheral. This division depends on whether an information horizon is populated with relevant or less relevant information sources respectively. Information horizon can also be dynamic if it is constructed from a problem or

situation that people are dealing with at a particular time or stable if information is judged independent from the situation (Pálsdóttir, 2005).

The fourth proposition states that human information behaviour may be ideally viewed as collaboration among individuals and information sources, including people, bounded by individual information horizon (Sonnenwald, 1999, 2005). Collaboration is essential for sharing both meaning and resolution of lack of knowledge. It involves reflexive interaction and reflective provision of information (1999). The fifth proposition states that information horizon may be conceptualized as densely populated spaces with potentially usefully information resources. This includes, social networks, documents, information retrieval tools and experimentation and observation in the world (Sonnenwald, 2005).

The theory of information horizon is comprehensive in that it embraces various aspects of human information behaviour. The behaviour entails: knowledge gap, information need, information exploration, information seeking, information filtering, information use and information sharing. Such broader focus of different aspects of human information behaviour makes the theory of information horizon rich not only in concepts and variables, but also in its application to the different contexts. The theory has been used in number of studies including Goggins and Erdelez (2010) who studied collaborative information behaviour in completely online group and Tsai (2012) social network in the information horizon of college students. Other studies include Sonnenwald, Wildemuth and Harmon (2001) and Pálsdóttir (2005).

The theory distinguishes between perception of lack of knowledge and information need where lack of knowledge creates information need. Sonnenwald (1999) further argues that an individual may perceive lack of knowledge yet may not take any action to satisfy the need. Such argument, though not explicitly discussed by Sonnenwald (1999, 2005) corresponds to Folkman's (1984) stress copying theory which has been used by Wilson (1996) to explain the link between information need and information seeking. Similarly, the theory could be used in research to explain why some knowledge gaps do not result in information needs. The strength of the theory is that it integrates both cognitive and social perspectives in understanding human information

behaviour (Tsai, 2012). The theory states that reflection and evaluation of changes which might lead to identification of information requirements is motivated by both personal factors such as uncertainty and confusion as well as influences from environment and other members within social network.

In relation to this study, both the variables and the prepositions of the theory directly relate to collaborative information behaviour. The three basic concepts of context of information behaviour, situations of the context and social networks that this theory addresses are also main concepts in studies of CIB. Furthermore, four out of five propositions of this theory are directly related to collaborative information behaviour. The first proposition views human information behaviour as a process. This process is influenced by individual as well as, social networks, situations, and contexts. Also the concept information horizon, used in the third and fifth propositions, resembles the concept information world in which information behaviour of individuals is defined and shaped. The fourth proposition describes human information behaviour as collaboration among individuals and information sources. This includes people who are, bounded by individual information horizon. Such conceptualization also fits studies of human information behaviour in group context.

The theory of information horizon (Sonnenwald, 1999) emphasizes a) the importance of evaluation of information sources and process, b) the importance of understanding multidimensional nature of context and its influence on information behaviour, social norms and c) the role of social networks in information sharing. In relation to this study, the theory of information horizon addresses the following research questions:

- What factors shape information behaviour of undergraduates working collaboratively in academic settings?
- How do undergraduates share information when engaging in collaborative learning tasks?

- How do undergraduates evaluate information during collaborative information seeking and use?

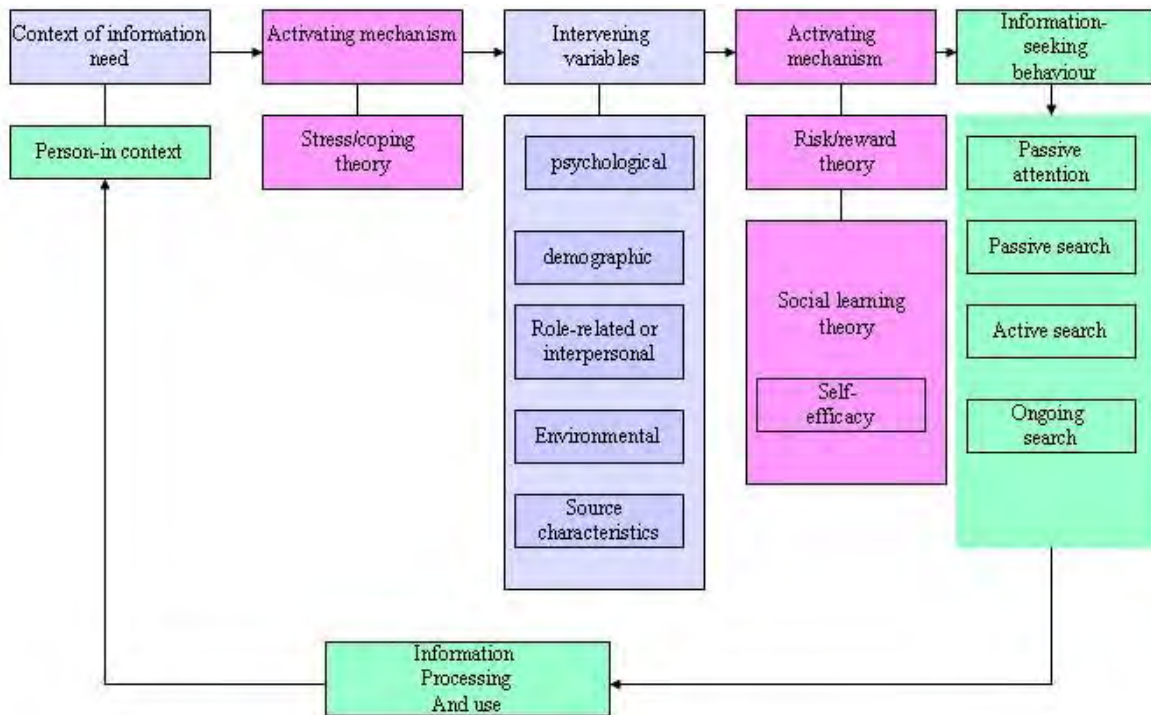
Despite its comprehensiveness and strengths, theory of information horizon has limitations. Sonnenwald (1999, 2005) separates information sources from the “social network.” Tsai (2010) suggests the term network should be used instead of social network as it includes both individuals and information resources within information horizon. Huvila (2008) criticizes the notion of information horizon as it does not provide a broader picture of information behavioural activities. Huvila (2008) proposes the use of the concept “work horizon” which is more inclusive and includes other concepts such as information work horizon, context of work as well as, individuals and shared information behaviour contexts and situations.

### **2.2.2 Wilson’s (1996) model of information behaviour**

Wilson’s (1996) model is a general and interdisciplinary model of information behaviour. The model is based on the review of Wilson’s (1981) model of information seeking behaviour, empirical studies and review of other studies from different fields such as Personality in Psychology, Consumer Behaviour, Innovation Research, Health Communication Studies, Organizational decision-making and Information Science (Wilson and Walsh, 1996).

The model pictures the cycle of information activities from the rise of information need to the phase where information is being used (Niedźwiedzka, 2003; Preez, 2008). Wilson (1997) argues that information need is influenced by different factors including an individual himself as well as context of the situation in which an individual lives or works (Niedźwiedzka, 2003). Individual information users and context of information need are central to the understanding of information behaviour. The model also introduces sets of variables that influence the recognitions of information need and decisions to take actions to satisfy or not to satisfy information needs. Figure 2.2, below depicts Wilson’s conceptualization of context, process and actions related to human information behaviour.





**Figure 2.2: Wilson’s (1996) model of information behaviour (Source: Wilson, 1997)**

According to this model there is an intermediate stage between identification of information need and information seeking action. Folkman’s (1984) stress copying theory provides theoretical explanation on activating mechanisms that link information needs and decisions to satisfy information need (Wilson and Walsh, 1996 and Mughairi, 2006). Wilson and Walsh (1996) state that not all information needs result in action to satisfy them. On the contrary, the level of stress that an individual experiences is a motivating factor for user to either upon perceived information need or not (Wilson, 1997). The bigger the stress, the bigger the motivation to look for information (Niedźwiedzka, 2003).

The model has introduced sets of variables that may promote or hamper an individual from engaging on information seeking. These variables are psychological factors such as: desire to be curious and demographic variables such as age, level of education and economic status. There are also work-related or interpersonal variables. There are environmental variables which include national culture, geography and time and sources characteristics variables which include access and credibility of information sources (Wilson and Welsh, 1996).

Based on the decision to seek or not to seek information to satisfy information needs, Wilson's (1996) model uses Settle and Alreck's (1989) risk/ reward theory and Bandura's (1977) social learning theory. Influenced by consumer research, Wilson (1996) associates decision to seek information with risks or reward theory, where individual engages in information seeking if there are more physical or psychological gains. Bandura's (1977) social learning theory, including self- efficacy theoretical construct has been used to explain how information seeking may take place for the desire to improve one's sense of mastery in coping with some problems (Wilson and Welsh, 1996).

Wilson's (1996) model views information seeking as repetitive, planned and serendipitous, process. The model provides four modes of information seeking behaviour ranging from passive attention, passive search, active search and ongoing search. During passive attention, information acquisition may take place without any intention. In passive search some behaviour such as browsing may lead to the acquisition of information which is relevant to individual (Mughairi, 2006; Preez, 2008). On the other hand, active information search involves deliberate search for information. While, ongoing search is an occasional search which is done with the purpose of expanding or updating one's framework of ideas, beliefs of values (Wilson, 1996).

As part of information behaviour circle of information, this model has included two stages of information processing and use. Information processing is defined by this model as incorporation of information into user's framework of knowledge, while information use involves application of the knowledge to solve a problem or information need (Wilson and Walsh, 1996). The model points out that availability and accessibility of information sources does not quarantine absorption of information into user's framework of knowledge, belief and values (Wilson and Welsh, 1996).

Wilson's (1996) incorporation of different theoretical constructs that explain various information behavioural patterns makes the model a rich source of variables and hypothesis (Wilson, 1999) and applicable in wide range of contexts. This model views information behaviour as the "totality of human behaviour in relation to sources and channels of information, including both

active and passive information seeking, and information use” (Wilson, 2000:49). Such definition can be used in collaborative context as well. In exploring human information behaviour, Wilson’s (1996) model not only recognizes the importance of individual factors, but also social and environmental factors (Hyldegard, 2006a; Saleh, 2012). These factors, which are neither affective nor cognitive, can be used in understanding collaborative human information behaviour. There are other information behavioural processes that are described in this model which are also part of CIB. These include: information seeking, information processing and information use.

As indicated in subsection 1.4, one of the objectives of this study was to examine the applicability of Wilson’s (1996) model of information behaviour in collaborative context. The reasons for choosing Wilson’s (1996) model are threefold: First, the model is comprehensive as it consists of different components of information behavioural activities. Also, Wilson’s (1996) model incorporates information behavioural process described in other models including Erdelez's (1997) 'information encountering' which is described by Wilson and Walsh (1996) as passive attention mode and active search mode which is similar to Ellis's (1989) information seeking. Such broader view of information behaviour is in conformity with the focus of the current study which focused on different aspects of students’ collaborative information behaviour including: a) information needs, b) collaborative information evaluation, c) collaborative information seeking, d) information sharing, e) information use.

In addition, the model has different variables which correspond to the research questions addressed in this study. The following research questions correspond to the variables and information behavioural processes discussed in Wilson’s (1996) model of information behaviour.

- What factors shape information behaviour of undergraduates working collaboratively in academic settings?
- What factors shape information behaviour of undergraduate students working in collaborative learning tasks?

- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?

Third, the model has been used by Hyldegard (2006a) in exploring collaborative information behaviour in group context, particularly on factors affecting information behaviour in group based settings. Other studies that use this model are Niedźwiedzka, (2003), Mughairi, (2006), Preez, (2008) and Chiware, (2008). Despite the fact that the model has evolved over 40 years and been used in number of studies, little attempt has been done to test its applicability in the context of group learning tasks.

Just like many other models of information behaviour, Wilson's (1996) model of information behaviour is also context sensitive. From the ontological perspective Wilson's (1996) model views context of information behaviour as a "constructed meaning" which is understood from information user or person-in-context point of view. This approach views context of information behaviour as a set of "centric layers" including physiological, cognitive and affective needs, together with individual roles and social, cultural, political and physical environment (Courtright, 2007). Such approach is criticized for failure to account for the complexity, variability and mutual interactions of other factors such as, social network and nature of organization in which individual lives. The approach is also criticized for providing linear trajectories where external and internal factors influence individuals as they progress during information seeking and using process (Courtright, 2007).

Likewise, Wilson's (1996) model is "seeker-centric" as it focuses on information user who is external from information provider (Niedźwiedzka, 2003 and Davies and Williams, 2013). Niedźwiedzka (2003) criticizes Wilson's (1996) model for being limited to the context where information user seeks information personally and not through mediators. Despite the fact that this criticism seems to be convincing, Niedźwiedzka (2003) also overlooks the fact that information behaviour may not only involve mediators seeking information personally, but also individuals who work collaboratively to define information need, seek information, evaluate and use information to solve a problem.

Critics of this model including Niedźwiedzka (2003) states that information behavioural is a generic term that include sub-sets such as a) identification of information needs, b) information seeking and c) using; Therefore, activating mechanisms should apply in all these stages rather than on information seeking only. There are factors that could affect the use of information. These factors include perceived usefulness, affordability of information sources and even the influence of other people including peers, information mediators or seniors. The model does not provide theoretical explanation or suggest motivating factors that influence decision to process and use information.

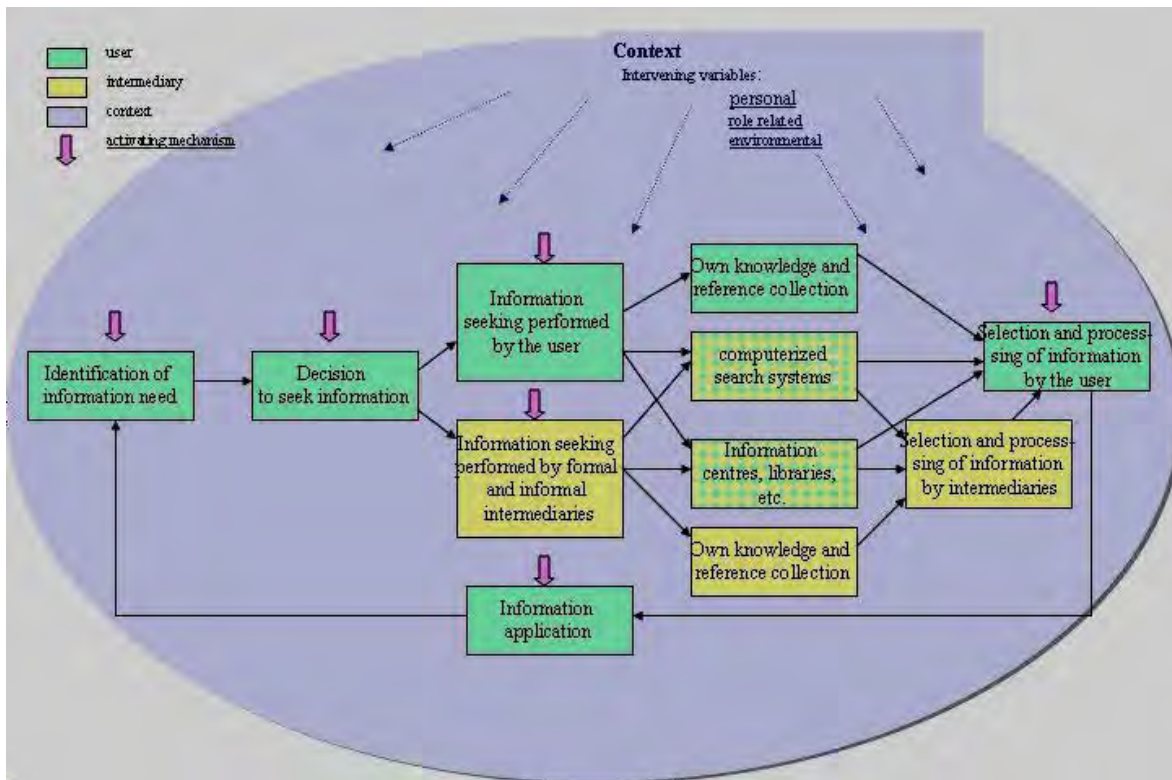
### **2.3.3 Niedźwiedzka's (2003) general model of information behaviour**

Niedźwiedzka's (2003) general model of information behaviour was developed as a critique and complement Wilson's (1996) general model of information behaviour. The model was developed from two empirical studies of policy makers and health managers (Niedźwiedzka, 2003). Niedźwiedzka's (2003) model includes different information behavioural sub-sets such as, information need identification, information seeking and information application.

According to this model, information needs of the same person may vary depending on changes in environment, individual roles, characteristics of both formal and informal information sources (Niedźwiedzka, 2003). According to Niedźwiedzka (2003) the graphical representation, shown on figure 3, is a "compact" description of the totality of information behaviour that includes the variables, the context of users and different user categories. In figure 3, the context of information behaviour and the user context are linked to the information behaviour processes through activating mechanisms. These activating mechanisms influence information behaviour in different stages from the identification of information needs to the application of information.

Niedźwiedzka, (2003) further indicates two strategies of seeking information that is, seeking information by delegation, (Richmond, 2013) or seeking information personally. Based on the two searching strategies, the model categorizes information users into three types: independent user, semi-independent user and dependent user.

Niedźwiedzka, (2003) insists on the use of intermediaries in information seeking. Such dependence of intermediaries in information seeking may influence both the choice of information sources and evaluation of information. This is in line with research question number two. This question seeks to understand sources of information undergraduates use when seeking information for academic group assignments and question number five which focuses on information evaluation process. A graphical presentation of Niedźwiedzka's, (2003) general model of information behaviour is presented in figure 3.3 below:



**Figure 2.3: Niedźwiedzka's (2003) general model of information behaviour Source: Niedźwiedzka, 2003)**

Unlike Wilson's (1996) model of information behaviour, this model shows that activating mechanisms are not limited to information seeking behaviour. In contrast, they occur in all stages, from identification of information need to the use of information. The model further challenges the way different theories has been integrated and presented in Wilson's (1996) model. Niedźwiedzka (2003) replaces the theories with specific concepts such as 'stress',

'perception of risk', 'hope for reward', 'perceived level of self-efficacy. Niedźwiedzka (2003) argues that her model is comprehensive and applicable in a broader range of users, but at the same time the author admits some shortcomings of her model. Niedźwiedzka (2003) holds that:

*“...the model is still far from perfection and completeness. It does not present all aspects of information behaviour...”* she further holds that, *“It can be also argued that the model is not really universal, since it does not include incidental information seeking or information encountering (Wilson passive attention), which definitely are ways of information acquisition”* (Niedźwiedzka, 2003).

It is worth to emphasize that Niedźwiedzka's, (2003) general model of information behaviour was built on the foundation of Wilson's (1996) model of information behaviour. When comparing this model with Wilson's (1996) model of information behaviour, it is apparent that Niedźwiedzka's (2003) model of information behaviour seems compact and less inclusive. The model does not describe all aspects of information behaviour including different modes of information seeking and searching as presented in Wilson's (1996) model. In addition, Edwards, Fox Gillard, Gourlay, Gueven, Jackson, Chambers and Drennan (2013) criticize Niedźwiedzka (2003) model for not acknowledging the key role of group decision making process in information behaviour. Edwards, Fox Gillard, Gourlay, Gueven, Jackson, Chambers and Drennan (2013) argue that information seeking and use are more likely to occur in groups and, the nature and composition of group members has implication on information behaviour. These include type of information needed, sources to be consulted, and who has to search for it.

The classification of information users into independent, semi independent and dependent users is problematic. Dependent information users according to Niedźwiedzka (2003) are those who entirely depend upon intermediaries and they only act independently at the stage of mental processing of information. On the other hand, independent users entirely depend on themselves to identify information needs and seek information. Information seeking and use however, can neither be completely dependent or completely independent. In many cases, individuals in

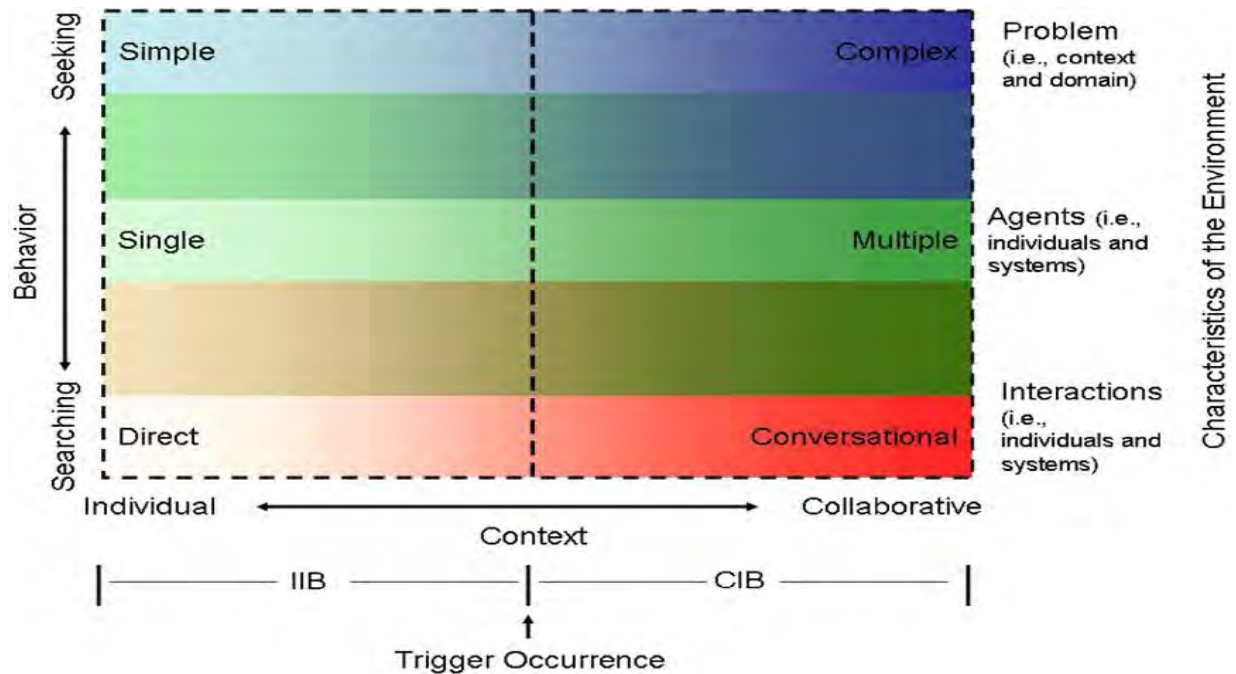
different levels collaborate with information professionals, peers or co-workers when seeking, using and sharing information.

The model assumes a sequential path in the information behavioural process. Edwards, Fox Gillard, Gourlay, Gueven, Jackson, Chambers and Drennan (2013) argue that information seeking is cannot be considered a sequential process which begins with identification. The decision to search information either by an individual or with the help of intermediaries, and the process of filtering, processing and finally using information described in the model is oversimplification of the actual information behavioural process (Edwards, Fox Gillard, Gourlay, Gueven, Jackson, Chambers and Drennan, 2013). On the contrary, information behavioural process is an ongoing complex, which sometimes does not have apparent pattern.

#### **2.3.4 Reddy and Jensen's (2008) model of collaborative information behaviour**

Reddy and Jensen's (2008) model of collaborative information behaviour is a domain specific model, which was developed from two medical studies conducted in the surgical intensive care unit and emergency department. Reddy and Jensen (2008) defined information behaviour in the context of information environment. This model consists of behaviour axis, context axis and agents of information which include humans and non-humans. Behaviour axis is a spectrum of behavioural activities ranging from information searching to information seeking and use. Context axis consists of individual or collaborative information behavioural contexts (Reddy and Jansen, 2008). In figure 2.4 below, Reddy and Jensen (2008) describe a complex nature of collaborative information behaviour. Collaborative information behaviour is described in the broader context of information which comprises a number of components. These include individual information context, collaborative information context, human information behavioural axis and the characteristics of information environment.





**Figure 2.4: Reddy and Jansen's (2008) model of collaborative information behaviour**  
**(Source: Reddy and Jensen, 2008)**

The following research questions are addressed and reflected in this model: What are the information needs of undergraduates working in collaborative academic assignments? What factors shape information behaviour of undergraduates working collaboratively in academic settings? And to what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

According to this model, the decision to engage on collaborative information behavioural activities is triggered by complexity of information need and complex information domain in which multiple areas of expertise are needed. These factors are also unique characteristics that differentiate individual information behaviour from collaborative information behaviour. Individual information behaviour suggests that interaction between individuals or individual and information system is directional. On the other hand, collaborative information behaviour interactions are conversational in character (Reddy and Jensen, 2008). The model also stresses the importance of communication, which is describe as a mechanism for sharing information and the context of information work (Reddy and Jensen, 2008). Successful collaborative information

activities are also built upon effective coordination of activities and trust among collaborators (Reddy and Jensen, 2008).

Reddy and Jensen's (2008) model of CIB discusses key concepts and processes that relate to the objectives of this study. The model discusses core processes in CIB including collaborative information need, collaborative information seeking, information sharing and use which is the focuses of this study. Furthermore, the concept of information environment, like information world and information horizon, not only defines rules but also determine how individuals collaborate, what sources of information to use and how to use them. Such concepts, which set demarcation, are essential in understanding collaborative information behaviour in specific context.

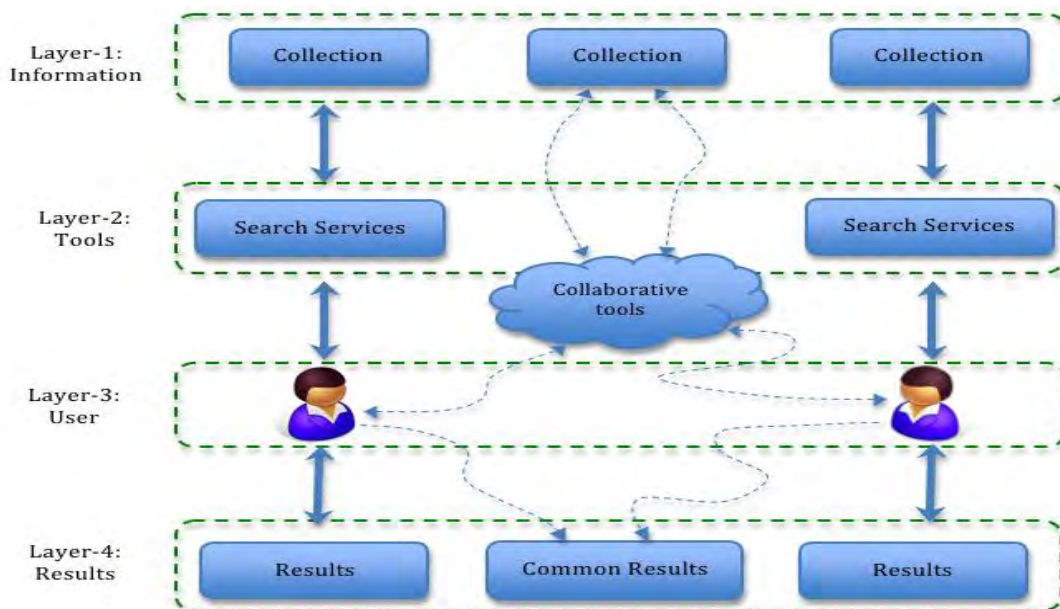
According to Reddy and Jansen (2008) collaborative information behaviour comprises a set of complex interactions between people and technology. This idea might not be the reflection of what is happening in all collaborative information activities. While one cannot underscore the role of technology in collaborative information behaviour, it is also important not to exaggerate its role. The degree to which individuals interact with technology during collaborative information activities depends on a number of factors. Such factors include: the nature of collaborative work, setting in which collaborative activities are taking place and proximity in which participants are geographically co-located or dispersed.

In terms of the relationship between information behavioural activities and context, this model emphasizes the contextual stability in which context is defined as objective reality. This can be conceptualized independently of the activities of the participants (Courtright, 2007). Critics of this approach argue that, such objectivist view of context of information behaviour has failed to explain variability in information practices among different actors within similar context. It has also failed to provide a link between different contextual factors to particular information practices. Reddy and Jansen (2008) developed this model with intention of addressing the dearth of knowledge. This knowledge refers to the relationship between individuals and collaborative information behaviour in an organization context. It can be argued that the contents and

graphical representation of the model make it suitable for examining the factors that trigger individuals to engage in collaborative information behaviour rather than modelling various collaborative information practices.

### 2.3.5 Shah's (2008) model of collaborative information seeking behaviour

Shah's (2008) model describes information seeking behaviour from a collaborative perspective model of collaborative information seeking behaviour. This model of CIS is focused on five aspects: a) information access, b) collaborative information searching, c) collaborative information retrieval, d) information organization and use. Collaborative information seeking which includes: collaborative information searching and retrieval, is described as, an intentional and interactive process where users with common information needs, collaborate using traditional or collaborative tool to achieve personal and common information goals (Shah, 2008; Shah, 2010a). Figure 2.5 below illustrates interactive and collaborative nature of CIS. The figure shows how individuals with similar information needs use collaborative information tools, to seek and share information. The figure presents typical CIS in online environment.



**Figure 2.5: Shah's (2008) model of collaborative information seeking behaviour (Source: Shah, 2008)**

The model places collaborative information seeking behaviour in a broader collaborative perspective alongside communication, contribution, coordination and cooperation (Shah, 2008, 2010a). The structure of the model is based on four layers namely: information, tools, users and results. The first layer is made up of information sources of different formats. The second layer is a mediating layer between information sources and users and it consists of information tools, interface, search services and techniques. This technique is used by users to access information (Shah, 2008). The third layer consists of group of users who use tools to access information. The fourth layer is made up of search results which include relevant searches, web pages, bookmarking, tags or notes from the web and the knowledge that users gained from information seeking process (Shah, 2008).

In discussing collaborative information seeking process, Shah (2010a) adopts Gray's (1989) three general phases of collaboration and Marchionini (1995) nine information seeking sub-process. The three phases of collaboration adopted from Gray (1989) are pre-negotiation or problem setting, direction setting and implementation. Pre-negotiation phase involves recognition, negotiation and creation of common understanding about information need. It also includes choosing information system or sources to be used and the division of tasks among members. Direction setting phase, is the core stage in collaborative information seeking process. This involves group members who identify their personal interests and harmonize them with shared interests so as to create shared goals (Shah, 2010a). The last phase is the implementation phase, which involves a) formulation of search query, b) search execution, d) examination of results, e) extraction of information and creation of shared understanding. During the last phase, group members may decide to reflect or, iterate the process of query formulation, execution of search or examine search results before engaging on aggregation.

Based upon this model, two types of collaborative information seeking behaviour namely complementary and integrative collaborative information seeking are identified. In the former category, collaborative information tasks are distributed across group members while in the later group members work together during collaborative information seeking. The model suggests that collaborative information seeking is more than simply working in group in search for

information, but it involves independence and interdependence decentralization and centralization of activities, coordination, communication and cooperation among members(Pickens, Golovchinsky and Morris, 2008; Widen and Hansen, 2012).

This model is based on phases and process of information seeking. This relates to information need identification and definition or redefinition, recognition, negotiation and creation of common understanding, information seeking and evaluation of information results. Four research questions which this research addresses correspond to the variables and different information behavioural components discussed in this model. These questions are related to information needs; factors shape information behaviour, sharing of information and evaluation of information

Shah's (2008) model presents a typical scenario of collaborative information seeking in an electronic environment. The current study does not focus on collaborative information behaviour in electronic environment however; it Edwards, Fox Gillard, Gourlay, Gueven, Jackson, Chambers and Drennan (2013) is evident that the model proposed by Shah (2008) describes information behavioural processes that are part of collaborative information behaviour. The model discusses various stages of CIB including information access, collaborative information searching, collaborative information retrieval, information organization and use. Such stages described in the model reflect some of the objectives of this study particularly objectives relating to information need identification, types of information sources used and how collaborators share information. The model can be used as a theoretical framework in CIB studies which focus on areas such as human computer interaction, collaborative information retrieval and online collaborative information behaviour. The model can also be used to support the implementation of CIS environment, evaluation of existing collaborative information systems (Shah, 2008) and understanding the role of technology in supporting effective collaboration. Previous studies that used this model include Yue and He (2010) examined collaborative information seeking behaviour of lawyers working on e-discovery.

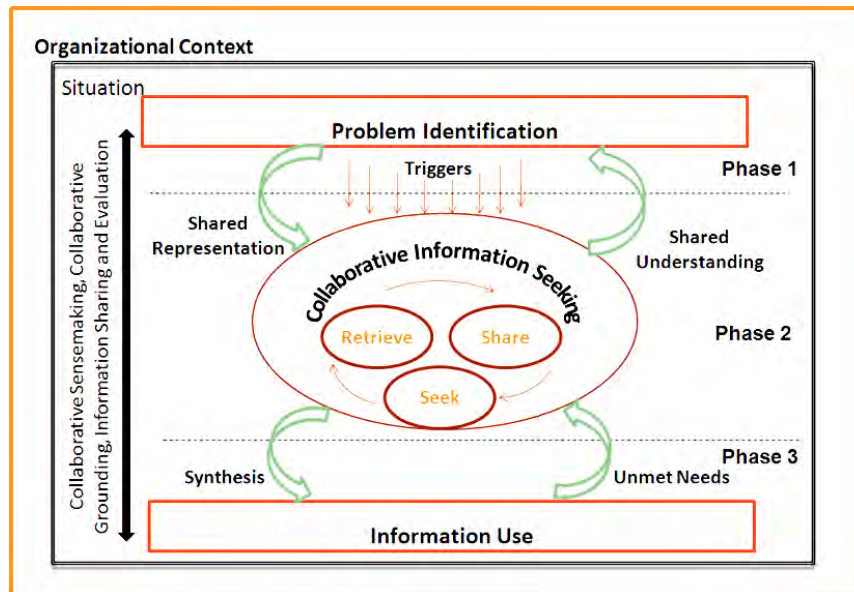
In describing different stages of collaborative information seeking behaviour, Shah (2008, 2010a) uses the term pre-problem setting to describe a phase where individuals in a group

recognize, negotiate and create common understanding about information need. This stage should not be viewed as a problem setting stage as the phrase “pre-problem setting” has negative connotation that individuals create a problem. It would be rather appropriate to use phrases such as “creation of common understanding”, “identification of information problem” or “identification of information need” than using the phrase “pre-problem setting”. Shah (2008) model attempts to incorporate non-linear characteristics of information seeking. It is evident that the model describes information seeking as a dynamic and iterative process only at the stage of query formulation, search execution and extraction of information. Shah (2008, 2010a) suggests that only during implementation phase collaborators may reflect or repeat process of query formulation, execution of search or examine search results before engaging in aggregation. Such repetition does not occur during pre-negotiation stage.

### **2.3.6 Karunakaran, Spence and Reddy’s (2010) model of collaborative information behaviour**

This is a model of collaborative information behaviour which is embedded within organization context. The model was developed by Karunakaran, Spence and Reddy (2010) and it is based on review of existing CIB literature from both technical and social perspectives. The figure 2.6 below presents three main aspects of CIB: problem identification, collaborative information seeking and information use.

The model comprises of three broader sets of behavioural activities which are; problem identification, collaborative information seeking and information use. Problem identification according to this model is a phase in which collaborators identify information problem, create shared representation and shared understanding of a situation (Karunakaran, Spence and Reddy, 2010). Communication and group awareness is vital during this stage in which different forms of communication including conversation, verbal communication and sharing of artefacts are sometimes evident. The figure also shows how CIB is situated within organization context and situation.



**Figure 2.6: Karunakaran, Spence and Reddy’s (2010) Model of Collaborative Information Behaviour (Source: Karunakaran, Spence and Reddy, 2013)**

The model also identifies four major factors that trigger the transition from individual information behaviour to collaborative information behaviour. These factors are: complexity of information need, fragmented information sources, lack of domain expertise and lack of immediate accessible information (Karunakaran, Spence and Reddy, 2010). These factors provide explanation on why individuals in organization decided to collaborate during information seeking and use.

The second phase involves collaborative information seeking process which is defined as: *“Purposive seeking of information by two or more individuals because of an information need in order to satisfy a shared goal”* (Karunakaran, Spence and Reddy, 2010). This model views CIS as an explicit process. This process involves active or passive acquisition of information together with other micro level activities such as information searching, retrieval and sharing. The last phase involves information use, which is defined as a physical, mental and communicative act of incorporating information found into the group existing knowledge base in order to achieve common goal (Karunakaran, Spence and Reddy, 2010).

Karunakaran, Spence and Reddy, (2010) also point out that collaborative information behaviour involves other set of activities that cut across all three phases. These include: collaborative sense making; which involves collaborative generation and understanding of meaning, information sharing and evaluation which involves evaluation of identified information need, evaluation of information seeking, and retrieved and synthesized information (Karunakaran, Spence and Reddy, 2010). The model also adopts Hertzum (2008) concept of collaborative grounding which involves construction of shared understanding through group discussions, debates and conversation.

Karunakaran, Spence and Reddy (2010) model has been included to form part of theoretical framework chapter as this model is comprehensive and rich in variables. The model describes CIB and includes identification of information needs, information seeking, information evaluation, information use and sharing. The extensive treatment of CIB is related to the focus of this study, particularly the objectives and questions this study addresses. The components of the model are reflected in three research questions namely: a) factors shape information behaviour, b) sharing of information, c) evaluate information and challenges of collaborative information seeking and use.

Although the model attempts to describe collaborative information behaviour as repetitive an iterative process, the illustration of the model shows that when information need is not met, users will go back to collaborative information seeking stage. Unmet information need, may be attributed to factors that are not necessarily related to information seeking. These factors may include failure to properly identify and define information need or unavailable information. It is evident that, the model has categorized collaborative information behaviour into macro and micro levels. Macro collaborative information behavioural processes such as collaborative grounding or information sharing involve all phases of CIB. Micro collaborative information behavioural processes are specific phases which include problem identification or information seeking. The categorization offered by this model is problematic in that, some of the processes have been treated as both macro and micro. For example Karunakaran, Spence and Reddy,

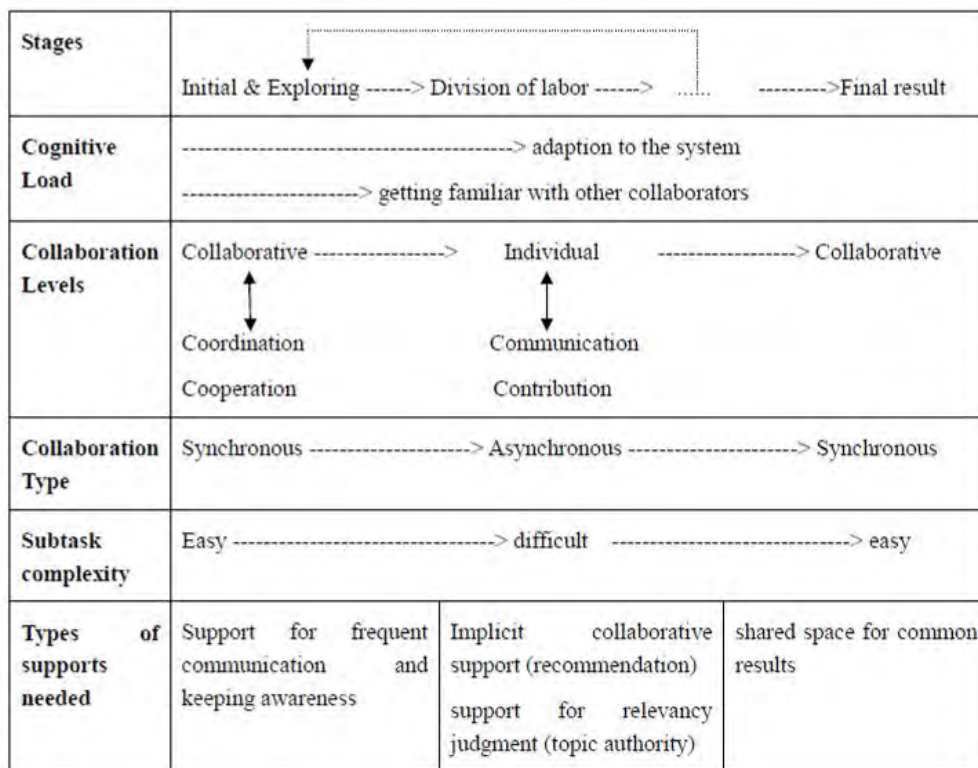


(2010) consider information sharing as a macro and micro information behavioural activity within collaborative information seeking. Karunakaran, Spence and Reddy, (2010) opines that:

*“We conceptualize that CIS is comprised of other microlevel activities such as retrieving and sharing.”* At the same time the authors when commenting on the cross cutting information behavioural activities argued that: *“Throughout the entire process, there is continuous information sharing.”*

### 2.3.7 Yue and He’s (2009) model for understanding collaborative information behaviour in e-discovery

Yue and He’s (2009) model attempts to explain collaborative information behaviour in the context of electronic discovery tasks performed by legal practitioners. As indicated in figure 2.7 below. CIB is described as a multistage process in which collaborators work synchronously or asynchronously to identify information need, seeking, sharing and using information.



**Figure 2.7: Yue and He (2009) CIS model (Source: Yue and He, 2009)**

This model is domain specific. It was developed from two studies which focused on lawyers' exchange of information for civil litigations and investigations. Like many models of CIB, this model was developed specifically to model online collaborative information seeking behaviour where individuals collaborate in searching and retrieving information.

This model was developed with a focus on information behaviour in electronic environment. It describes stages and processes that are common in collaborative information behaviour. Yue and He (2009) model describes collaborative information seeking as a process that involves multiple stages. The intensity of collaboration among users vary from one stage to another (Yue and He, 2009). These stages are exploration, division of labour and results wrapping up. The exploration stage is characterized by intensive synchronous collaboration. Collaborators explore collaborative tasks; create common understanding of information need and set strategies for information searching. The second stage involves division of labour, where each group member is allocated sub-tasks and pursue paths independently (Yue and He, 2009). Collaboration at this stage is less intensive and asynchronous. The third stage involves an interpretation of results where individuals combine and make sense of results. This stage also is characterized by intensive synchronous collaboration.

Collaborative information seeking has extra cognitive and collaborative costs when compared to individual information seeking (Yue and He, 2009). Collaborative Cognitive load is caused by efforts to be familiar with search and collaborative tools and creating common understanding among collaborators. The model adopts some components of Shah's (2008) model of collaboration which views collaboration as a superset comprising of four sub-sets: coordination, cooperation, communication and contributions. Yue and He (2009) argue that the extent to which these four forms of collaboration play roles during collaboration differs from one stage to another. For example during problem and task exploration, individuals engage in synchronous collaboration, as a result, cooperation and coordination play a more significant role than other levels of collaboration. In addition, information searching in synchronous collaboration entails a division of labour. Communication and contribution are predominant features of collaboration.

Communication is triggered by the need to share information and maintain awareness among group members (Yue, Walker, Lin and He, 2008). Adapt adopt

The Yue and He's (2009) model associates collaborative information behaviour with different components and process. These include: cognitive work load and complexity of information sub-tasks. Both cognitive work load and task complexity are some of the challenges which affect collaborative information behaviour. The model also emphasizes the existence of different forms of collaborative information behaviour. These behaviours include information seeking by intermediaries, recommendations, division of labour, as indicated by presence of integrative and complementary collaborative information behaviour. The models also include different levels of collaboration such as: communication, coordination, cooperation and contributions. The models identified the different forms of collaboration and collaborative information behaviour which relate to the research question number three. The question focuses on factors shaping information behaviour.

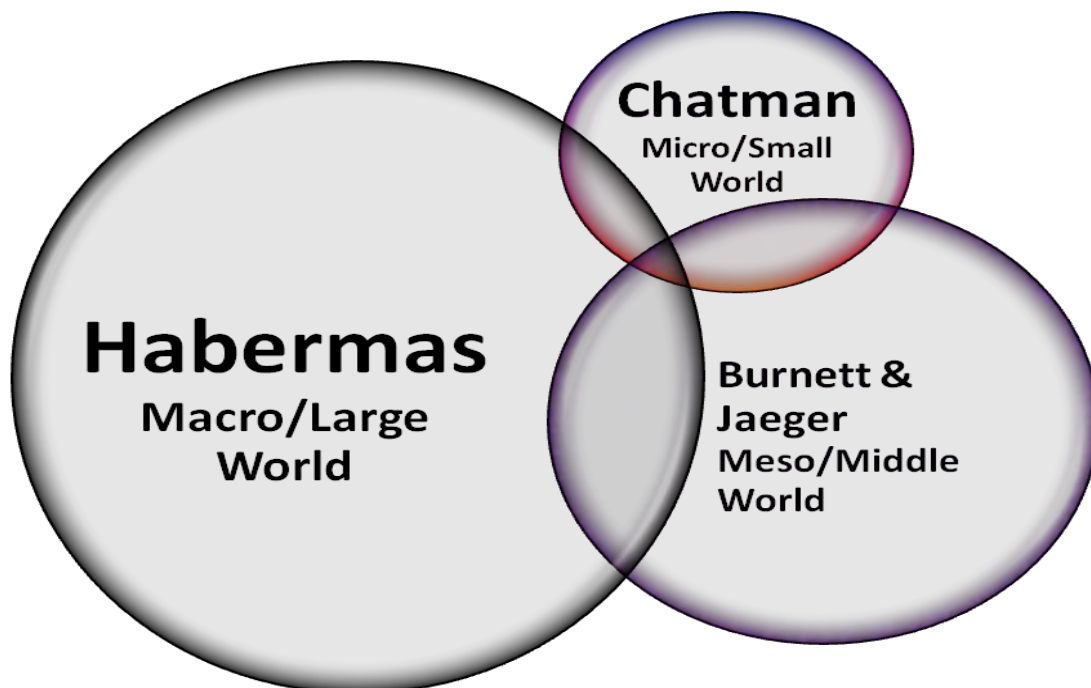
Like other models of collaborative information behaviour, Yue and He (2009) model associates CIB with factors such as complexity of information need and task complexity. While these factors may be used to explain why individuals engage in collaborative information behavioural practices, they are not exhaustive as they are other important factors that influence individuals to engage on CIB. In some cases, individuals may be forced by their superiors to collaborate in order to accomplish a particular task. Collaboration could also be initiated by factor such as presence of collaborative tools. Furthermore, the model has discussed exhaustively, a) stages in collaborative information seeking, b) levels and types of collaboration, c) tasks complexity and supports needed to accomplish the tasks. However, the link between collaborative information seeking behaviour and collaborative task which individuals intend to accomplish is not clearly discussed.

### **2.3.8 Burnett and Jaeger's (2008) theory of information worlds**

This study draws its theoretical framework from theory of information worlds (Burnett and Jaeger, 2008). The theory builds upon the foundational works of library and information science

theorist Elfreda Chatman particularly on her concepts of social norms, social types, information behaviour and small world. This refers to a definable localized group of people and their social environment. The theory has also been influenced by the works of philosopher Jurgen Habermas, specifically on the concept “lifeworld” that focusing on social world and information resources in broader context (Jaeger and Burnett, 2010, Burnett and Jaeger, 2008 and 2011). When forces from Chatman’s Micro World and Habermas’ lifeworld intersect an information or intermediary world which is created.

Information users belong to different social groups and social types; it is evident that their behaviours are largely influenced by both internal and external forces. This has been affirmed by Burnett and Erdelez, (2009) who stated that user’s mobility, influences of development of technology, have created situation whereby different contexts influence behaviour of similar individual or group of people concurrently. Figure 2.8 below illustrates how two different information worlds:



**Figure 2.8: The Burnett and Jaeger’s theory of information worlds (Source: Krub, 2011)**

The rationale for using this theory as a framework for the study is that it conforms with the main problem addressed in this study. The theory of information worlds views information behaviour as results of interactions among various forces and processes, including people and their environment. Furthermore, the theory of information worlds offers a critique to the conventional wisdom, that information behaviour can be studied in single context. The theory of information worlds; a cross disciplinary social theory emphasizes the importance of understanding information behaviour in multilayered contexts such as, social, environmental and technological forces. Likewise, within the collaborative information behaviour context, information behaviour is understood as a result of multiple factors and forces. These forces are within and without a particular social group in which information behaviour is investigated. This theory is an attempt to bridge the missing link between small world and the life world (Krub, 2011).

This theory suggest that, information behaviour of individuals is shaped by both immediate influences of friends, family, co-workers and the trusted information sources (small world) within which individuals live as well as the large social influences, (lifeworld). These include public sphere institutions, technology and politics (Jaeger and Burnett, 2010, Burnett and Jaeger, 2011). Information behaviour of individuals is a reflection of not only individual characteristics, but also norms, perceptions, attitude and values of “information world” in which individual are a part (Burnett and Jaeger, 2011 and Krub, 2011). Burnett and Jaeger (2008) use the term information worlds to mean social environment where people live and work, bounded together by shared interests, expectations, information behaviour and geographical or virtual proximity (Burnett and Jaeger, 2008, Krub, 2012).

The theory of information worlds focuses on five elements: a) social norms or shared sense of appropriateness of observable behaviours, b) information values or shared sense of importance of information, c) social types or individual roles and their perceptions, d) information behaviour and boundaries in which actors work and exchange information (Burnett and Jaeger, 2008 and Burnett and Jaeger, 2011). The theory includes different concepts that relate to information behaviour such as information need, information access, information value, information exchange, information evaluation and use.

Burnett and Jaeger (2008) and Jaeger and Burnett (2010) criticize minimalist view of information access which focuses only on physical access. By Contrast, Burnett and Jaeger (2008) offer a broader view of information access that includes physical, intellectual and social access. Physical access refers to the degree to which individuals can acquire and use information from different locations, in different formats and conditions together with technologies, and abilities required for accessing information sources (Jaeger and Burnett, 2010). Intellectual access on the other hand, refers to the ability to understand information that has been physically accessed. While social access refers to the ability to use information in social contexts (Jaeger and Burnett, 2010). Such description of different levels of information access makes this theory appropriate in providing framework for understanding the way information is accessed and shared in a group context.

This theory also discusses in detail the concept of information value. This concept is defined as a shared perception on importance and usefulness of information among members within information worlds (Jaeger and Burnett, 2010). Information value consists of four parameters: content value, control value, economic and social values. Content value relates to the degree to which information meets the needs of individuals and group (Burnett, Jaeger and Thomson, 2008; Jaeger and Burnett, 2010). Control value of information can be viewed as a mechanism to control some kind of power over the world's ability to access or not to access information. Other parameters of information value are, economic and social value (Burnett, Jaeger and Thomson, 2008; Jaeger and Burnett, 2010). The value of information is determined by the way information is accessed, used and shared. The theory also acknowledges that group perception of information value may also be influenced by other factors outside small world including members from macro or micro world (Jaeger and Burnett, 2010). Likewise, society's perceptions on utility and profitability of information and potential of information to benefit members of information world are also important factors that determine information access, use and sharing (Burnett, Jaeger and Thomson, 2008; Jaeger and Burnett, 2010). The theory stipulates that information sharing among group members may be in a form of physical contact or virtual social spaces. Information sharing may take place within information world or across multiple information worlds.

The theory of information worlds provides a multilevel perspective in understanding human information behaviour in social context (Jaeger and Burnett, 2010). The applicability of this theory in the study of collaborative information behaviour is widely applied. Firstly, the theory of information worlds views information behaviour as “a full range of information related behaviour and activities available to members of a world” (Jaeger and Burnett, 2010:171). The definition and perception of what constitutes information behaviour offered by this theory is in conformity with collaborative information behaviour perspective. Secondly, the theory describes group perceptions, norms, values and experiences as the factors that influence articulation of information need, access, evaluation, use and sharing of information. Such understanding of information behaviour goes beyond individual situation, cognition or affective state. It focuses on social factors within information world which is essential in understanding information behaviour in group context. Thirdly, the theory emphasizes ways in which information is contextually embedded within social worlds; hence provides suitable framework for investigating real-world settings (Burnett and Jaeger, 2011) such as collaborative information behaviour of undergraduates in academic settings.

There are a number of previous related studies which have used theory of information worlds as a theoretical and conceptual framework. These studies include: Worrall, Burnett, Marty, Burnett, Stvilia, Kazmer and Hinnant, (2010) who used the theory to guide the study of lifecycle of scientific teams and the effectiveness of long term collaborations. Worrall, Burnett, Kazmer, Marty, Burnett, Stvilia, Roberts, Hinnant, and Wu (2013) used the theory to examine social and organizational factors that best support the continuation of scientific collaborative teams. Warrall (2013) uses the theory of information worlds to examine the role of Librarything and Goodreads digital libraries in information of multiple existing and emergent social information worlds.

## **2.4 Gaps and summary**

This Chapter discussed theoretical issues that underpin the study. This chapter commenced with conceptual and terminological discussions of key concepts followed by discussion of the role of theories and approaches to the use of theories in research. Different models and theories of information behaviour that relate to the current study have been reviewed. The main arguments,

strengths and weakness have been pinpointed. Moreover, the relationships between different variables are articulated.

Based upon the review of models and theories it has been noted that different models and theories focus on different aspects of human information behaviour. The differences are attributed to factors such as, nature of empirical studies in which models and theories were originated, level of analysis and researchers’ perspectives towards human information behaviour. Also, the models and theories differ in the way they use different terminologies. These describe various stages of human information behaviour and factors that influence information behaviour. Each model or theory of information behaviour is applicable in a specific context or situation.

In the context of collaborative information behaviour different new models of CIB and CIS have been developed in the past few years. These include Jansen and Reddy (2008) CIS model, Shah (2010) CIB model, Hue and He (2010) CIB model and Karunakaran, Spence and Reddy (2010) CIB model. Despite laying a foundation for both the conceptual and theoretical understandings of different aspects of collaborative information behaviour, the models are still in their early development. With similar sentiment, Kim (2013) asserts that the new CIB and CIS models have to be widely tested and compared to different settings so as to improve their predictive power. Kim (2013) also argues that these models have to be debated and compared before they become well established (Kim, 2013). Table 2.1 outlines the theories/models reviewed and how they relate to research question in this study.

**Table 2.1: An outline of theories, models, key variables and their relevance to research questions**

<b>Theories and models</b>	<b>Key variables</b>	<b>Relevant research questions</b>	<b>Previous studies use / review theory or model</b>
Burnett and Jaeger (2008) Theory of	Information need, Shared information need, Work related needs, Information sources, Social	Research questions no. 1-6	Worrall, Burnett, Marty, Burnett, Stvilia, Kazmer and



Information Worlds	norms, Social type, Information seeking behaviour, Information behaviour, Information value, Information world, Information access, Information sharing, Information exchange, Information utility, Information use.		Hinnant, (2010), Worrall, Burnett, Kazmer, Marty, Burnett, Stvillia, Roberts, Hinnant and Wu (2013), Warrall (2013)
Yue and He (2009) Model for Understanding Collaborative Information Behaviour in e-discovery	Collaborative information need, Collaborative information seeking, Collaborative information searching, Communication, Contribution, Coordination, Cooperation, Collaboration, Task exploration, Awareness, Collaborative task, Information sharing, Collaborative Cognitive load	Research questions no. 1, 3	Lee (2013)
Karunakaran, Spence and Reddy (2010) Model of Collaborative Information Behaviour	Collaborative information behaviour, Collaborative information need/ Problem, Shared understanding, Shared representation, Communication, Awareness, Information acquisition, Collaborative sense making, Collaborative grounding, Information sharing, Information retrieval, Information synthesis, Information evaluation, Information use	Research questions no. 3,4,5, &6	Lee, (2013), Pérez (2015)
Shah (2008) Model of	Common information need/ Problem, Information goal, Collaborative	Research questions no.	Yue and He (2009)

Collaborative Information Seeking Behaviour	information seeking behaviour, Information seeking behaviour, Information access, Collaborative information searching, Collaborative information retrieval, Information organization, Information use, Communication, Contribution, Coordination, Cooperation, Collaboration.	3, 4 & 5	
Reddy and Jensen (2008) model of collaborative information behaviour	Collaborative information behaviour, Information environment, information behaviour axis, context axis, collaborative information need, Information domain, Information agents (user and system), Communication, Information sharing, Coordination.	Research questions no. 1, 3& 6	Lee (2013)
Niedźwiedzka (2003) General Model of Information Behaviour	Information need, information seeking, information application, information user, information intermediaries, Information behaviour	Research questions no. 2, 3 & 5	Edwards, Fox, Gillard, Gourlay, Gueven, Jackson, Chambers, and Drennan, (2013)
Wilson's (1996) Model of Information Behaviour	Information user, Information need, Person-in-context, Situation, information access, Information searching, Information seeking, information processing, Information use, Information behaviour	Research questions no. 3, &6	Matsveru (2013), Preez, (2008), Chiware, (2008), Mughairi, (2006), Hyldegard (2006), Niedźwiedzka, (2003),
Sonnenwald's	Context of information behaviour,	Research	Sonnenwald,

(1999) Theory of Information Horizon	Situation of context, Social network, Information horizon, Knowledge gap, Information need, Information exploration, Information seeking Information filtering , Information use, Information sharing, Social norms, Social beliefs, Information world	questions no. 3, 4 & 5	Wildemuth and Harmon (2001), Pálsdóttir, (2005), Goggins and Erdelez (2010), Tsai (2012)
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## CHAPTER THREE: REVIEW OF LITERATURE

*“If I have seen further it is by standing on the shoulders of Giants.”* (The Correspondence Of Isaac Newton, 1959).

### 3.1 Introduction

Literature review provides a summary of the current state of the field under investigation, rationale for the significant contributions in the field and bridges research to the large context (Murchison, 2010). Literature review also enables researcher to discuss the main problems, questions and issues that have been previously addressed in the literature by other scholars (Hart, 2001). Levy and Ellis (2006) also commented that literature review helps researcher to explore and understand existing body of knowledge, including what is known and what is unknown. It justifies the proposed study as one that contributes something new to the existing body of knowledge. Levy and Ellis (2006) further argued that literature review enables the researcher to frame valid research methodologies, approaches and research questions for a proposed study.

The purpose of this study is to investigate collaborative information behaviour (CIB) of undergraduates in selected universities in Tanzania. These universities are: University of Dar es Salaam (UDSM), Ardhi University (ARU) and Sokoine University of Agriculture (SUA).

This chapter provides an account of literature on human information behaviour and scholarly collaboration in general as well as, collaborative information behaviour in particular. The chapter is organized along thematic areas that reflect key research questions. These specific research questions are:

- What are the information needs of undergraduates working in collaborative learning assignments?
- What sources of information do undergraduates use when seeking information to accomplish academic group assignments?

- What factors shape information behaviour of undergraduates working in collaborative learning tasks?
- And how do undergraduates share information when engaging in collaborative learning tasks?
- The study also sought to address the questions how do undergraduates evaluate information during collaborative information seeking and use?
- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
- To what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

The chapter is also based on key variables derived from related theories and models of human information behaviour. These variables are a) information use, b) context of information behaviour, and situation of the context, c) work roles, d) collaborative work, e) collaborative learning tasks, f) group awareness and g) information value. The literature review also reflects three broader topics that related to the study. These topics are scholarly collaboration, information behaviour and collaborative information behaviour. Attempt has been made to confine scholarly collaboration or scientific collaboration with students' collaborative learning activities. In linking the three broader issues the review of literature systematically discussed the relationship between scholarly collaboration, information behaviour and collaborative information behaviour. Furthermore, other related concepts that relate to scholarly collaboration and collaborative information have been discussed. These concepts are communication, cooperation, contribution and coordination.

### **3.2 Individual and collaborative information needs**

Information need is one of the key concepts in research and models of human information behaviour (Fidel, Pejtersen, Cleal and Bruce, 2004 and Wilson, 2006). While researchers agree that individuals seek and use information to satisfy information need, there is little agreement on what constitutes information need (Wilson, 1981). There are also numerous concepts which have been used alongside with information need. These concepts include knowledge gap, knowledge deficit information problem, desire for information, knowledge discontinuity and anomalous state of knowledge.

According to Wilson (1981, 2006) information need has created “intractable problems” including semantic and multiple connotative problems. Wilson (2006) relates information need with three basic human needs; physiological needs, affective needs and cognitive needs. He concludes that information need is not an independent need, but a secondary need that emerges out of desire to fulfil basic human needs. The conventional wisdom among researchers is that information need creates motivation for information seeking and use (Niedźwiedzka, 2003, Sonnenwald, 2005, Reddy and Jansen, 2008, Naumer and Fisher, 2009 and Shah, 2010a).

There are different paradigms for understanding information need including information transfer paradigm, cognitive paradigm, social constructionist paradigm and organizational or group paradigm (Naumer and Fisher, 2009). Information transfer paradigm or physical paradigm defines information need as demand for physical information object. The paradigm associates information needs with the need for physical documents such as books or journals. Cognitive paradigm on the other hand, conceptualizes information need as a lack of knowledge about a topic and the level of proficiency and cognitive processes that one engages to make sense of information (Naumer and Fisher, 2009). The cognitive paradigm suggests that, two people in similar situation will experience different information need because of differences in understanding of such situation (Allen, 1997). The Social Constructionist paradigm is an antithesis of cognitive paradigm. It views information need as a social and dynamic phenomenon that changes as individual interacts with information and society. Allen (1997) argues that within Social Constructionist view of information need, two people with different backgrounds, but

within the same situation will have similar information need. Also, the same person may experience different information needs depending on changes in environment and individual roles (Niedźwiedzka, 2003). The last paradigm for understanding information need is organizational paradigm. In this paradigm Information need is associated with organization group values, structure and norms. According to this approach, individuals within a group or similar organization will experience similar information need because of sharing organization framework, values and social structure (Allen, 1997).

Information need is defined from different perspectives. This is partly related to the fact that researchers have different views on factors that give rise to information needs. The nature of information need also varies across context and situation. Campbell (1995) for example, argues that it is the perception of lack of information that creates a need for information. Campbell (1995) adopts a cognitive approach further states that information needs presents only in the mind of information user. On the other hand, Timminis (2006) argues for a better understanding of information need, one has to focus on both the antecedents to information need and attributes or recurring characteristics that distinguish the concept of information need.

There has been a shift of focus in studies of human information behaviour. Researchers are not only interested in understanding individual information needs, but also group or shared information needs as well. Shared information need is considered as one of the motivations for people to work together toward accomplishment of collaborative information work (Poltrock *et al.*, 2003, Shah, 2010a, Paul, 2010 and Saleh, 2012). Shah (2010a) for example, noted that, sharing information need allows people to join forces, identify their common goals, define and understand problem and choose tools for searching information. In a different vein, Lin, Eisenberg and Marino (2010) argue that shared information need is not the only necessary condition for activating collaborative information behaviour. Collaborative information behaviour may include initial activities and interactions that take place before arriving to the common information need (Lin, Eisenberg and Marino, 2010). In addition, Rieh *et al.*, (2013) argue that individual may initiate a task and then realize the need for diverse expertise to resolve

the problem. The need for collaborative may emerge later after collecting preliminary information on how to accomplish a task (Rieh...*et al.*, 2013).

Discussion on shared information needs and its role in initiating and influencing collaborative information behaviour is rooted in the existence of different forms of collaboration and the role of different individuals in collaborative information behavioural activities. Not all collaborative information behavioural activities are initiated by shared information needs however, having common information need is an important characteristic that unify group members towards realization of common goal. Depending on what brings different people to work together and how people form groups for collaboration, shared information need is a result of the groups' knowledge deficiency. It is also an imbalance between what is known and what is not known that group of people experience (Zhou and Stahl, 2007). The extent to which common goal plays a role in initiating information needs, depends on whether collaboration is implicit or explicit.

Collaborative information behaviour, information needs are dynamic, change from time to time depending on what is accomplished by group members (Zhou and Stahl, 2007). During information seeking process individuals may be exposed to different sources information that might shape their needs. Timminis (2006) argues that information needs are problem focused, subjective and they evolve through different stages such as inception, development, satisfaction or redundancy. Hertzum (2010) also offers an explanation that during collaborative information seeking, information is not only needed as an alternative end, but also as a resource that is used to inform group members about various decisions and situations. It may include a need for shared understanding of what is known and what is not known or a need to understand what other group member have accomplished (Zhou and Stahl, 2007).

In the context of collaborative information behaviour the process of defining information need is more complex than in individual information behaviour (Wilson, 2010a). Wilson develops taxonomy of perceptions in collaborative information seeking. He focuses on information need and collaborative work roles. According to this nomenclature, group understanding of shared information need evolves as information needs of individuals evolve. The perception of



information need in individual information seeking is based on personal evolving knowledge and understanding. However, in collaborative information seeking behaviour, individual perception of shared information need may differ from other group members based on the way that person perceive information need (Wilson, 2010a).

Research on information needs in academic setting focused primarily on identifying information needs of students, faculties, researchers or information service providers. Studies have been done from different aspects such as users' information needs and effectiveness of libraries in meeting the needs (Butz, 1999, Elly, 2003, Callinan, 2005, Poteri, 2007 and Ramasodi, 2009), types of information sources needed by users (Rugezea, 2002; Yi, 2007). Studies have also compared information need with other variables such as level of education, age and sex (Callinan, 2005 and Yi, 2007), information needs with individuals' perceptions (Yi, 2007; Rieh... *et al.*, 2013), information needs and nature of work or learning tasks (Saleh and large, 2011 and Saleh, 2012). Others have also types of information needs and user' profession (Msuya, 2003) and information needs of users with special needs (Seyama, 2009).

Kubmann, Elbeshausen, Mandal, and Womser-Hacker (2013) in the study of collaborative information behaviour of university students working on search team explain that a shared information need is a necessity for successful collaborative information search. While, Callinan (2005) noted differences in information need between first year and final year biology undergraduate students. Callinan (2005) noted that students' differences affected not only their information searching skills but also information use. Yi (2007) examined information needs of international students at Texas Women University to determine if they had different information needs. The findings of the study revealed that international students have special information needs, including the need to improve their English language proficiency, solving academic problem, improving library user skills and finding periodicals in their native languages. Baro, Onyenania and Osaheni (2010) examined, among other things, the information needs of undergraduate students in the field of humanities in three universities in Nigeria. Different needs were identified. These included need for information to accomplish course assignments, seminar papers, and information to prepare for their class discussions, examinations and tests.

Dule, Lwehabura, Milimila and Matovelo (2001) assessed the capability of agricultural libraries in meeting researchers' information needs in Tanzania. The findings of the study identified the inability of the libraries to meet researchers' need. Elly (2003) discussed challenges that Sokoine National Agriculture library faces in meeting information needs of the university community. Specifically the study focused on how the library is prepared to ensure that quality and value added information is made available to users. It was identified in the study that, in order for libraries to provide high quality information and meet the growing information need of users in a university community, the library had to undertake re training of its staff and its users and networked with other libraries.

The information needs of users have been studied in relation to work roles or learning tasks. Examining the effects of collaborative projects on the undergraduate engineering students' collaborative information behaviour was Saleh and Large (2011) revealed that information needs, project stages and nature of the learning task affect each other simultaneously. It was further noted that information needs of students changed as the nature of the learning tasks and project stage change. Preez (2008) focused on a similar domain but a different user group. He stated that information needs of consulting engineers in South Africa are largely determined by their work roles and embedded tasks.

In the study of Health and Medical care domain, conducted by Sarcevic (2009), the dynamic nature of information need was observed. Medical practitioners' information need was found to be changing rapidly overtime. Based on the findings of the study Sarcevic (2009) concluded that there is no single shared information need among medical professionals who work in trauma resuscitation. On the contrary, information needs changed as a result of responding to patients' conditions and the dynamic of events. The influence of dynamic work environment by information need was also observed by Sonnenwald and Pierce (2000). Sonnenwald and Pierce (2000) investigated collaborative information behaviour in command and control domain and found that the nature of work situation, work process and complexity of work tasks influenced CIB in military domain. This was characterized by frequent changing of information needs. In their theoretical account of information needs, Botha and Bergenholtz (2013) refute the notion

that information needs are static. Botha and Bergenholtz (2013) argued that information needs are dynamic as a result of users' interpretations about information needs, change of context of information behaviour and emergence of new information needs.

### **3.3 Information behaviour and sources of information**

Information behaviour has been conceptualized as the process in which human beings interact with information sources. This includes people, documents, web pages, and information retrieval tools (Sonnenwald, 1999). Shah (2010a) separates information sources from retrieval tools. He explains that tools provide interface and mediation between information sources and users of information. In studies of information behaviour use, the terms information sources and information resources are often used interchangeably (Reddy, 2003, Akintunde, 2010). Clarification for such ambiguities and misuse of the two terms is provided by Chatterjee (2007) who holds that:

*“The documents held by a library provide information sought by users and hence called information sources and more precisely documentary information sources. But such documents are also referred to as information resources. That is, the terms ‘information sources’ and ‘information resources’ are used interchangeably. But it is to be noted that an information source only provides information, but a resource is one, which like capital or labour, gives rise to something new. As a library generates all its services on the basis of the information sources available with it, such sources are called information resources”* (Chatterjee, 2007).

In this study the concept ‘information sources’ will be used throughout as the preferred term. Due to the interrelated nature of different aspects of human information behaviour, it is difficult to have studies relating solely to information sources. Information source has been studied in connection with other aspects such as information need, information seeking and information use. Researchers have approached information sources from different viewpoints such as: types of information sources most preferred by users (O’Farrel, and Bates, 2009 and Saleh and Large, 2011), availability, access and accessibility of information sources (Mtanda, 2008 and Nwagwu, 2012) and perceived usefulness (O’Farrel and Bates, 2009).

Hyldegård (2006a) argues that an understanding of information behaviour from tasks performed by users not only provides insight on how people perceive their tasks, but also how different information sources are used during task performance as well. In the study of undergraduate engineering students working in group based projects, Saleh and Large (2011) found that students used wide range of information sources including books and manuals, journal articles, technical reports, standards and codes. Students also used patents, government reports, statistics, business reports, company information and catalogue, laws and bylaws. The comparison between printed and electronic information sources revealed that students preferred electronic information sources as they are perceived to be more up to date compared to print information sources Saleh and Large (2011). The findings further revealed that undergraduate engineering students also preferred to use people inside and outside their groups as sources of information. From these findings, Saleh and Large (2011) concluded that, the nature of engineering discipline; collaborative work and embedded tasks determine types of information sources that undergraduates use in the collaborative assignments.

Saleh (2012) noted that undergraduate engineering students working in group learning tasks preferred to use people including peers and subject experts. O'Farrel and Bates (2009) also revealed that found that LIS students preferred to use both electronic and printed sources of information when working in group projects. Similar findings were also noted by Zhou and Stahl (2007) who examined collaborative information behaviour of middle school students. In that study, students largely relied on group members as the main source of information. In the study of Smith (2010) noted that among other sources of information young students in secondary schools preferred to use people as a source of information. The rationale for using people as sources of information was that, when students work in groups they locally produced information which is suitable and useful within a group (Saleh, 2012). Such preference can also be attributed to factors such as trust (Hertzum, 2008) that group members have for people both in and out of their groups.

Availability, accessibility, access, affordability and usefulness of information are also determinant factors that have been identified by researchers (Wilson, 1997) to influence users'

preferences to use or not to use information. For example, access refers to the process of finding and successfully retrieving required information (Mutula, 2013), may be hindered by format of information and associated skills needed to find and retrieve the information. Lee, Paik and Joo (2012) investigated undergraduate students' information sources selection and identified factors associated with students' information source selection while working in real settings. The findings indicated that although the number of information sources such as experts/professionals, librarians, research reports and institutional repositories were perceived by students as useful and credible sources of information, undergraduates were found less likely to use them due to lack of accessibility and unfamiliarity with the sources.

Elia (2006) in his study of the use of information sources in electronic environment among students of University of Dar es salaam noted that, although students have a positive attitude towards electronic information sources, they preferred printed sources because students lacked computer and information literacy skills. In addition low internet connectivity, limited computer terminals and frequent power cut-off were some of the problems that affected use of electronic information sources among students of the University of Dar es Salaam.

Rugezea (2002), in a study of secondary school students information behaviour noted that due to poor information searching skills, many secondary school students in Dar es Salaam relied on teaching notes and fellow students as sources of information. In the study of information seeking behaviour of undergraduate students in University of Makerere, Kakai, Ikoja-Odongo and Kigongo-Bukenya (2004) were interested in establishing students' preferences and perceived value of information sources used. The study revealed that lecture notes and handouts were preferred information sources. Other sources identified were textbooks, colleagues and internet sources. Similar findings were observed by Ajiboye and Tella (2007). The undergraduate students at University of Botswana preferred to use lecture notes and handouts and the Internet as the one of preferred sources of information. The findings of these studies are different from that of Malekani (2006) who compared students' information behaviour at the Open University of Tanzania (OUT) and Sokoine University of agriculture (SUA). Malekani (2006) identified that participants used wide range of information sources including books, lecture notes, journal

articles, thesis/ dissertations and Internet. In the study of information behaviour of visually impaired students at the University of Kwazulu Natal, Seyama (2009) noted that university library is the main source of information used by students. The study further noted that the use of assistive technologies played significant role in supporting users to access and use information sources.

There are other studies that have been done in different domains such as medical, military, work profession and small business. In the medical domain, studies of collaborative information behaviour have produced different results on information resources preferences. Reddy (2003) stated that hospital are a typical example of an information-rich environment. Medical professionals who work collaboratively prefers to use a wide range of information sources in electronic and printed formats. Spence (2005) also revealed that medical practitioners in hospital emergence department prefer to use of people as source. The reliance on people as source of information was justified by geographical and work related factors. It was noted that most of the time collaborators depended on each other in providing quick solutions for solving urgent and complex problems.

Poltrack, Grudin, Dumais, Fidel, Bruce and Pejtersen (2003) in the study of information seeking and sharing of design engineers revealed that that designer who worked in teams relied on people as the source of information. They preferred this as it provided benefits beyond simply obtaining an answer to the questions.

Previous research has also established the relationship between the choice and use of particular information sources with stages and characteristics of work in which individuals engage (Byström, 1999; Byström and Hansen, 2005 and Hansen, 2011). Byström (1999) for example, noted that there is a positive relationship between perceived task complexity and preferences to information types and sources used by local government administrators. Likewise, Byström and Hansen (2005) identified how task complexity affect not only the need for information but also sources to be used. In patent domain, Hansen (2011) noted that task complexity was one of the factors that influenced users to choose multiple sources of information.

### **3.4 Factors shaping individuals collaborative information behaviour**

In the review of factors that shape individual collaborative information behaviour, two questions have to be addressed: Firstly; why an individual collaborate in information behavioural activities and secondly, what factors shape information behaviour of individuals working in group? The question of why individuals collaborate during information seeking has been dealt with extensively in the previous studies (Spence, 2005; Reddy and Jensen; 2008, Shah, 2010a; Saleh and Large, 2011 and Saleh, 2012). These studies have established various factors that trigger collaborative information behavioural practices. Reddy and Jensen (2008) explain that factors that initiate collaborative information activities are domain and context based. They include presence of shared information need (Spence, 2005; Shah, 2010a; Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013), complexity of information need (Reddy, Bernard and Spence, 2010; Shah, 2010 and Saleh, 2012) and project requirement (Saleh and Large, 2011; Saleh, 2012). Other factors include the need for multiple expertise or lack of domain expertise (Paul and Reddy, 2010, Saleh, 2012), lack of immediate accessible information (Paul and Reddy, 2010 and Reddy, Bernard and Spence, 2010) fragmented information sources or situation where information sources are located in different locations (Reddy, Bernard and Spence, 2010).

Shah (2010b) investigated incidences, motivations and methods for collaboration among library and information science graduate students and faculties. The findings revealed motivations for collaboration are associated with different types of collaboration. This included forced collaboration, peer to peer collaboration and expert-novice asymmetrical role collaboration. The findings of the study further revealed that there are different motivations for collaboration. These include the requirement for a project, and the need or desire for division of labour so as to accomplish complex tasks within limited time and resources.

Saleh and Large (2011) noted that there are multiple factors that trigger undergraduate engineering students to collaborate in information seeking. The identified factors were multidisciplinary nature of their projects which require subject knowledge from different engineering departments, project requirements that oblige them to collaborate and the complexity of information needs. Harrison (2009) investigated collaborative information seeking practices of

undergraduate students and found that students collaborate because it is part of the requirements of an assignment and because of the complexity of the searching process. Other factors identified were the need to improve their search efficiency, the shared goals and shared searching tools.

Other studies have also identified similar motives for individuals to collaborate in information seeking and using. Meyers (2010) for example studied collaborative information behaviour of middle school students and found that they were highly motivated to work in groups because of the desire to pool resources. The study further noted that students collaborated only in some stages of information seeking process including, problem identification, resources assessment and evaluation. Meloche and Dalton (2011) identified different reasons that allowed individuals to collaborate in information seeking. These reasons included: complexity of project tasks, project requirements, that is the projects should be done in group, complexity for accessing information sources and the need for multiple expertise. Spence, Reddy and Hall (2005) stated that the academic researchers working in multidisciplinary collaborative information related research projects collaborate because of the desire to bring in the team different expertise and perspective that are essential for the successful implementation of collaborative task. The study further noted that collaborative information behavioural activities were part of research projects requirements.

In the medical domain, studies of collaborative information behaviour have yielded different results. Spence (2005) and Reddy, Bernard and Spence (2010) conclude in their study that medical practitioners collaborate when there is information breakdown. Reddy, Bernard and Spence (2010) noted that breakdown in information flow occurs when information is not available as anticipated, information is incorrect or incomplete, and when information is provided to the wrong persons. Furthermore, Reddy, Bernard and Spence (2010) found that complex information need, inaccessible information, lack of domain expertise and fragmented information sources, that is information sources residing in multiple and disperse systems, are among the factors that trigger collaboration. Similarly, Spence (2005) noted that collaborative information seeking among patient care team is initiated when information is not easily accessible, when information needed is complex and when an individual member lacks expertise



to accomplish a task. In contrast, Reddy (2003) reports in a different study that collaborative information behaviour is not a response to the breakdown in information flow, rather a process in which individual is involved in the ongoing work of creating, maintaining and managing of flow of information. Reddy (2003) further argues that in information rich environment, the problem is not lack of information, but getting the right information to people when they need it.

Studies of information behaviour have also focused on the factors that shape individual information behaviour when they work in group context (Hyldegård, 2006a; Reddy and Jensen and Bernard, 2010; Yue and He, 2009; Harrison, 2009 and Saleh, 2012). From these studies it is agreed among researchers that unlike individual human information behaviour, collaborative information behaviour consists of more complex processes and activities (Hyldegård, 2006a; Reddy and Jensen and Bernard, 2010; Yue and He, 2009; Harrison, 2009 and Saleh, 2012). An understanding of information behaviour in collaborative context requires the analysis of both information behaviour of multiple people and embedded collaborative tasks.

Different factors that shape individuals information behaviour in group contexts have been identified, including the intent for collaboration (Reddy and Jensen, 2007; Shah, 2010a), characteristics of group members (Hertzum, 2002 and Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013), nature of collaborative work and tasks (Saleh, 2012) and domain in which work is done (Yue and He, 2009). Hyldegård (2006a) further categorizes the factors that affect individual collaborative information behaviour into three broader categories namely, contextual, social and personal factors.

Saleh (2012) noted that collaborative information behaviour of students is dynamic and that the behaviour changes according to different sub-tasks requirements, objective and task complexities. In this study it was also established that, perceptions of task complexity affected collaborative information behaviour. The study further revealed that students' collaborative information behaviour is both integrative and complementary. While integrative collaboration is characterized by joint working, complementary collaboration was characterized by division of labour. Saleh (2012) stated that personal compatibility in teams and trusts were essential factors

that shaped both integrative and complementary collaborative information behaviour of students. In a different study, Saleh and Large (2011) examined how undergraduate engineering students collaboratively sought information when working in collaborative course based project. Saleh and Large (2011) further examined students' collaborative information behaviour and how this affected the learning tasks and its perceived complexity. The findings of the study showed that; characteristics of information needs, work tasks and roles and expected collaborative learning assignment outcome affected students' information behaviour. Ford (2004) also found that when people worked to accomplish collaborative learning based tasks their information behaviour, particularly information sources preference, changed and the learning tasks progressed.

Limberg (2007) examined the implications of students' learning assignment in information seeking research. Unlike other studies the found characteristics of learning task as the factor shaping information behaviour of students (Saleh and Large, 2011; Saleh, 2012), Limberg (2007) noted that the social cultural factors, including the practice of information seeking in particular context of school contribute to the variation in students' information seeking behaviour. Kim (2008) examined how task dimensions influence LIS students' information searching behaviour on World Wide Web environment. The findings of the study indicated that different types of tasks were attributed to different information searching behaviour. Kim (2008) found that students spent more time, viewing and navigating pages and using search engine more frequently when they worked on factual tasks than when they worked on exploratory tasks.

Poteri (2007) examined researchers' information practices in a group context, with specific interest on understanding how researchers in a university setting sought information in group setting. Poteri (2007) also examined the kind of information behaviour that occurred when they working in collaboration. This study noted that the nature of collaborative research group and the frequency of interactions determined their information behaviour. Two characteristics were noted to influence collaborative information behaviour among the group members. On one hand, a close knit group characterized by their joint information seeking behaviour and close collaboration while, a loosely knit group was identified as independent information seekers, who worked independently and informed each other about relevant information sources obtained.

Other studies have attempted to study collaborative information behaviour using time and space dimensions (Harrison, 2009 and Shah, 2010b). Collaboration is viewed as either synchronous or asynchronous and the fact that collaborators are either working in proximity or dispersed. Time-space factor was noted to affect individuals' information behaviour in relation to the way in which individuals communicate, interact and use different tools to collaborate (Harrison, 2009).

Hyldegård (2006b) noted that the collaborative information behaviours of individuals working in group context is influenced by work related factors such as group distribution of work, work task process and stages and personal factors such as personal interface. Kubmann, Elbeshausen, Mandal, and Womser-Hacker (2013) focused on collaborative information behaviour of university students working in collaborative information search. They noted that the division of roles is one of the main factors that influenced students' collaborative information behaviour. Kubmann, Elbeshausen, Mandal, and Womser-Hacker (2013) further stated that students' information behaviour is characterized by coordinated collaboration with symmetrical role allocation, equal power and responsibility distribution. It was also revealed that collaborative information behaviour to be influenced by individuals' characteristics including the fact that participants had more or less similar skills and experiences related to collaborative information tasks.

Spence and Reddy (2012) investigated collaborative information seeking practices of IT teams working in health information systems. Four categories of contextual factors that influenced IT team members information behaviour were identified which included individual factors, team factors, organizational factors and technological factors. Individual factors included physical, social and psychological characteristics while team characteristics include factors such as location, permanence, homogeneity or heterogeneity of members, formality of interaction and configuration. On the other hand, organizational factors included organization structure and culture, policies, processes and procedures governing the organization. While factors related to technology included physical or mobility issues, as well as, the social and accessibility features of technology which support collaboration information seeking.

Davies (2013) investigated information behaviour of health information providers with the intention of developing a model that best support their behaviours. The study revealed that collaborative information behaviour of health information providers is characterized by both individual and collaborative multitasks. Three behavioural patterns namely information acquisition behaviour, information production behaviour and information dissemination behaviour.

Yue and He (2009) examined collaborative behaviour of legal practitioners in civil litigation. They noted the information behaviour of lawyers is influenced by characteristics of collaborative work. This includes perceived task complexities and stages in which task are accomplished. The study further identified four levels of collaboration: communication, cooperation, contribution and coordination. These levels were found to contribute to effectiveness of synchronous or asynchronous co behaviour of lawyers.

Prekop (2002) investigated collaborative information behaviour of members of the armed forces who worked in command and control domain. They discovered that their collaborative information seeking patterns were influenced by both collaborative and organization contexts. The study revealed that CIB in simulation battle field is characterized by dense social networks that facilitate information sharing, dynamic work goal and situation, work process and specialized domain knowledge. Different collaborative information seeking patterns were identified in the study. These included information seeking by recommendations, information seeking by direct questions and information seeking by advertising information paths.

Based on the reviewed literature, it has been noted that there are numerous factors that motivate individuals to collaborate when seeking and using information. These factors vary from one study to another. Variations on nature of collaborative work, types of collaboration that individual are engaging in and domain in which such collaboration is studied have been identified as determinant factors influencing CIB of different user categories.

### **3.5 Information sharing and non-information sharing as collaborative information behaviour**

Information sharing is an essential part of collaborative information behaviour. In some studies information sharing has been studied as a sub-set of information behaviour (Talja, 2002) while other researchers such as Karunakaran, Spence and Reddy (2010) describe information sharing as a macro level set of information behavioural activities. According to Shah, (2010a) information sharing enables facilitation and filtering of information among people. Similarly Davies (2013) and Talja (2002) see information sharing as natural and inevitably linked to collaborative information behaviour. Hertzum (2010) describes information sharing as a process that enables collaborators to create and maintain awareness among peers and construct shared understanding.

It is important to define what kind of information is actually shared during collaborative information behaviour and why people share what they share. Information sharing according to (Talja, 2002) involves sharing information about relevant or irrelevant documents, sharing relevant documents, sharing information about the content of relevant information and sharing information about an efficient strategy of finding relevant information. Talja, (2002) descriptions provide an understanding of the concept of information sharing, however this offers a narrow view of information sharing as it focuses only on a materialistic view of information sharing and collaborative information retrieval. The current study focuses on a broader perspective by including information sharing activities in different stages of collaborative work tasks. This study views information sharing as a process of sharing information about collaborative information activities, collaborative related work activities and information obtained from collaborative information practices.

Information sharing is sharing of not only physical documents but also coordinating information used to facilitate collaborative process (Sonnenwald, 2006). Pilerot (2012) argues that unless the researcher state what is actually shared then, the meaning of information sharing and the difference and knowledge sharing will remain elusive and vague. Pilerot (2012) focuses on the theoretical understanding of information sharing and the activities that are involved in this

process of sharing within specific context. Lee (2013) also indicates that in group based information behaviour students share information in different stages. This includes sharing information about information needs, search strategy and search results.

Information sharing has been used interchangeably with information exchange (Wilson, 1981; Wilson, 2010b), information transfer (Wilson, 1981) and knowledge sharing (Totterman and Widen-Wuff, 2007; Haeussler, 2010 and Haeussler, Jiang, Thursby and Thursby, 2014). Almeahmadi, Hepworth and Maynard (2014) stated that in academia information sharing involves information behavioural practices such as, providing information, giving information, exchanging information and sharing of information. This is done either verbally, physically or virtually. Pilerot (2012) argues that, information sharing is a generic term which includes other terms such as information exchange, information flow, and information transfer. There are also possible that there are some differences in the use of these terms within different disciplines such as library and information studies, communication studies, human-computer-interaction and psychology. These terms also depict different meanings when applied in directional and reciprocity dimensions. Pilerot (2012) in the review of literature on information sharing in the field of library and information studies noted that unlike information exchange which is non reciprocal and one directional, information sharing is reciprocal or multidimensional in character. A similar observation was noted by Wilson (2010) who insisted that there is an existence of weak and strong reciprocity in situations where individuals engage in information exchange. Tabak and Wilson (2010) also discuss the multi-directional relationship between information sharing and context of information behaviour. They conclude that while information sharing may be shaped by context, sharing also shapes context. Tabak and Wilson (2012) further argue that the desire to establish credibility of information is one of the most powerful accelerators and a primary trigger for information sharing practices in academic communities.

In an attempt to understand information sharing, Pilerot (2012) identifies five different theoretical perspectives in understanding information sharing practices. Firstly, social network perspective focuses on the transfer of information from one person to another or transfers of information through common experience such as meeting (Pilerot, 2012). Secondly, information

sharing is viewed as important process for facilitating common grounding or common understanding among information users. Information sharing is essential in creating common understanding among group members. This approach has been widely used by researchers such as (Hertzum, 2008; 2010). Thirdly, the small worlds approach views information sharing as the activity that takes place in a social environment. It involves individuals who share common interests and norms. Both the common ground approach and the small worlds approach view information sharing as the process of creating meaning. Lastly, information sharing is viewed from social capital perspective. Scholars who use this perspective view information sharing as exchange of information motivated by specific incentives, rewards or risks (Totterman and Widen-Wuff, 2007). The social capital approach may be seen as external and is concerned with the sharing of information between one actor and another. This can be internal and involves bonding structure between individuals in a social unit (Pilerot, 2012).

Wilson (2010) developed a framework for analyzing information sharing. The framework contains multiple factors such as risk, reward, and proximity and organization culture. Wilson (2010) describes information sharing as a complex and multidimensional phenomenon that varies from context to context. Factors for information sharing may not be replicated in other contexts.

Similarly, Mishra, Allen and Pearman (2011) examined motives for information sharing and factors affecting information sharing among tactical commanders working in multi-agency major incidents. Mishra, Allen and Pearman (2011) noted that factors that influence individual to share information include confidentiality and availability of information and familiarity with technological tools that support information sharing. Mishra, *et al.*, (2011) further state that information sharing emanates from the need to avoid duplication and overlapping of activities among members and the desire to share expertise and resources.

Talja (2002) explains that information sharing or non-sharing practice in academic setting is influenced not only by individual's factors such as individual attitudes and interest to share information, but also cultural and social factors which are related to information behaviour. Talja

(2002) also developed a conceptual framework for understanding of factors related to sharing or non-sharing of information in academic setting. Four types of information sharing were identified: a) strategic information sharing, b) paradigmatic information sharing, c) directive information sharing and d) social information sharing. Davies (2013) criticizes Talja (2002) framework for understanding information sharing on the ground that it is difficult to draw a well-defined boundary between strategic, pragmatic and directive information sharing. Davies (2013) further argues that the classification overlaps especially in the situation where individuals have similar goals and concerns. It is also evident that such classification of information sharing fits best in information searching and retrieval stages rather than all aspects of information behaviour. On top of that, such schematic description of information sharing is based on “materialistic approach” that treats information as a physical document.

Haeussler (2010) use social capital and rational choice approaches to investigate scientists working in the academic and industrial sectors. Haeussler (2010) looked at the factors that influenced sharing of information. The study revealed that social capital is capable of increasing the level of sharing of information among academic and industrial scientists. In addition, sharing professional identity motivates academic scientists to share information with other academic scientists than industrial scientists. The social capital approach has also been used by Totterman and Widen-Wuff (2007) in the study of collaborative information behaviour of university members of teaching staff. Totterman and Widen-Wuff (2007) explore elements of social capital including social identification and affective trust, and its effect, on information sharing among faculties. It was revealed from this study that proximity or working within the same building; friendship and scholarly closeness have great influence on information sharing among faculty. The study further noted that professional identification, existence of formal and informal network structures together with trust and open communication among faculties also influence information sharing. In similar way, Poteri (2007) found that the size of research group and members' geographical proximity to determine degree of collaboration and information sharing.

Previous studies have indicated that there is a two-way relationship between trust and information sharing practices. On one hand, high level of trust is an element of social capital



which motivates individuals to share information with others (Lee, Anderson and Burnett, 2014, Mishra, Allen and Pearman, 2011, Poteri, 2007). In other words trust is identified as one of the pre-conditions for effective information sharing. On the other hand information sharing practices are described as factors that help build trust among collaborators (Marsh and Dibben, 2005). Such variations of research findings may be attributed to the existence of different types of trust including: dispositional trust or trust related to personality traits, learned trust which is based on personal experience and situational trust which is individuals' response to situational clues (Marsh and Dibben, 2005). Depending on which types of trust at play that the researcher focuses on, this may lead to different research findings on relationship between trust and information sharing.

Lee, Anderson and Burnett (2014) pointed out that trust together with shared interest and social interactions are the factors which encourage LIS doctoral students to share information. Within the same line Mishra, Allen and Pearman (2011) concluded that trust is the major social factor which affects information sharing practices. Wilson (2010) argues that trust is not an independent variable that can be used to study information sharing practices. According to Wilson (2010) influence of trust in information sharing should be studied in relation to other variables such as proximity and risk/ rewards that individuals anticipate from sharing information. It is evident from the literature that for a better understanding of effects of personal trust on information sharing, a closer eye should be taken to other variables including sense of shared interest among people who wish to share information, the way individuals interacts (Lee, et al, 2014) and benefits that are expected after sharing information (Wilson, 2010).

Information sharing, like other aspects of human information behaviour, can be studied in relation to other macro factors. Tabak and Wilson (2012) indicated that information sharing practices in academic communities is sometimes influenced by macro factors such as political environment changes, public concerns or matters related to international relations. The influence of large social forces on information behaviour has been also extensively discussed by Burnett and Jaeger (2011). Individuals decision to share or not to share information may be influenced by factors such as public concerns about security (Tabak and Wilson, 2012), societal norms, rules

and regulations. Related information sharing with culture, Wilson (1997) stated that information exchange, his preferred term for information sharing, is more likely to occur in cultures with high collectivism.

Depending on roles distribution and types of collaboration, information sharing or non-sharing can occur implicitly or explicitly. Capra, Valasco-Martin and Sams (2010) discussed different levels of working together and information sharing. They identified different types including self-initiated information sharing. This is one directional information sharing that occurs in situation where there is no explicit description of interest on the part of individual receiving information. The second type involves perceived interest information sharing. Unlike self-initiated information sharing, this method allows searcher to share information based on the belief that others will find it useful. There are also expressed interest and explicit information sharing (Capra, Valasco-Martin and Sams, 2010). The former is based on explicit interest or request to share information while the later is a result of explicit cooperation among people who have common goal (Capra, Valasco-Martin and Sams, 2010).

In the study of collaborative information behaviour of engineering students, Saleh (2012) revealed that division of engineering design tasks created a need to share information about on-going-information needs. Saleh (2012) states that due to division of tasks and activities among group members information sharing and common grounding are inevitable part of collaborative information behaviour. O'Farrell and Bates (2010) investigated Library and information Science undergraduate and graduate students' during group projects. They noted that sharing information sources was the dominant characteristics of collaborative information behaviour of students. In addition, students more frequently shared relevant website, journal articles, books, journal and names of relevant authors.

Fewer studies focused on non-information sharing behaviour of individuals working in group (Fisher, 2006; Almeahadi, Hepworth and Maynard, 2014). Almeahadi, Hepworth and Maynard, (2014) reported that constant competition, avoiding conflicts and lack of interest contribute to failure to share information among female academics in Saudi Arabia.

Studies have also established the influence of information technology tools on information sharing behaviour (Spence, Reddy and Hall, 2005; Saleh, 2012 and Crescenzi and Capra, 2013). Previous studies have shown that both traditional and modern methods of information sharing are used concurrently (Spence, Reddy and Hall, 2005; Saleh, 2012 and Crescenzi and Capra, 2013). Saleh (2012) reported that engineering students used different method for sharing information where the use of email and face to face meetings were dominant. Other tools identified included *Googledoc*, *DropBox* and phones. Furthermore, Saleh (2012) revealed that engineering students shared information using collaborative software tools to build information base. They also developed new information object which is required for creation of shared knowledge. Harrison (2009) also noted that undergraduate students preferred to use multiple tools including phone, Skype, email, Facebook, instant messaging and face to face communication. Similarly Spence, Reddy and Hall (2005) investigated channels of communication used during collaboration among researchers in academic setting. The findings showed that various mechanisms are used for sharing information during collaborative information seeking. These include: the use of email, face to face encounter, phones, Instant Messaging, teleconference, electronic forum and fax. Shah (2010b) noted that collaborators used different method to share information including email, face to face meetings, IM, phone and conference calls.

In medical domain Spence (2005) noted that group members preferred to use face to face communication compared to the use of technology in sharing information. Similarly, Sarcevic (2009) noted that health practitioners prefer traditional face to face method when sharing information.

The factors that influence people to select specific tools or method slightly differ across studies. Shah (2010b) observed that the choice of tools used was largely influenced by factors such as situation or space. This refers to whether or not collaborators are co-located or remotely located. The objectives or nature of the task to be accomplished such as brainstorming or searching information is also relevant. On the other hand, Spence, Reddy and Hall (2005) noted that the

choice of medium of communication is largely influenced by the extent to which researchers are familiar with each other. In the medical domain Spence (2005) and (Sarcevic, 2009) noted that information sharing happens face to face because individuals spend most of their time working collaboratively in an effort to solve complex problems. The use of technology posed some limitations due to the nature of health emergence incidents.

### **3.6 Information evaluation process in collaborative information behaviour**

Different concepts have been used interchangeably to describe the process of evaluating information. These concepts include information skimming, information synthesis and information sense making. Evaluating information is an important process which determines the usefulness and use of information. This determines whether to use or not to use information found (Byström, 1999; Rieh and Hilligoss, 2008 and Rieh *et al.*, 2013). This study adopts Sonnenwald's (2005) idea of linking process of evaluating information source to different stages of information behaviour. The stages include identification of information need, decision to seek and use information.

Rieh *et al.*, (2013) noted that little attention has been paid to understanding how individuals collaborate in evaluating process. The process of information evaluation in collaborative information behaviour is not widely discussed. According to Rieh *et al.*, (2013) collaborative information evaluation involves:

*“individuals’ judgment of the value of certain information shared, negotiated, and changed through feedback, suggestions and validations from other individuals as a result of interacting with them in the situations where they have common information problems to resolve.”* (Rieh *et al.*, 2013:2).

Rieh *et al.*, (2013) further argue that unlike evaluation of information in an individual context, collaborative information evaluation entails a more complex task as it involves evaluation of information in different stages of collaborative information seek. It also involves group discussions, reviews, agreement and disagreement about information (Harrison, 2009). Through

evaluation of information, individuals not only understand the value of information, but also add value as they validate and confirm information from each other (Rieh *et al.*, 2013). Collaborative information evaluation increases group awareness about information and it offers a common understanding of the value of information in relation to information need.

Rieh *et al.*, (2013) further developed a framework that comprises of individual information evaluation axis and group-based information evaluation axis. Rieh *et al.*, (2013) stated that individual information evaluation axis involves shared information, a process in which individuals evaluate the usefulness of information against information needs. They use both influences from other people along-side their own criteria. Individual evaluation involves information exchange, evaluation or transferring of information to information seeker. It contains suggestions of value or usefulness of information. The group-based information evaluation comprises comparative information evaluation axis and cooperative information evaluation axis. The former occurs when individuals have shared information need collaborate explicitly in seeking information and evaluate the results together. While the later occurs when individuals share information need but they do not always work together. In the last axis information is shared as the need to compare the outcome of their search results, verify, and prioritize and synthesis.

With regards to Rieh *et al.*, (2013) framework there are some few controversial areas that need further discussions. The term “shared information evaluation” as it has been used suggest that individuals are involved in evaluating shared information while the process relate on how external factors influences the process of evaluating the value and usefulness of information. Furthermore, the authors relate individual information evaluation with implicit collaboration and group-based information evaluation with explicit collaboration. It is possible that explicit collaborative information behaviour includes all four types of information evaluation. Individuals involved in explicit collaborative information behaviour sometimes make judgment on the value of information. This is based on the influences of others, after they have shared information which contains value judgment or after discussing and validating the value of information with others.

Hertzum (2008) developed a six dimensional framework for evaluating collaborative information behaviour. This dimension not only focuses on evaluation of information, but the entire practice. The dimensions included in the framework are: a) the purpose of collaborative information practices, b) types of collaborative information sought, c) roles and patterns of responsibilities, d) prototype activities, and e) granularity or levels in which CIS is studied and coupling or interaction between actors. The framework dimensions provide insights into various CIB studies (Hertzum, 2008).

There are different methods used to evaluate information sources Judgment on value and usefulness of information sources has been done using criteria such as relating information found with task requirements (Saleh, 2012), assessing the validity, reputation of information sources and the relevance of information to the topic (Harrison, 2009) and comparing multiple sources that report similar results (Harrison, 2009 and Saleh, 2012). Saleh (2012) further noted that while collaborative information seeking of students involves divergent and convergent of activities, information evaluation was characterized by shared focus, convergent of activities and integrative collaboration. Rieh and Hilligoss (2008) point out that during evaluative judgment of information, students select information sources based on criteria such as personal interest to information sources, relevant to an assignment, recommendation from friends, reliability and authoritativeness of information sources. Head and Eisenberg (2010) investigated college students' information seeking strategies and challenges they encountered when accomplishing their course related assignments researches. One of the interesting findings of this survey is that despite the fact that assignments given to students were done on individual basis; evaluating information was often a collaborative process. Friends, family members and course instructors were the most frequently consulted people during information evaluation. Twait (2005) also reported that students used different criteria in selecting and evaluating information sources such as content, familiarity with the source, reputation and credibility. Other criteria used by students were convenience, format of information, external influences, availability and ability to understand.

Few studies have examined the role of libraries in supporting collaborative information behavioural practices, particularly information evaluation. Talja (2002) found that researchers do not view librarians as important intermediaries during CIS. Researchers have the perception that finding relevant documents is usually not a problem; rather, the problem is deciding which documents are most relevant (Talja, 2002). As a result, they prefer to collaborate with fellow researchers and students they trust and who may have previous knowledge in the field. O'Brien and Symons (2007) examined how undergraduates interact with information and what are their information behaviours and preferences. This study was considered useful in assisting librarians to better target information literacy programs to students based on their needs. It was noted from this study that while students expressed confidence that they used different methods to evaluate information found on web, including use of URLs, authorship, currency and quality of information sources, faculty members had the feelings that students do not have necessary skills in evaluating information sources.

### **3.7 Challenges encountered during collaborative information behaviour practices**

Collaboration in different information behavioural activities has been described as an advantageous and also challenging process. The process of working in groups to identify information needs, seek and use information might be both rewarding and challenging. Collaborative information behaviour is desirable as it enables collaborators to accomplish more as they benefit from each person's experiences and expertise, influence one another and develop profound understanding (Shah, 2010a). Furthermore, collaboration enables group members to pool resources by bringing array of knowledge, skills and experiences together and engaging in discussions that lead to revision and reassessment of individual's point of views (Meyers, 2010).

Focusing on collaborative information seeking behaviour (Shah, 2010a) identifies four conditions in which CIS is useful. These conditions are: existence of common goal and mutual benefits among collaborators, existence of complex task which is exploratory in nature, high benefits to collaborative load and lack of knowledge and skills among individual to perform a task individually. Sharing the same opinion, Meloche and Dalton (2011) identified four key factors for successful collaboration among researchers and educators working on collaborative

information seeking. The factors are: equal partnerships, bilateral communication, non-hierarchical collaborations, and appropriate dissemination of outcomes. Meloche and Dalton (2011) further argue that bilateral partnership enables establishment of trust among collaborators. The paper also provides a broader understanding of the concept of communication by including not only conversation, but also procedures, documentations and process related to communication. Communication informs group members about progress and development.

Spence, Reddy and Hall (2005) in the study of collaborative information behaviour of academic research found that collaborative information seeking is more successful as researchers can rely on each other for guidance and it is easier for collaborators to find more useful information when working in collaboration. Meyer (2010) among other issues explored collaborative information search of middle class students so as to identify stages in which collaboration was beneficial. The findings confirmed that students reported strong affective motivation for group work with most students citing that group work was preferred to individual work. Students also acknowledged resource pooling and constructive elaboration as key benefits to the group process.

Most of the challenges that individuals encounter when engaging in collaborative information process are related to the nature and characteristics of collaborative work. These challenges may be experienced at different stages including problem identification, information seeking, information evaluation, information sharing and use (Harrison, 2009). Harrison (2009) opines that the complexity of information seeking process is increasing when it is approached in a collaborative fashion as collaboration makes information seeking process more complicated.

Shah (2009, 2010a, 2010b, 2010c) identifies different limitations of collaboration in the context of information seeking. These limitations include the fact that collaboration is time consuming and could induce additional costs such as cognitive load and the cost to coordinate various events and participants (Shah, 2009 and 2010a). Individuals working in group join the group with collaborative and individual interest. One of the challenges is how to make sure that the common ground prevail and not overshadow the interests of the few (Shah, 2010c). There is also a



challenge of deciding relevance of information, information overload, lack of trust between group members and poor division of labour (Shah, 2009).

Hertzum (2008) argues that collaborative information seeking implies that individuals have to create certain level of shared understanding or common ground, a process that is complex and time consuming. Different stages of collaborative information behaviour require individuals to maintain awareness and common understanding. Hertzum (2010) further argues that during collaborative information seeking, information is not only needed as an ultimate end, but also to inform group members in various decisions. The challenge according to Hertzum (2010) is to ensure that people continuously acquire new information and at the same time maintain shared understanding of both acquired information and collaborative activities.

Meyers (2010) noted that collaborative information seeking requires resource pooling, a process which may lead to information overload, confrontation and multiple strategies brought by collaborator; may create cognitive conflict that may increase uncertainty. Meyer (2010) further noted that collaboration may create challenge of how to address the problem, of how to process and stream information and ideas from various collaborators.

The problem of having “free riders” in group has been highlighted as one of obstacles in collaboration (Campbell and Li, 2006). Campbell and Li (2006) argue that ensuring that every group member contribute equally and observe time are some of the challenges facing students when they work in groups. Similarly, Roberts and McInnerney (2007) stated that lack of group work skills and existence of group members who are “free riders” are some of the challenges that need to be addressed in students collaborative activities. Harrison (2009) identifies a number of challenges that students encounter during collaborative information seeking practices. These include the fact that there are unequal contributions from different students working together, varying group members’ opinions and the fact that group members can be indecisive.

Fidel, Pejtersen, Cleal and Bruce (2004) used cognitive work analysis approach to examine motivation and challenges for collaborative information retrieval among design engineers who

worked with Microsoft Company. Three sets of challenges were identified from the study including collaborators' dimension challenges, work and task situation dimensional challenges and organization related challenges. Collaborators related challenges noted by Fidel (2004) include differences in actors' priorities and stake, challenges of integrating and maintaining focus when new ideas emerged during the process and unequal knowledge and experiences among actors. From the task dimensions identified challenges include task complexity and the nature of information sought which requires members to engage on speculations, honchos and interpretations (Fidel, Pejeteron, Cleal and Bruce, 2004). From organizational dimension, there were also some challenges including the information needed is not documented and challenge of making decisions which have noticeable implication to the team work and organization.

Sonnenwald (2006) investigated challenges in sharing information among group members working in the military context. The study identified four challenges. These challenges included; difficulties of how to recognize different meanings of shared symbols, sharing implications of information, interpreting emotions and re-establishing trust among members. Collaborative information work involve group members who might have different perceptions, interests, attitudes and skills which all together contribute to group dynamics (Sonnenwald and Pierce, 2000). In another study Sonnenwald and Pierce (2000) noted that "contested collaboration," that is incidence in which collaborators contest one another, was one of the characteristics of collaborative information behaviour among members of armed forces. Contested collaboration is associated with factors such as group members' differences in past experiences, differences in use of specialized languages, terminologies and perceptions about quality of work (Sonnenwald and Pierce, 2000). Other factors related to contested collaboration are differences in individual's goals and priorities and lack of trust among group members (Sonnenwald and Pierce, 2000). The same challenge was observed by Poteri (2007) despite the existence of open culture of sharing information; collaborative information behaviour in academic setting is also characterized with contested collaboration particularly among young researchers.

Information technology has a significant impact on collaborative information behaviour. It shapes the way people seek, share and use information. Shah (2009) highlights different

challenges that are related to the “cost” of using systems that support collaborative information seeking, including cost of learning about how to use the new system, adaptation and adoption cost and collaborative cost.

### **3.8 Applicability of solitary models of information behaviour in collaborative context**

Researches in information science have developed a substantial number of models and theories of human information behaviour. For many years these models have been used to guide researchers in investigating different aspects of human information behaviour. Among these models include Wilson (1981, 1996 and 1999) models of information behaviour, Niedźwiedzka, (2003) general model of information behaviour, Ellis (1989) model of information seeking process and Kuhlthau (1991) information seeking process model.

One characteristic of these models is that they describe information behaviour as a process that involves individual information seeker. Information user is defined in these models as an individual who interacts with information systems or sources to satisfy his or her information need (Karunakaran and Reddy, 2010, Shah, 2010 and Saleh, 2011). In the book edited by Fisher, Erdelez and McKechnie (2006) an extensive review of seventy two theories and models that relate to information behaviour is provided. Despite the fact that such work provides an “encyclopaedic” review of theories that are used in the discipline, none of the theories and models discussed in the book explicitly incorporate and discuss aspects related to collaborative information behaviour.

There are number of studies that have challenged the reductionist view of previous studies on human information behaviour and existing models of information behaviour (Hyldegård, 2006b, Hertzum, 2008 and Saleh and Large, 2011 and Shah, 2013). Commented on the landmark research on information behaviour Wilson and Wilson (2010) questioned recent developments in collaborative information seeking research and assert that there is a need to reorient models and theories of information behaviour so that they can model the relationship between collaborative searchers in terms of roles, division of labour and search expertise.

Hyldegård, (2006b); Kubmann, Elbeshausen, Mandal, and Womser-Hacker (2013) and Wilson, (2010) examined the applicability of existing solitary models of information behaviour in group context. Generally, these studies question the extent to which the existing models of information behaviour are reasonable and complete representation of reality they seek to present.

Hyldegård (2009) tested uncertainty principle underlying Kuhlthau (1991) model of information seeking behaviour among group of students working on collaborative learning assignment. The study revealed that group members' experiences of uncertainty did not confirm the Kuhlthau (1991) information seeking process model. In a different study, Hyldegård (2006b) explored how Kuhlthau's (1991) information seeking process model may be applied in studying library and information science graduate students working in group based context. Generally the study revealed that only collaborative information searching process of undergraduate students resembled those described in the model. Information searching activities of students tend to decrease towards midpoint as writing activities tend to increase. There were some dissimilarities in the contextual, social and personal factors. The work task process alternated between "we mode" or integrative collaboration to "I mode" or complementary collaboration. This shift was related to focus formulation, information searching, relevance judgment, reading and writing. Based on the findings, Hyldegård (2006b) extended Kuhlthau (1991) model to Group Member-In-Context (GMIC)-model, that can be used to study group based information behaviour in academic context.

Using Kuhlthau's Information Seeking Process model (1991), Hyldegård and Ingwersen (2007) explored students' information behaviour. The study focused on thoughts and feelings experienced by students when performing group information searching as well as the factors affecting group members' information behaviour in an academic environment. The findings showed that the ISP-model did not fully conform to students' group problem solving process and information seeking behaviour. The study further found that group learning tasks and situational social factors including group work and processes were the factors that affected students' information behavior.

Chaura (2015) used Kuhlthau's Information Seeking Process model to investigate information searching behaviour of fourth year students at Mzuzu University in Malawi. The findings indicated that students' information searching behaviour did not conform fully to Kuhlthau's Information Seeking Process model. It has been noted in this study that students' previous experiences working on different or similar assignments reduced feelings of anxiety, uncertainty, confusion, doubtfulness and afraid of failing.

Kubmann, Elbeshausen, Mandal, and Womser-Hacker (2013) examined the applicability of Elli's (1989) model of information seeking behaviour in students collaborative search process. The study revealed that Ellis' model does not completely fit in collaborative context. Only five stages of starting, browsing, extracting, differentiating and ending were found to be relevant to collaborative information searching processes. Starting phase relates to active communication and maintenance of awareness in the initial stage in collaborative information searching. The study revealed that differentiation plays a similar role particularly during the stage of collaborative information evaluation and during the ending stage during the creation of presentation. The remaining stages of chaining, verification and monitoring play secondary role in collaborative information searching where few participants were observed to chain or follow links they found on results pages.

Shah and González-Ibáñez (2010) mapped Kuhlthau's (1991) information seeking process model to the participants working in collaborative information searching activities in a laboratory setting. Based on the analysis of cumulative data of the searching session, it was generally confirmed that information seeking process model developed by Kuhlthau, is a reasonable model that can be used to explore various activities taking place in collaborative information search. Six stages of Kuhlthau model, initiation, selection, exploration, formulation, collection and presentation were identified in collaborative search process.

The theory of library anxiety has been widely used to provide framework in studies of human information behaviour. These studies have applied the theory of library anxiety in individual context (Lu and Adkins, 2012). Wilson and Wilson (2010) re-examined the applicability of

library anxiety theory in the collaborative information seeking context. Wilson and Wilson (2010) stated that collaborative information seeking collaborators may differ in terms of experiences, knowledge and skills. Such feelings of inadequacy that novice searchers have sometimes create anxiety and hence different behavioural patterns.

Focusing on sense-making process, Paul and Reddy (2010) in their focus on sense making process criticized models of sense-making such as Dervin's sense-making model. Paul and Reddy (2010) described sense-making as individual based cognitive activity that consists of organizing information into frameworks or representations, refining the representations used based on new information found and changing representations or frameworks that are in use to fit new information. Paul and Reddy (2010) also argues that even existing models of collaborative information behaviour have failed to take into account that collaborative sense-making is an important aspect of collaborative information behaviour.

There are a number of models of collaborative information behaviour that have been recently developed such as Shah (2008), Yue and He (2009) and Reddy and Jensen (2008). Despite such effort to develop models to support collaborative information behaviour, Shah (2013) stated that unless some fundamental issues such as user motivations and methods for collaboration, social aspects of working in collaboration, individual and group benefits, user roles and evaluating aspects related to user and the system are addressed, it will be difficult to develop sustainable models of CIS. Kim (2013) examined the state of art of collaborative information seeking research published between 2000 and 2013 with the aim of providing theoretical and methodological critique on a) approaches, b) theory development, c) conceptual framework and methodologies used in the field. Kim (2013) commented that there is a lack of comparable CIS theories and models which are similar to those that exist for individuals information seeking. The review noted that few studies of collaborative information seeking behaviour are based on previous theoretical framework. Such observation has been also noted from the literature that few studies of collaborative information behaviour have used traditional models and theories of information behaviour to guide their studies. These studies include (Hyldegård, 2006b) who uses (1996) general model of information behaviour and Allen (1997) integrated person-in-situation

behaviour model as theoretical framework for the study of collaborative information behaviour of graduate students.

### **3.9 Key variables related to the study**

This sub-section discusses selected key variables that have been extracted from models and theories of information behaviour discussed in the theoretical framework chapter. The selected variables have been discussed in relation to other variables relating to the study and in line with the main thematic areas that form part of the literature review. The variables discussed include information use, context of information behaviour, and situation of the context. The discussion of the selected variables has also incorporated other variables which are embedded within these three main variables. The embedded variables include: work roles, collaborative work, collaborative tasks, and group awareness and information value.

#### **3.9.1 Information use**

Many of the issues related to use of information have been highlighted and discussed under the topic of evaluation of information sources. Process of evaluating sources of information is an important stage towards the use of information. Information evaluation deals with assessing the value, utility and usefulness of information in relation to information need and use. The concept information use also relates to information need, where information need creates motivation for information seeking and use (Bartlett and Toms, 2005).

What constitutes information use, when and how information is used and what metrics should be used to study information use are the topics of much debate (Wilson, 2000; Kari, 2007 and Davies, 2013). Wilson (2000) defines information use as physical and mental (cognitive) acts of incorporating found information into their knowledge base (Wilson, 2000). Such conception corresponds with Bartlett and Toms (2005) description which consider information use as a final stage in information seeking process. Davies (2013) argues that there is no single definitive definition of information use as there are multiple dimensions that focus on different aspects of information use. Kari (2007) and Davies (2013) further challenge Wilson (2000) and Bartlett and

Toms' (2005) notion that information use starts when information is sought. On the contrary they Kari (2007) and Davies (2013) argue that information need occurs in all stages of information behaviour. Similarly Byström and Hansen (2005) commented that in information intensive task, information is constantly used during performance.

In addressing some of these challenges, different frameworks have been developed and used to guide the research on collaborative and individual information use. Davies (2013) used a cognitive dimension of information use that focuses on changes in thinking. This occurs when people interact with information. Spink and Cole (2006) proposed the need to develop and use integrated model of human information behaviour that distinguishes looking for information as a potential use of information sources and real physical and mental acts of incorporating found information into knowledge base. The proposed framework was developed focusing on information use in everyday life and in an organization contexts. However, it introduces new insights by including two dimensions of information use namely internal and external information use. External use of information involves activities such as listening, agreeing or disagreeing while internal use relates to activities such as comparing, categorizing and polarizing information (Spink and Cole, 2006).

Kari (2007) also developed a framework that describes different dimensions of information use. The first dimensions is information practices dimension which focuses on processes of approaching information sources such as reading, consuming, searching, creating and sharing information. The second dimension according to Kari (2007) is information searching which involves choosing, approaching, looking for information, consulting others or using technical tools. The third dimension is information use dimension which involves processing analyzing, modifying, internalizing, feeling and interpreting information.

The fourth dimension is knowledge creation dimension where information use is conceptualized as the process of making and unmaking meanings, developing new concepts, incorporating pieces of information into knowledge base, constructing information, and bridging knowledge gap. The fifth dimension is information production which deals with external expression of



information, packing and repacking information as well as sharing and bridging together pieces of information. The sixth dimension relates to the process of applying information in making decision, solving problems or in accomplishing tasks. The last dimension of information use focuses on effects of information use that is changes that information brings about including external and internal changes such as increase personal confidence. The inclusion of different dimensions of information use as suggested by Kari (2010) intends to provide a broader understanding of students' information use by including different dimensions of information use in relation to various stages of collaborative information behaviour.

Maybee (2006) investigated undergraduate students' perception of information use with the intention of improving information literacy pedagogy and learning environment. The study revealed three different conceptions of information use held by undergraduate students. The identified perceptions are: information use as finding information located in information source, information use as initiating process of using information and information use as a process of building a knowledge base for various purposes. While the identified perceptions of information use do not address issues of information use in group work, they highlight students' perception of what constitute information use.

Parker, (2001) explore university students' learning information behaviour in literature based assessment tasks. In his study Parker (2001) argues that a better understanding of the interactions between information seeking and use is fundamental to a meaningful investigation of student learning. Limberg (1997) examines the possibilities of linking aspects of learning and information use in the students' learning assignments. Limberg (1997) found that students' understanding of subject's content, working in common subject knowledge and interest are some of the factors that influence information use in learning.

It is noted from the reviewed literature of collaborative information behaviour that despite its importance, the concept information use has been given little attention among researchers. Information use has not been studied frequently as an independent or at least related aspect of collaborative information behaviour. Studies of information use have focused on aspects such as:

factors that influence the choice of information sources to be used, relationship between personal factors such as sex, age, level of education and experience of users to the usage pattern of information sources and reasons for using or non-use of information. Also, instead of focusing on actual information use, numerous studies have focused on the use of sources and channels of information.

### **3.9.2 Group awareness**

The term awareness covers a wide range of activities including awareness of existence of information need, potential information sources, task activities and information related activities. Karunakaran, Spence and Reddy (2010) and Yue and He (2009) underscore the importance of awareness in collaborative information behaviour as it informs group members about ongoing collaborative activities and information activities. Communication plays significant role in facilitating awareness. Through different forms of communication verbal or non-verbal collaborators become aware of various activities.

The importance of maintaining awareness in collaborative information seeking has been also emphasized by González-Ibáñez, Haseki and Shah (2012). González-Ibáñez, Haseki and Shah (2012) argued that awareness enables collaborators to evaluate each other's actions with respect to group goals and progress, and as a result this is fundamental to the coordination of activities, sharing of information and selection of useful and important information. Shah (2010d) describes awareness as a distinctive characteristic that differentiates collaboration from other activities such as coordination and cooperation. Shah (2010d) remarks that:

*“For an interactive, intentional, and mutually beneficial collaboration to be successful, it is imperative that all the participants be aware of each other's actions and contributions. This also helps to establish trust among participants. Such awareness may not be a requirement for coordination or cooperation”* Shah (2010d:8).

Despite its importance in collaborative information seeking, Shah (2010d) argues that awareness may depend on different factors such as responsibilities among the collaborators, roles of the

collaborators, need for privacy versus sharing of information among the collaborators, and the nature whether collaboration is either synchronous or asynchronous and co-located or remote.

Paul and Reddy (2010) identified two types of awareness common during collaborative sense making. These include: social awareness and activity awareness. While social awareness relates to awareness about collaborators, activities awareness focuses on what collaborators do and relates to a higher level of sequence of actions related to a goal, mediated by tools and situated in many embedded context (Paul and Reddy, 2010). Paul and Reddy (2010) further argue that activities awareness may involve awareness about work practices, culture, organization structure and interpersonal relationship. Paul and Reddy (2010) affirms that support activity awareness during collaborative information seeking allows, collaborators to create and maintain temporal connection of activities of each individuals. Such observation stresses that successful collaboration requires the maintenance of group awareness throughout.

Focusing on undergraduate students working in group based assignments; Saleh (2012) noted that awareness plays an essential role in both integrative and complementary collaborative information behaviour. Erickson (2010) studied synchronous collective search carried out online by different searchers. Erickson (2010) noted that communication through gestures, gaze and speech and presence of common representation facilitate awareness among group members. The study identified existence of mutual awareness collaborative search. Mutuality of awareness requires each person to be accountable for his actions and at the same time helps group members to limit and structure their interactions with others. Sonnenwald and Pierce (2000) identified different types of awareness that individuals have to establish and maintain when working in collaborative information related activities. The types of awareness include: individual situation awareness, intra-group situation awareness and inter group situation awareness. Sonnenwald and Pierce (2000) noted that awareness facilitates group shared understanding of both collaborative work and information sharing.

Hertzum (2010) analyzed breakdowns in collaborative information seeking among clinicians working in health care services. The conceptualization of information breakdowns offered by

Hertzum (2010), indirectly relate to the concept of lack of awareness of both information and understanding of information required to completely perform a task. In providing a detailed analysis of information breakdown Hertzum (2010) identified two types of breakdowns. These include collaborative information seeking where actors remain unaware of the information and collaborative ground breakdown where information remains unknown to some actors who need it. Meanwhile, some actors are aware of the breakdowns during CIS are related to collaborative grounding rather than information seeking. The study also found that breakdowns are usually related to the use of records (information) rather than oral communication. Increased proximity and fragmented of information increased the risk of breakdowns.

### **3.9.3 Context of information behaviour and situation of the context**

The concept of context has been widely used in studies of human information behaviour. Sonnenwald (1999) defines context of information behaviour as an indistinctive and multidimensional entity that provides source of meanings to human information behaviour. Case (2002) defines context as:

*“A particular combination of person and situation that served to frame an investigation.”*  
(Case, 2002:13).

Such combination according to Case (2012) involves multiple attributes including individual situations, the surrounding environment, the types of people, and the size of the social group involved in the investigation. Context as a multidimensional entity provides source of meanings and frame in which a particular phenomenon can be investigated Sonnenwald (1999). It may include a collection of events, histories, culture, knowledge and understanding that exist together at a point in time (Prekop, 2002). There are other related concepts that have been used synonymously with context including information world (Burnett and Jaeger, 2011) and setting or environment (Wilson, 2010).

According to Courtright, (2007), the term context has been used differently in research. In some research, context is viewed as social construct from the interactions among people or between

people and nonhuman elements. Researchers who subscribe to such view include Burnett and Jaeger (2011). There are those who subscribe to the view that context is a “constructed meaning” understood from the point of view of information user (Courtright, 2007). For example Wilson (1997) explains that “person in context” is the centre of information behaviour while Sonnenwald places individual at the centre of “nested set of factors” which are social network, situation and context (Courtright, 2007).

Researchers have mixed views on the role of context in understanding and shaping users information behaviour. While (Poteri, 2007) holds that context plays significant role in setting boundaries for which different collective behaviours can be studied, shape activities, roles and information behaviour. (Prekop, 2002), Burnett and Erdelez (2009) are more sceptical that the developments of information and communication technologies make information accessing tools more mobile, and portable. Development of information and communication technology influences not only the way information is accessed and shared but also makes contexts of information blurred, integrated, multiple and multilayered (Burnett and Erdelez, 2009). Fidel, Pejeteron, Cleal and Bruce (2004) argue that one of the limitations of studies that use social context to examine collaborative information behaviour is that they cannot be generalized outside the context in which they were conducted.

Paul and Reddy (2010) noted that collaborative information behaviour of medical practitioners is characterized by co-existence of two different contexts namely clinical activities context which relates to the provision of medical services and organization context which relates to the resource allocation task. Such coexistence of multiple contexts within a single user community makes assessment of the role of context more complex.

Related to the term context is the term situation. According to Sonnenwald (1999) situation is a sub-set of context and it may include different sets of activities or stories. In relation to information behaviour, situations may include processes such as information seeking situation, information sharing situation or task situation (Sonnenwald, 1999). Sonnenwald (1999) revealed that holds that when individuals describe a particular situation they may be influenced by

previous experiences, knowledge of similar situation or access to information. As a result, two people may describe similar situation differently.

There are other variables that have been linked to context of information behaviour and situation of context. These include information use, personal related variable such as age, sex, level of education, group work situation, and work related situation. Using different populations of study Hyldegård (2006a and 2006b) examined the impact of work task, group work and personality on individuals working in group setting. The study showed a positive relationship between task complexity and degree to which individual collaborate. Group conflicts, the distribution of tasks, sub-tasks and individual personalities were some of the factors that influence individual collaborative information behaviour.

### **3.10 Broader issues related to the study**

This study falls under the wider topic of scholarly collaboration and human information behaviour. This sub-section provides a brief review of literature that relating to the three broader research issues of scholarly collaboration, information behaviour and collaborative information behaviour. In the course of discussion, other related concepts are addressed that include communication, cooperation, coordination, contribution and collaborative information seeking.

#### **3.10.1 Scholarly collaboration, information behaviour and collaborative information**

Scholarly collaboration or scientific collaboration is a broader concept that includes a wide range of collaborative activities such as research collaboration, collaborative learning and faculty-librarian collaboration. In the context of academic setting, Walsh and Kahn (2009) defined collaboration as a process in which two or more parties from potentially disparate settings work together to achieve a common academic goal. Scholarly collaboration involves group of people of varying size implicitly or explicitly working together to accomplish a particular academic goal. In order to understanding scholarly collaboration, one has to view it as a social reality and process rather than an amalgamation of different entities understood from aspects such as case studies or co-authorship output (Walsh and Kahn, 2009).

Many studies on scholarly collaboration focus on different forms of research collaboration at the regional, national, institutional or individual levels. Despite existence of different forms of scholarly collaboration, this review focused on one type of scholarly communication namely students' collaborative learning activities and its relation to information behaviour.

Scholarly collaboration as an umbrella term is studied in conjunction with other related terms such as communication, cooperation, contribution and coordination. These terms are sometimes used synonymously. In an attempt to clear the contradictions that exist in the use of these terms, Shah (2010a) developed a framework of different levels of collaboration in which collaboration is described as a higher level process. According to Shah (2010a) collaboration differs from other "weak forms" of collaboration including communication, contribution, coordination and cooperation on degree of interaction, intent, trust, human involvement, symmetry of benefits and level of awareness. Shah's (2010a) framework defines communication as process of sending and exchanging information using various medium. On the other hand, contribution allows individuals to work with each other in achieving desired goals. By contrast, coordination involves connecting part together for harmonious actions. Cooperation according to Shah's (2010a) is the higher level concept next to collaboration, and involves taking part together in planning activities, negotiating rules and sharing resources.

During collaboration, information is unevenly distributed among actors. This makes communication and collaboration worthwhile as large efforts are required to make sense of both information and information seeking processes. Hertzum (2008) discussed three basic requirements for both creation and making collaboration more successful. First collaboration requires a certain level of shared understanding or common grounding. Without it collaboration is unlikely to succeed. The complexity of establishing and maintaining common ground increases as the size of the group increases. Unless information is continually shared, acquisition of new information within a group will lead to gradual disintegration of common ground. According to Hertzum (2008) collaborative ground involves the process of constructing shared understanding (common ground) that assimilates, evaluates and reflects information in group

context. While involved in common grounding the individuals constantly share information, debate meanings and resolve the differences.

Different forms of collaboration have been identified that relate to the students collaborative learning process. Collaboration can take different forms and this depends on the motives, the characteristics of group members and the nature of collaborative work that group members wish to accomplish. Reddy and Jensen (2008) noted that collaboration can be hierarchical or non-hierarchical. The former is based on unequal power relationship among group members such as collaboration between a student and his or her lecturer. While, the later involves collaboration among members who have more or less equal power such as peers, students or co-workers. Collaboration involves division of labour which lead to different types of collaboration such as integrative and complementary collaborations. Complementary collaboration occurs when individuals share common goals but they work separately and combine the results of their works later on (Sonnenwald, 1999 and Poteri, 2007), while integrative collaboration does not involve division of labour in accomplishing task and roles. On relation to the time and space dimensions, collaboration can be described as synchronous or asynchronous or remote and collocated respectively.

Studies have shown that the extent to which particular types of collaboration will be successful depends largely on different factors. In his remarks on forced collaboration among students, Shah (2010b) stated that the extent to which forced collaboration will be successful depends on the ability of group members to establish trust which is required to carry the collaboration. Saleh (2012) associates the success of integrative and complementary collaboration with factors such as students' personal compatibility in terms of work style as well as students' individual personalities, maintenance of awareness and trust.

There are different types of collaboration within the context of students' collaborative learning. There is no clear line that differentiates these types. Students' collaboration in learning activities may further take different forms such as forced collaboration, peer to peer collaboration and expert-novice collaboration (Shah, 2010b). Complementary collaboration for example can be



synchronous or asynchronous, co-located or remote. Collaborators may experience different forms of collaboration within similar collaborative work collaborators may experience different forms of collaboration. Hyldegård (2006b) noted that contextual, social and personal factors and stages in which a particular task is performed affect and influence students shift from wither “we mode” or integrative collaboration to “I mode” or complementary collaboration.

According to Shah (2013) the relationship between collaboration and information behaviour is symmetrical and reciprocal. Shah (2013) identified two situations of relationship between collaboration and information behaviour. The first scenario of relationship is “collaboration to help information seeking scenario.” In this scenario, the focus is on how collaboration is motivated by the desire to solve information related problems that are too difficult for the individual. The second scenario is “information seeking to help collaboration. In this scenario, information seeking is used to support projects which are inherently collaborative. Shah’s (2013) description of the relationship between collaboration and information behaviour, highlights two important points: Firstly, collaborative information behaviour entails information sought not for its own sake, but as a part of specific collaborative activities. Secondly, in order to understanding human information behaviour in collaborative context one has to focus on both collaborative work and information behaviour related activities. Human information behaviour is used as a broad term in this study. Human information behaviour has been discussed under other sub-topic such as information seeking, information use, information sharing and information need in this study. It is therefore sensible to indicate in advance that much of the remaining part of the discussion will be focused on as a single aspect of collaborative information behaviour and how it relates with other aspects of the stud.

Adopting the definition of human information behaviour from Wilson (2000), Saleh (2012) defines collaborative information behaviour (CIB) as a totality of behaviour exhibited when two or more individuals collaborate in identifying information needs, seeking, evaluating, sharing and applying information in solving a problem. As a generic term collaborative information behaviour encompasses different process and concepts such as collaborative information needs,

collaborative information seeking, collaborative information searching, information sharing, information use and collaborative sense-making.

Rieh *et al.*, (2013) identify different assumptions underlying conceptual foundation of collaborative information behaviour. His first assumption is that it entails identification of information need seeking information and information use. Second, collaborative information seeking involves both individual and collaborative activities. The third assumption is that collaborative information seeking may be initiated with the desire to evaluate the value of information collaboratively. Hertzum (2008) views the difference between individual information behaviour and collaborative information behaviour as primarily a matter of level of analysis and not disagreement about whether collaborative practices exist or not.

Researchers have associated the differences between individual information behaviour and collaborative information behaviour. Then attributes includes complexities of activities and complexities of information needs. For example, in individual information behaviour evaluation of information is mainly done in the final stage. By contrast, collaborative information seeking behaviour involves multiple parties who recognize the need for information and importance of information evaluation in different stages. Paul (2010) found that collaborative sense-making is a more complex process as it involves understanding task related information, understanding information about division of labour among information seekers, information found by other group members and the sense that other group members have made.

The main challenge in studying collaborative information behaviour according to Hertzum (2008) is to balance the individual and group behavioural aspects. Hertzum (2008) criticizes studies of information behaviour which either focus on individual behaviour in group rather than collaborative information behaviour. Such studies according to Hertzum (2008) are characterized by the problem of “individual reductionism” and “group reductionism” respectively. Hertzum (2008) developed framework for locating studies of collaborative information behaviour that consist of different dimensions. The dimensions included in the framework are: purpose of collaborative information seeking behaviour, types of information sought, types of collaborative

activities performed, granularity or levels of collaborative information seeking and coupling or interconnection between different actors' activities.

The notion of synergic in collaboration information behaviour is related to the conventional wisdom that people who work together produce better and greater results than the sum of the individual results. Shah and González-Ibáñez (2011) attempted to fill the gap of lack of evaluation metrics for studying and measuring such synergic effects of collaboration in information seeking by investigating the extent to which cognitive work load in collaborative team differ from that of individuals. This study revealed that people working in collaboration do better and greater particularly in discovering more and diverse information.

Katopol (2010) used cognitive work analysis dimension to develop a methodological framework for examining human information behaviour research that includes collaborative information seeking and retrieval in workplace. The framework is comprehensive and it can be used to evaluate studies of collaborative information seeking and retrieval in different work situations. The framework consists of seven dimensions; the work environment dimension that has influenced work environment on information behaviour, organization dimension which involves management style, organization culture, social convention and role allocation, work domain analysis, task analysis or the analysis of specific tasks that make up the whole work, decision analysis, strategy analysis and actors' resources and value analysis.

### **3. 11 Summary of the chapter and research gaps**

This chapter provided a review of literature related to the topic. The chapter has been organized in thematic areas which reflected on key research questions, variables derived from the related theories and models of human information behaviour and broader issues related to the topic under investigation. The main issues that have been reviewed in the chapter include: individual and shared information needs, collaborative information behaviour and sources of information. The literature has also covered studies that focus on factors shaping individuals collaborative information behaviour, information sharing, information evaluation, challenges encountered during collaboration and applicability of solitary models of information behaviour in

collaborative context. Also, in this chapter, different key variables and broader issues have been discussed these include: information use, group awareness, context of information behaviour and situation of the context, scholarly collaboration, information behaviour and collaborative information.

It is evident from the literature that understanding of users' information needs is essential in order to appreciate their information behaviour including motives for information seeking, using and sharing. Most of the controversies on information needs revolve around semantic, definitional and connotative issues rather than whether or not information need exists. This plays a central role in understanding human information behaviour. While there is little agreement on what constitutes information, there is a conventional understanding among researchers that information need creates motivation for information seeking and use. Information source has been studied in connection with other aspects such as information need, information seeking and information use. From the literature reviewed, it has been noted that undergraduate students prefer to use different information sources when working either in solo or collaborative settings. Different factors have been identified that influence use of particular information sources including: characteristic of work, availability, accessibility and associated skills and technology need to access and use information sources.

Different studies have identified wide range of factors that motivate individuals to collaborate in seeking and using information. These factors include complexity information need, lack of immediate accessible information, requirement for multiple expertise and requirements for collaboration. Whilst it is evident from the reviewed literature that frequently collaborators prefer to use multiple tools and methods for sharing information. The factors that influence people to select specific tools or method slightly differ across studies. The choice of the method or tools are largely influenced by factors such as whether or not the collaborators are co-located or remotely located, the extent to which researchers are familiar to each other and nature of work to be accomplished. Regarding challenges of engaging in collaborative information practices, studies have demonstrated that collaborative information practice is characterized by both challenges and opportunities. The opportunities include the ability to accomplish more benefits

from each person's experience and expertise. Pre-condition for successful collaborative information behaviour include: existence of common goal and mutual benefits among collaborators, high benefits to collaborative load, equal partnerships, building trust and non-hierarchical collaborations.

The review of literature has identified a number of research gaps in studies of collaborative information behaviour. First, there are several researches that have either examined applicability of existing individual models and theories of information behaviour in collaborative context (Hyldegård, 2006b, 2009 and Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013 and Kim, 2013). In examining the existing models these studies have focused on a single aspect of information behaviour such as information searching process (Hyldegård, 2006b; Shah and González-Ibáñez, 2010), uncertainty (Hyldegård, 2009), anxiety (Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013). It is important to broaden our understanding of, and interrogate the extent to which existing single models of information behaviour can be used to represent and predict different collaborative information behavioural activities. Wilson (1996) general model of information behaviour need to be examined. This model incorporates different aspects and modes of information behaviour. The investigation will shed light on applicability of various aspects of the model in students' group information behaviour. Second, an understanding of the challenges that students encounter while working in collaborative learning process, particular, seeking and using information to support group based project is essential for students, educators and librarians.

The review of literature has identified several studies that have examined challenges of collaboration during information seeking and use (Spence, Reddy and Hall, 2005 Harrison, 2009). While these studies have provided great insights into a number of challenges facing collaborators during collaborative information process, most of these studies have been done in un natural setting such as laboratories and focusing on few aspects of information behaviour. It is important to broaden our understanding of the challenges that university students encounter when working together in a natural setting to identify shared information need, seeking information, sharing and using information in credit based group assignment. Such knowledge is

not only essential for educators, librarians and information services providers and students, but there is added value to the understanding of role of social context, work context and individual characteristics to the collaborative information behaviour. Third, it has been noted that, little attention has been paid in understanding how individuals collaborate in information evaluating process (Rieh *et al.*, 2013).

Few studies have discussed process of information evaluation in collaborative information behaviour. Studies including Rieh *et al.*, (2013) have associated evaluation process with the final stage of making decision and whether or not to use information found (Byström, 1999, Rieh and Hilligoss, 2008 and Rieh *et al.*, 2013). Based on the statement of the problem and objectives of the study stated in chapter one as well as review of theoretical and empirical literature in chapter two and three respectively, the subsequent chapter discusses paradigmatic and methodological issues that relate to this study.

## CHAPTER FOUR: RESEARCH METHODOLOGY

*“A crucial part of the scientific enterprise is the methods used in the creation of facts.”*

*(Monahan and Fisher, 2010)*

### 4.1 Introduction

Research methodology is a science of studying how research is to be carried out, which includes the procedures and methods by which knowledge is gained (Rajasekar, Philominathan and Chinnathambi, 2013). Research methodology is a generic term that includes not only questions related to how research has to be conducted but also why it has to be conducted in a particular way. Kothari (2009) holds that research methodology includes not only methods and techniques of conducting research but also the logic and rationale for choosing those methods and techniques.

Understanding collaborative information behaviour of undergraduate students and the applicability of existing models of information behaviour in collaborative context are important undertakings in developing a model of students' collaborative information behaviour in higher learning institutions. This study focused on collaborative information behaviour of undergraduate students in three selected public universities in Tanzania. The study focuses on the following objectives: to investigate collaborative information behavioural pattern of undergraduate students, to examine the challenges that undergraduates encountered during collaborative information seeking, sharing and use, to examine the applicability of Wilson's (1996) model of information behaviour in collaborative context and to develop a model of students' collaborative information behaviour in higher learning institutions.

This chapter begins with an account of philosophical foundation of research. Three main research paradigms have been reviewed. Furthermore, the chapter provides rationale for choosing an interpretative research paradigm as the philosophical framework which guides this study. The chapter also discusses research approach, research method and design used in this study. The remaining part of the chapter discusses the population of the study, sampling procedures, data collection methods, ethical issues, validity and reliability.

## **4.2 Research paradigms**

Researchers conduct research with some specific philosophical assumptions concerning the nature of reality, the way they view social world and approaches to the understanding of such reality. Such assumptions which provide a philosophical lens for observing, reasoning and understanding social phenomenon is called paradigm (Pickard, 2007). Paradigm is also described as a branch of philosophy of knowledge that relates to ontology or philosophical belief about nature of social reality, epistemology which concerns the nature of the relationship between researcher and knowledge that is being discovered and methodology which refers to the way one goes about discovering knowledge (Morgan, 2007; Pickard, 2007). Generally, research paradigm includes not only set of assumptions about the nature of reality but also principles and strategies that are used to discover such reality as well. The term paradigm also means shared beliefs among members of specialty area or exemplar on how research is done or ought to be done in a given field (Morgan, 2007). The unique characteristics that differentiate one research paradigm from another are ontological, epistemological and methodological orientations.

The significance of research paradigm in research has been discussed extensively (Case, 2012; Shekedi, 2005; Babbie, 2011 and Hennink, Hutter and Bailey, 2011). Research paradigm provides logical structure on how to organize observations, reasoning and perspectives or ways of looking at reality (Babbie, 2012; Hennink, Hutter and Bailey, 2011, Case, 2012). Shekedi, (2005) comments on the importance of research paradigm stated that research paradigm provides “bedrock” on which research may be built, shapes the way the researcher approaches research problem and method used to collect and analyze data.

## **4.3 Major research paradigms**

There are different research paradigms that are used in scientific enquiry. The choice of a paradigm to be used is largely determined by factors such as nature of research problem, research questions addressed and researcher’s philosophical orientation. This study incorporates the interpretative research paradigm however, it is equally important to provide a detailed discussion of major research paradigms commonly used in social science researches. These paradigms are positivism, post-positivism and interpretivism.



### **4.3.1 Positivist paradigm**

The positivist paradigm is rooted in the works of enlightenment thinkers such as Auguste Comte and Emile Durkheim. Positivism is a rejection of metaphysics as it relies on concept of realism which is the opposite of idealism. Positivism holds that authentic knowledge is that which is only based on senses and positive verification (Premlata, 2013). Positivism is based on the following principles which are: a) universal logic of enquiry, b) testability of scientific knowledge, c) value neutral relationship between theory and practice, d) it ignores the role of context in studying social phenomenon and embraces universality of knowledge and e) views science as a rejection of common sense (Premlata, 2013).

Ontologically positivists believe in realism and a tangible single social reality that is independent from researcher (Corbetta, 2003; Hjørland, 2004 and Pickard, 2007). Social reality according to this paradigm is objective and it is revealed and not constructed. The task of researcher is to describe and analyze the reality (De Vaus, 2001). Epistemologically, positivism views the relationship between researcher and object to be characterized with impartiality and independence. In relation to methodology, positivism is largely associated with quantitative approach and more precisely with strategies such as experimentation (Krauss, 2005). The methods used in positivist research paradigm therefore are quantitative and manipulative in nature. The philosophical foundation of positivism has been challenged in number of areas. Epistemological belief that insists on the neutrality of researcher is said to be unrealistic Hjørland (2005). Positivism is also criticized for viewing social world as deterministic and for operating by laws of cause and effects.

### **4.3.2 Post-Positivist paradigm**

Unlike positivism, post positivism is based on critical realist ontology. Within critical realism social reality is objective but exist with multiple interpretations. Post positivist paradigm insists that social reality is knowable only in an imperfect and probabilistic approach. Post-positivism is based on modified dualism where the goal of research is to develop laws or multiplicity of laws for the same facts (Corbetta. 2003). The paradigm views the idea of researcher-participant

independence as something that can be realized only improperly in actual practice (Betz and Fassinger, 2012).

The paradigm shifts slightly from positivist approach by using different methods in approximating reality such as, critical induction and constant comparison. Methodologically, post positivists emphasize that researchers' bias can be eliminated by the use of multiple sources of data, multiple techniques of data collection, theoretical frames and triangulation of researchers (Tracy, 2013). Unlike positivism, which embraces theory confirmation, post positivism insists on theory falsification where theories are considered to be provisional and open to revision.

#### **4.3.3 Interpretive paradigm**

Interpretive paradigm is a rejection of both positivism and post positivism. The paradigm is based on constructivism ontology and non dualism epistemology. The focus of interpretative paradigm is to understand subjective meanings that people attach to their experiences within specific context (Hennink, Hutter and Bailey, 2011) and interpret phenomena from participants' points of view (Bashir and Afzal, 2008). It is from this belief researchers are expected to focus on subjective experiences and seek meaning out of small scale interactions based on these beliefs.

Within interpretative paradigm there are different approaches such as hermeneutics, symbolic interactionism, dramaturgy, dramatism, ethnomethodology, ethnography and phenomenology. Despite the existence of different approaches within this paradigm, there are also some similarities among these approaches in terms of ontological, epistemological and methodological positions. In ontology interpretivists insist that reality and knowledge are constructed and reproduced through communication, interaction and practice (Creswell, 2002; Bashir and Afzal, 2008; Tracy, 2013). This paradigm also insists that there is no absolute reality as people perceive and interpret social realities differently. An individual's perceptions towards phenomenon or social reality may vary from one context to another. This constitutes multiple interpretation of reality.

Epistemologically interpretative paradigm assumes that the relationship between researcher and research is one in which the researcher attempts to lessen distance with those being researched (Creswell, 2002). Research process is interwoven between the researcher and those researched in terms of constant and continuous interactions, formal conversation and observations. The research process is also influenced by inherent subjectivity, perceptions, background and values of researcher (Hennink, Hutter and Bailey, 2011 and Betz and Fassinger, 2012).

Methodologically, the practice of research is based on inductive logic, studying a topic within its context and with flexible research design (Creswell, 2009). The paradigm refutes the notion supported by positivist thinking that research is truly value-free and researchers have no influence on data collection or interpretation. Interpretative paradigm stresses that research is the value of researcher's writing (Bashir and Afzal, 2008) and as a result, the social world has to be understood through observation and interpretation. This obliges researcher to be immersed within the setting in which the study is conducted, to work and spend time with subjects of research. Given the nature of ontological and epistemological positions of interpretative paradigm, researchers using this paradigm employ multiple methods of data collection including observation, focus group discussion and interview.

Maxwell (2013) opines that the use of a paradigm to guide research process is not a matter of free choice but on specific reasons. This study is based on interpretive philosophical assumptions. Reasons for choosing interpretive paradigms are threefold: First, the nature of the research problem addressed in this study is to understand students' group information behaviour within a specific collaborative learning context. Interpretive research paradigm was therefore chosen because its relativist and ontological assumption which value the importance of context in which social phenomenon occurs suite the nature of the problem under enquiry. The paradigm provides a frame in the understanding of how undergraduate students construct meanings when performing collaborative information activities.

Second, in comparison with positivist and post-positivist paradigms, ontological assumptions of interpretive paradigm were suitable and compatible with the research problem that was addressed

in this study. Positivist paradigm is detached from social context in which a particular phenomenon is studied and it views social reality as absolute objective. Likewise, the customized dualism that is part of epistemological foundation of post-positivist paradigm continues to insist on objective reality. These philosophical assumptions were found not to be compatible with the research problem addressed in this study which was aimed at investigating students' information behaviour with the intention of uncovering different contextual factors that influence students' collaborative learning. The epistemological assumption is not well-matched with the research problem and subsequent research questions. Third, the study of students' information behaviour in group based learning environments requires methodological approach that allows both researcher's and participants' values, experiences and perspectives to be part of research process. The research problem in this study together with generated research questions required the researcher to align with the research paradigm which allows for socially construct meaning out of observable students' interactions and actions.

#### **4.4 Research design**

Research design is a coherent sequence that connects research questions with research results and research conclusion (Yin, 2009). Creswell (2009) defined research design as a roadmap and procedures for research including decisions from wide assumption to detailed methods of data collection and analysis. Research design provides a logical structure of enquiry which determines the relevance of research method, identifies unit of analysis and criteria for interpreting and analyzing research findings. Yin (2009) argued that research design deals with logical problem rather than logistic problem as it enables researcher to avoid the situation in which the collected evidence does not address the initial research question and problem. Research design includes, research method or strategy, sampling procedures, research tools and statistical techniques used to analyze data. The choice of the research design to be used in a study is based on number of factors. These include nature of research problem, the worldview assumptions that researcher brings in the study and research questions that are addressed (Creswell, 2007).

There are three dominant research designs in scientific research. These include qualitative research design, quantitative research design and mixed research design. Quantitative research

design is defined by its relation to data collection and analysis process. It focuses on quantitative analysis of data using inferential, experimental or simulation approaches. Qualitative design on the other hand, focuses on the assessment of subjective attitudes, opinions or behaviours (Kothari, 2009). While, mixed research design is a combination of both qualitative and quantitative research designs together with the underlying philosophical assumptions. The three research designs may also be differentiated on their relationship with research paradigms. While qualitative research design is associated with interpretivism or constructionism, quantitative research design is associated with positivism or post-positivism.

This study is based on qualitative research design. It has been argued that qualitative research design is suitable when researcher intends to understand complex relationships and orientation to everyday events that are occurring in natural settings (Flick, 2007). Based on the nature of research problem, research questions and research paradigm adopted in this study, qualitative research design has been considered to be appropriate as it enables the researcher to observe processes, interactions and events that contribute to the understanding of students' collaborative information behaviour. Bashir and Afzal (2008) commented that qualitative research approach is more appropriate in understanding participants' roles, views, perceptions, feelings and experiences. This view is supported by Babbie (2012). He explains that qualitative field research is best in understanding attitudes or behaviour within settings, social process overtime, behavioural practices, varieties of events, roles and social types. The qualitative design is considered to be context sensitive, flexible and empathetic (Sarantakos, 2005). It allowed the researcher to study CIB of undergraduates in a naturalistic setting using multiple data collections techniques.

#### **4.5 Research method**

Research method is part of research methodology that addresses issues related data collection procedures, questions to be addressed, data analysis procedures, interpretation and validation of research findings. Research method is a set of practices, procedures and techniques on how to collect and analyze data and verify research findings. This study was based on multiple

ethnographic case studies research method. Ethnographic case study research method combines the characteristics of both ethnographic research method and case study research method.

A case study is an inquiry that looks into existing phenomenon within its real life context and uses multiple sources of evidence and benefits from prior theoretical propositions to guide data collection and analysis (Yin, 2009). A case study is thus defined by its focus on the instances of phenomenon and not methods used to collect data. Case study focuses on contextual details and is based on collection of data from naturalistic setting with little control over behaviour and no unnatural creation of setting (VanWynsberghe and Khan, 2007).

The term ethnography is used to mean both broader methodological issues in which people's behaviour in everyday context is understood or a way of doing research which is also known as little ethnography (Brewer, 2000; Murchison, 2010). This study uses ethnography as a way of doing qualitative research rather than a perspective of doing research. This method involves studying people's behaviour in naturalistic setting with the purpose of understanding and explaining what they actually do.

The extent to which researcher is immersed in the context of those who are researched is the main difference between case study and ethnography. An ethnographic study involves prolonged contact with subjects of study. The duration of stay in the field in ethnographic study vary depending on the purpose and needs of research (Suryani, 2008). Faulkner (2009) states that the main assumption in ethnographic studies is that something has to be discovered that participates in social life. The role of theory in ethnographic research method is that of providing “cognitive signpost” rather than controlling the direction of research (Pickard, 2007).

The study focused on specific cases so as to generate in depth and rich information about undergraduate students collaborative information behaviour. It used the ethnographic research method in which the researcher was part of the research process for an extended period of time. This is important in understanding the perspectives or realities from both insiders' and the outsider's or researcher's perspective. Ethnographic case study enabled researchers to collect

data in an uncontrolled environment using multiple data collection techniques such as: observation, interviews and focused group discussion. Researchers' use of multiple data collection techniques with prolonged and extensive data collection from a close, intimate immersion in social world are the salient features of ethnographic case study (Faulker, 2009).

This research method is in compliance with the philosophical assumption adopted in this study. It insists on providing interpretative meaning and understanding collaborative information behaviour of undergraduate students. This was achieved while working in real life setting that enabled the gathering of contextually and naturalistic based data. Such approach enabled exploration of phenomenon, processes, practices and events from the undergraduate students' perspective. This study also used multiple case studies which shared characteristics. Murchison (2010) discusses the benefits of inclusion of several cases in ethnographic studies. This helps researchers identify variations and differences within and across cases. De Vaus (2001) further stated that strategically selected, multiple case studies, can provide a much tougher test of theory and can specify the different conditions under which a theory may or may not hold.

The use of multiple ethnographic case studies aimed at collecting context specific data that enabled the researcher to conduct detailed and more authentic interpretation and hence be able to test existing model of information behaviour and develop a framework for evaluating collaborative information behaviour of undergraduates. The method has been widely used by previous studies of CIB including Reddy (2003), Hyldegård (2006a), Poteri, (2007) and Shah (2010).

#### **4.6 Study population**

Tanzania has 37 fully fledged universities and 15 affiliated university colleges. Out of 37 universities 24 are private and 13 are public (TCU, 2013). This study however focused on three public universities namely, University of Dar es Salaam (UDSM), Ardhi University (ARU) and Sokoine University of Agriculture (SUA). The reasons for choosing these three universities is stated under subsection 4.7 below. The first two universities are located in Dar es Salaam, the commercial city, while the latter is located in Morogoro, about 183.7km West of Dar es Salaam.

The study population consists of all second year students in BSc. Botanical sciences and BSc. Applied zoology (UDSM), fourth year students studying B. Architecture (ARU) and second year students studying B.Sc. Forestry (SUA). These are the students who are involved in long term group projects which last between 5 to 7 weeks. The entire population consisted of 161 undergraduate students. The study population also includes 91 academic staff in respective schools and faculty where these programmes are offered and 163 librarians and library officers in respective university libraries. Table 4.1 below provides population distribution of students, teaching staff and librarians.

**Table 4.1 Study population**

S/No	Name of programmes	Students' population in the programmes	Faculty members in faculty/ school	Librarians and library officers
1	BSc. Forestry (SUA)	68 (2 <sup>nd</sup> year students)	37	17 librarians, 24 library officers
2	B. Arch. (ARU)	37 (4 <sup>th</sup> year students)	15	5 Librarians, 21 library officers
3	BSc. Botanical sciences and BSc. Applied Zoology (UDSM)	56 (2 <sup>nd</sup> year students)	39	24 librarians, 72 library officers
Total		161	91	163

(Source: Ardhi University: Directorate of planning and development: 2013/2014 facts and figure; University of Dar es Salaam: Directorate of undergraduate studies, University of Dar es Salaam Library; Department of planning, Sokoine University of agriculture-Facts and Figures; Office of Director, Sokoine National Agriculture Library (SNAL)).



#### **4.7 Sampling procedures and sample size**

As it has been previously stated in section 4.6 this study confined itself to three public universities. The selections of universities, academic units within selected universities, degree programmes and students groups to be studied were based on purposive sampling technique. At the level of institution purposive sampling technique was used to select three universities out of 37 accredited universities in the country. The reasons for using purposive sampling technique is that the three universities selected are among the oldest and well established universities in teaching, research and consultancies. These Universities have also provided extended group based field assignments to some of their students. These long term students' group projects lasted up to eight weeks. Also, purposive sampling is one of the most commonly used sampling techniques in qualitative case studies.

Purposive sampling technique was used to select academic units within the universities and undergraduate degree programmes. Purposive sampling allows researcher to pick sample based on special criterion such as available knowledge on subjects of the study. The selected degree programmes seem to meet such purpose as they provide extended group based field works for their students. A similar sampling technique was used to select faculty members who are responsible for the supervision of students' group work and librarians who provide services to this cohort of undergraduate students. A total of 6 members of teaching staff and 9 librarians were purposively selected. The purposive approach ensured that the study has rich information sources and key informants who have great deal of knowledge. Babbie (2012) commented that purposive or judgmental sampling involves the selection of a sample on the basis of knowledge of population, its element and purpose of the study.

At the group level purposive sampling was also used to select groups from each case study. Justifications for using purposive sampling method vary from one case study to another. For the Case study 1 (SUA) group members' heterogeneity was the criterion used to select groups. A sample of 4 out of 8 groups were selected based on whether groups had gained experienced (in-service) or they were novice (fresh from school). Selection also considered sex distributions of

group members. These personal traits were considered to be important variables which could influence group members' information behaviour in different ways.

For the Case study 2 (ARU), 2 out of 4 groups were selected. The selection was based on nature of learning task assigned to students and sex composition of group members. The two groups selected had more or less equal number of male and female students. The groups were involved in learning tasks with different learning objectives. The rationale for selecting groups working on different tasks was to explore if differences in learning task objectives had impact on students' information behaviour. In Case study 3 (UDSM) a sample of 3 out of 6 groups was selected. Selection was also based on group heterogeneity in terms of sex distributions and group having more or less equal number of students from both degree programmes. Tables 4.2 and 4.3 below provide summaries of samples from different categories.

**Table 4.2 Students' sample size**

S/No	Name of programmes	Population in groups	Sample size in groups
1	BSc. Forestry (SUA)	8	4
2	B. Arch. (ARU)	4	2
3	BSc. Botanical sciences and BSc. Applied Zoology (UDSM)	6	3
Total		18	9

**Table 4.3 Librarians and faculties' sample size**

S/No	Categories of respondents	Population	Sample size
1	Librarians	163	9
2	Teaching staff	91	6
Total		254	15

#### **4.8 Ethical consideration**

There are different theoretical orientations to ethical issues in research such as, deontological ethics, utilitarianism, relational ethics and ecological theory of ethics. Depending on researcher's theoretical orientation to ethical issues there are different measures that researchers have to comply with in order to ensure that their research meet ethical standards. These measures include: a need for informed consent from subjects, avoidance of any kind of harm to the subjects of research, maintenance of confidentiality and anonymity and abiding to the principle of reciprocity where both researcher and researched have to gain from the study. Ethical issues are also extended to other holistic aspects such as, ensuring that the researcher is honest and the respondents are not deceived and ensuring that the research conducted contributes towards the domain broader than researcher's personal gain (Miles and Huberman, 1994).

Different measures were taken to ensure that the researcher complies with ethical issues in different stages of the research process. Prior to the actual data collection, ethical clearance approval was applied and granted from the University of Kwazulu Natal ethical committee. Furthermore, research clearance was applied and obtained from respective universities where research was conducted. During negotiation of access and later stages of the research process the researcher clearly explained to the research respondents and research authorities about the nature and purpose of the study. This is emphasized by Madison (2005) who argues that who holds that informed consent is more than the provision of a brief overview of a research to respondents, but, it involves obtaining permission of subjects to participate in a study, obtaining approval from appropriate authorities and engaging in ongoing and dynamic discussions with subjects about the nature and the meaning of participating in a study. Based upon this assumption, informed consent was viewed in this study as a multi stage process of ensuring that both undergraduate students, teaching staff, librarians and participating institutions' authorities understand the nature of the study, the benefits and potential risks. The researcher also avoided deception by making sure that in all stages of the research process respondents were given correct information on the purpose of the study. There was no attempt made to limit the respondents understanding of the nature of the research.

At the beginning of the study respondents were informed that participation in the study was voluntary and that they could make an informed decision. To avoid breaching the principles of confidentiality, the researcher made sure that information collected from respondents was used strictly for the intended academic purposes. During data collection, questions asked were sensitive. The researcher was aware of psychological, emotional or physical harm to respondents. Ethical consideration was also observed during data collection and analysis process where trained research assistants were recruited to assist in collection of data. Also measures were taken to ensure that that research findings are presented appropriately and without disclosing the identities of participants. In the process of writing final report and presentation of research findings, the researcher ensured that respondents remained anonymous.

#### **4.9 Data collection procedures**

The qualitative study requires researcher to collect data in naturally uncontrolled setting. This ensures that data collection process is extensive and relied on multiple techniques. Pickard (2007) reiterated that qualitative study relies on converging lines of enquiry that facilitates triangulation and much more convincing findings. The rationale for extending data collection process is to produce rich and holistic data with strong potential for revealing complex and thick description that are vivid and nested in a real context (Miles and Huberman, 1994).

Various data collection techniques are used to collect data in qualitative research. These include observation, interview, focus group discussion and content analysis. This study has employed three data collection techniques. These are semi participant observation, face to face interview and focus group discussion techniques. To complement these data collection techniques documentary review method was also used.

In qualitative research, negotiating access and building trust with the research participants is an important stage that facilitates smooth data collection process. This is emphasized by Madson (2005) it is important to plan in advance how to enter the terrain of your subjects in a way that is appropriate, ethical and effective. In the course of establishing contact and negotiating access to research subjects, the researcher used different processes including establishing initial informal

contacts with information gatekeepers such as faculties and librarians, requesting authorization from the university authorities and attending pre-field sessions between students and faculties. Establishing trust was also another stage in data collection process. This aspect was important to the respondents. This involved proper use of both verbal and nonverbal behaviour such as effective use of communication skills, proper self presentation and friendliness to the respondents. The researcher also openly discussed with respondents the purpose of the study and the anticipated gains. One could anticipate and speculate that the principal researcher being a teaching staff in one of the selected universities could cause bias during data collection phase. Such potential bias was minimized by researcher taking a low profile and participating in some activities as a student rather than faculty member. This strategy is based on the principle of self - scrutiny or reflexive practice in which researcher ought to constantly monitor his or her role towards research undertaken as well as people studied. This strategy yielded positive results as it facilitated both negotiation of access to the field and establishment of trust with respondents and authorities.

#### **4.10 Data collection techniques**

Three data collection techniques were used to collect data from students, teaching staff and academic librarians. These techniques as pointed above are semi participant observation, face to face interview and focus group discussion. Extensive documentary review was also carried out. The documents reviewed include thesis and dissertations, peer reviewed journal articles, books, conference and research papers. Triangulation of data collection techniques was intended to yield rich and in-depth data that enabled the researcher to provide both analytic generalization and conclusions.

##### **4.10.1 Observation method**

Unlike other methods, observation research method is focused and confined to specific aspects of interests. Corbetta (2003) explains, that during observation, researcher is supposed to focus his or her observation on research problem under investigation, research questions to be addressed and the theory that guide the study. Corbetta (2003) further identified three areas which require for

researcher to be focused during observation. These dimensions are physical location, the actors and actions. While physical location helps researcher to provide detailed account of the area, the social setting helps researcher to provide human element descriptions particularly formal and informal interactions among participants, roles and relationship established, how communication takes place and other group dynamics (Corbetta, 2003).

Data collection involved actual observation of undergraduate students performing different activities in the fields. The process also involved participating in informal conversation with students and field instructors. The aim was to seek clarifications on some observed events and activities. This method also involves collecting data through listening and sometimes asking questions for clarifications. During data collection, participants were aware of the researcher and assistant researchers' statuses as observers and participants.

Direct observation enabled researchers to observe experience and understand different observable individual and collaborative information behavioural activities as students accomplished various collaborative learning tasks. This included observing how students collectively involved themselves in discussions on understanding tasks objectives and defining information needs, how students identified and accessed different information sources within and outside their learning environment. It also included observing how students shared and evaluated information and challenges that students encountered when working in group learning. The researcher also observed how and why students used information in different stages of collaborative learning.

Within observation method researcher may take specific role that defines the relationships between the observer and subjects of study. The role determines the degree to which researcher shares the life and activities performed by those who are observed (Kothari, 2009). Researchers opted to take a moderate level of involvement by opting not to be fully involved in observation as participants. In this role, researchers partially participated in some activities done by students and at the same time remained as observers. Besides observation, the researcher only participated

in limited activities such as assisting students in taking measurements, talking with students while working, sharing similar transport with students and sometimes eating together.

Reasons for choosing moderate level of participation in observation are twofold: First, students were involved in academic, credit based group assignments in which evaluation was part of their subjects' coursework. In this case complete researcher's participation would affect learning results as the researcher could influence the students' performance in the assignments. Secondly, fully participation of researcher would require having educational background similar to that of students and full knowledge of the subjects in which students were involved. Neither the researcher nor research assistant had such educational background. Striking the balance between non participation and complete participation was considered to be the best option that could minimize researchers' influences while compromising the quality of data collected.

This method allowed researchers to study students' collaborative information behaviour with high level of flexibility. This method also allowed researchers to observed and understand how different students' collaborative learning activities, patterns of group interactions influences their collaborative information. Extensive contacts with social settings in which research subjects live and work allowed researcher to understand not only context in which they worked but also how different contextual factors influenced the way they behaved towards sources of information.

#### **4.10.2 Focus group discussion**

Focus group discussion is a group interview in which several individuals are systematically and concurrently interviewed (Brayman, 2012; Corbetta, 2003). This method is preferred due to the fact that it is socially oriented, flexible and interactive. Focus group discussion has been deliberately used in this study with the intention of understanding the benefits of group conversations, discussions and social interactions. As Brayman (2012) noted during focus group discussion group members may involve themselves in argumentative interactions and complementary interactions.

Focus group discussion was conducted to groups of undergraduate students during the last week of their field works. This method intended to clarify some issues, events and behavioural practices that were noted during observation process. A total of 9 focus group discussions from three case studies were conducted. In Case study 1, there were 4 groups with each group consisting of 7 students. In Case study two, there were 2 groups where each group had students while Case study 3 comprised of 3 groups with 10 students from each group. This was considered to be an optimal number that can generate more discussions, arguments, and interactions. To ensure that data were accurately collected during focus group discussion the researcher was assisted by a facilitator who played the role of group discussion moderator. This made the researcher to assume the role of taking notes and asking probing questions whenever needs arose. Notebooks, tape recorders and video camera were used to keep records and data during group discussion. In figure 4.1 below the researcher and one group of students from Case study 2 (ARU) are engaged in a focus group session.



Figure 4.1 The researcher and participants in a focused group session

As part of focus group discussion Information Literacy training was conducted to all groups by a facilitator who was also an expert in information literacy. Information literacy sessions were intended to introduce students to key issues related to collaborative information behaviour and impart them with basic information literacy skills essential for effective information seeking and



use in natural learning environment. The intention was to prepare students to effectively participate in focus group discussions. Focus group discussion has been used in number of information behaviour studies to collect data. These studies include Prabha, Connaway, Olszewski and Jenkins (2007), Weiler (2004), Young and Von Seggern (2001).

The fact that during focus group discussion group members may argue, agree and challenge each other, provides participants with the opportunity to revise their opinions or think more about why they hold the views that they do and helps researcher to develop a more robust and realistic account of what people think about a particular phenomenon (Brayman, 2012). This is also emphasized by Marshall and Rossman (2011) who hold that focus group interview method assumes that individuals' attitudes and beliefs are socially constructed and that people often listen to others opinions, understanding and then form their own. This method with the combination of observation was effective in understanding collaborative information behaviour of undergraduate students. The method also was chosen because it conforms to the interpretive research paradigm underpinning this study.

#### **4.10.3 Face to face interview**

In soliciting more information, face to face semi structured interview was used to collect data from faculties and reference or readers' service librarians. Only faculties who were involved in supervising students' group field work and reference / readers' service librarians from respective libraries were interviewed. The rationale for using semi-structured interview was to increase flexibility in data collection where researcher had a list of questions to be covered in the interview, but at the same time the interviewees had great leeway on how to reply. Also the researcher had the opportunity to probe more based on interviewee's responses. This made the interview process to be more flexible; less structured and hence produced rich and detailed answers. A total of 15 respondents were interviewed of which 6 were faculties and 9 were academic librarians.

#### **4.11 Trustworthiness and dependability**

Qualitative research is based on different ontological, epistemological and methodological assumptions. The notion of rigor that is commonly used in quantitative research to represent reliability, validity and generalization is not applicable in a similar manner in interpretative research (Bhattacharjee, 2012). Lewis (2009) argues that there is a concurrence on the need for trustworthiness, accuracy and dependability of research findings however, the definitions of reliability and validity in qualitative research differ from that of quantitative research. Unlike quantitative research, in qualitative research the researcher is the main instrument of data collection. This fact poses the question of not only whether or not validity and reliability are essential components of research, but also how researcher can ensure validity and reliability in research process.

Researchers have developed different criteria for evaluating reliability and validity in qualitative studies. In qualitative research trustworthiness and dependability are used to mean validity and reliability respectively. There are also other concepts such as confirmability, credibility and transferability. These concepts are used alongside validity and reliability.

##### **4.11.1 Trustworthiness**

Validity or trustworthiness is defined as the degree to which research data provides an accurate reflection or measure of the topic or variable under consideration (Murchison, 2010). It is the extent to which an instrument measures exactly what it intends to measure. Trustworthiness is made up of different set of criterion: credibility which is equivalent to internal validity or matching what is observed with theoretical ideas, transferability which is parallel to external validity or degree to which findings can be generalized across social settings. There is also conformability which is used as a synonym of construct validity to mean researcher's objectivity and neutrality (Riege, 2003).

In this study replication logic in multiple case studies has been used with the intention of increasing external validity or transferability. The researcher appropriately selected samples that reflected knowledge of the research topic under investigation so as to improve validity. This

procedure of ensuring validity was also emphasized by Morse *et al.*, (2002) who stressed that appropriate selection of sample, that best represents the knowledge of research topic and congruence between research questions and methodology are essential to the improvement of research validity.

The researcher was also involved in intensive field work which involved repeated observations and confirmations of similar phenomenon. Multiple data collection techniques were undertaken. Such practice was aimed at increasing construct validity. Descriptive validity was enhanced by making sure that data is accurately and completely collected. During group interviews researcher used different equipments such as camera and tape recorder. The use of electronic equipment not only facilitated collection of huge amount of data, but also improved accuracy in data collection process.

Furthermore, the influence of presence of researcher in the field was acknowledged. The researcher was aware of the effect of reactivity on what is being observed or asked. Confirmation of the effect of reactivity was tested by conducting a prolonged observation so as to observe different patterns rather than to have “snap shots” of events. The researcher also implemented self scrutiny so as to eliminate or reduce effects of reflexivity.

The theory of information worlds (Jaeger and Burnett, 2008) which in part underpinned this study provided a point of reference for the researcher to test procedural validity. With the use of the theory of information worlds (Jaeger and Burnett, 2008), the researcher constantly makes reflexive accounts of: a) relationship between what is observed and the broader context in which the study is situated and b) relationship among researchers, students (participants) and learning environment.

During interpretation of research findings, the researcher carefully observed, understood and interpreted actions, viewpoints, interactions and behaviour. During data analysis and interpretation, the evidences collected in the field were compared with extant literature related to the topic. This was essential for developing interpretative validity of the findings. This practice is

supported by Lewis (2009) argues that to improve interpretative validity researchers have to avoid imposing their own framework of meaning. This is achieved by understanding perspective of the people they study and the meanings they attach to their actions. Researcher also ensured that collected data were accurately interpreted so as to improve interpretative validity.

#### **4.11.2 Dependability**

The term dependability is used synonymously with reliability in qualitative research. Reliability refers to degree to which instrument measures consistently and persistently what it intends to measure. Reliability is defined as stability, consistency or dependability in measurement and research results (Bhattacharjee, 2012). There are different sources of unreliable measurements including researcher's bias, poor data collection process and poorly constructed questions (Bhattacharjee, 2012).

To establish dependability, several measures were taken into consideration including: a) the identification and formulation of research problem, b) selection of research participants to the data collection, c) accuracy in data collection, analysis and interpretation. Three case studies were used. Case study 1, case study 2 and case study 3. These studies were aimed at replicating, verifying and comparing the findings. This was used to ensure literal and theoretical replication in the study and to test the extent to which the instruments used were dependable and consistent across all case studies. Intensive and prolonged field observation with multiple observers made it possible for researchers to observe the same phenomenon in different time, spaces and perspectives. This allowed corroboration data gathered by different observers.

Altheide and Johnson (2013) remark that reliability gains its importance as the standard for assess qualitative research only by associating with specific theory and method. In their account Altheide and Johnson (2013) emphasised the importance of applying procedural reliability as the criteria for testing reliability in qualitative research. To ensure the reliability of research process, data were collected in standardized manners. These include a) conducting training to the research assistants prior to the commencement of the field observation b) data collected from observation by three observers were constantly and frequently compared and evaluation of observation trend

was done c) prior to the conducting Focus Group Discussion, training was provided to group members to familiarize them with nature of the study

#### **4.12 Data analysis and presentation of research findings**

Interpretative data analysis involves two levels. These levels include observation of phenomena from subjective perspective of participants and understanding the meanings that participants' experienced (Bhattacharjee, 2012). Generally, qualitative data analysis involves synthesizing the respondents' views with those of researcher. This process is iterative in nature as it may follow or overlap data collection process. In this regard Pickard (2007) and Creswell (2009) hold that analysis of qualitative data is flexible, inductive, interactive and recursive. The flexibility and iterative nature of data analysis is also attributed to the process of data collection. The researcher may validate or refute emerging themes and issues which are part of data analysis.

Data analysis for this study consisted of multiple levels of analysis. The first stage was a preliminary data analysis. During the preliminary data analysis stage, the researcher identified and developed main thematic categories based on what was observed and heard. The initial data analysis involved analyzing data "along the way" by identifying and establishing broader data categories and assigning initial data units to the categories (Gorman and Clayton, 2005; Murchison, 2010). The second phase was detailed data analysis. This stage goes beyond creation of themes and classification of observed events, behaviour and interactions. During this stage the researcher provided what Corbetta (2003) called thick and enriched descriptions. This include meanings and interpretations of observed phenomena and genuine constructions which results in the assembling of different materials, narratives from interview, documentaries and focus group discussion. Shank (2006) noted that detailed data analysis should include "thick description" of observed phenomenon. According to Shank (2006) it is neither a voluminous description nor a personal look at the world that is shared that make think description but a description with interpretation and reason behind.

The third level of analysis involved cross case studies analysis. In cross case study analysis findings from each case are used as the raw data to help researcher develop rich, descriptive

narratives from cross case themes (Pickard, 2007). The analysis was more challenging, as it provided a basis for establishing trustworthiness by analyzing similar concepts, patterns and themes across three case studies. Data analysis process was also interwoven with interpretation of research findings which included both comparing observed phenomena to the known phenomena. This was done using both existing literature and the use of theoretical lens.

Data collected from interview, focus group discussion and observation were transcribed and typed using Microsoft Word package. The transcripts were then imported into Nvivo 10 qualitative data analysis package. This was followed by coding and creation of themes. The findings were then presented in narrative perspective, episodes and cases. Vignettes and quotes have been used to support and illustrate different cases, issues and points. In some cases images, tables and figures were used to provide more description and/ or visualize research results.

#### **4.13 Summary of the chapter**

This chapter discussed research methodology used in the study of collaborative information behaviour of undergraduate students in three public universities in Tanzania. The chapter also provided an account of various research paradigms commonly used in social science research. The chapter discussed and justified the choice of interpretative paradigm which provided philosophical foundation of the study.

This study was based on qualitative research design with a multiple ethnographic case studies method. Rationale for using multiple ethnographic case studies was that the researcher was desirous of employing a research method that allowed for studying information behaviour of undergraduates from the naturalistic settings.

The study population included three public universities namely, University of Dar es Salaam (UDSM), Ardhi University (AU) and Sokoine University of Agriculture (SUA). Within these universities three departments; Botany and Zoology at the University of Dar es Salaam, Architecture at the Ardhi University and Forestry at Sokoine University of Agriculture formed part of the study. Purposive sampling technique was used in this study. This technique was used

to select a) Universities, b) departments and degree programmes within the universities, c) faculty members from the selected departments d) librarians from respective university libraries and e) and groups of undergraduate students involved in collaborative field work.

Researcher used a triangulation of data collection methods which included semi participant observation, focused group discussion, face to face interview, review of students' daily log diaries, and review of related literature.

Data analysis process involved three levels namely; preliminary data analysis, detailed data analysis and cross case studies data analysis. Different measures were taken by researcher to ensure trustworthiness and dependability of research findings. These measures included: the use of replication logic in multiple case studies, appropriate selection of sample that best represents the knowledge of research topic, prolonged and intensive field observation and accurate interpretation of research findings. The last part of this chapter dealt with various ethical measures that were observed during the research process. These measures included informed consent, avoidance of any kind harm to the subject of research, maintenance of confidentiality and anonymity and abiding to the principle of reciprocity between researchers and researched.

This chapter focused on the research methodology. Specifically the chapter discussed different aspects including philosophical research assumptions related to the study, research design, research method and study population. The chapter also focused on sampling procedures, ethical issues observed in the research process, data collection procedures, measurements in research, data analysis and presentation of research findings. The next chapter deals with data analysis and presentation of the research findings.

## CHAPTER FIVE: DATA ANALYSIS AND PRESENTATION OF RESEARCH FINDINGS

*“The greatest value of a picture is when it forces us to notice what we never expected to see.”*  
(John Tukey, American Mathematician)

### 5.1 Introduction

This chapter presents the research findings of the study on Collaborative Information Behaviour (CIB) of undergraduates in selected Tanzanian universities. The study was carried out in three universities which form case studies 1, 2 and 3 respectively. The study sought to understand collaborative information behaviour of undergraduate students through group learning assignments. The following research questions were addressed:

- What are the information needs of undergraduates working in collaborative academic assignments?
- What sources of information do undergraduates use when seeking information to accomplish group academic assignments?
- What factors shape information behaviour of undergraduates working in collaborative learning tasks?
- How do undergraduates share information when engaging in collaborative learning tasks?
- How do undergraduates evaluate information during collaborative information seeking and use?
- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
- To what extent is Wilson’s (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?



As discussed in the preceding chapter, data were collected using interviews, focus groups discussions and observations. Qualitative data collected from the interview, focus group discussion and observation were analysed using Nvivo 10 and integrated thematically. This study presents the findings of qualitative data; however, quantitative data presentation has been used to provide summaries of qualitative data.

This chapter begins with descriptions of collaborative learning tasks performed by students. This is followed by presentation of research findings based on specific research questions. Wilson's (1996) general model of information behaviour constructs and broader issues relating to the research problem are also presented. In particular, the findings are presented on the following themes: Students' individual and shared information needs, channels of communication and sources of information used by students and collaborative information seeking behaviour of undergraduate students. Other themes include factors shaping students collaborative information behaviour, students' information sharing behaviour, collaborative information evaluation, information use and applicability of Wilson's (1996) model of information behaviour to students' collaborative learning assignments.

## **5.2 The nature and characteristics of students' collaborative learning tasks**

This study involved students, librarians and teaching staff as follows: 76 students who formed 9 groups. A total of 18 students (2 groups) were selected from ARU, 30 students (3 groups) from UDSM and 28 students (4 groups) from SUA. The study also involved 9 librarians 3 from each university and 6 teaching staff 2 from each university. Librarians and teaching staff were selected based on their levels of position.

Field observations were conducted in four areas; Morogoro, Arusha, Bagamoyo and Dar es Salaam. Students from Sokoine University of Agriculture did their field work in Arusha and Morogoro while students from Ardhi University were in the city of Dar es Salaam. Field research for the students from University of Dar es Salaam was conducted in Saadani national park. The park is located about 200km from the city of Dar es Salaam and 70km from the historical town of Bagamoyo. Three case studies were identical. They all covered undergraduate students from

public universities. These students worked on field assignments in the naturalistic settings outside their conventional learning environments. These assignments would earn them credits. The three case studies were dissimilar in, the disciplines of study, types of collaborative learning tasks performed and the settings in which students worked. However, there are some similarities in the unit of analyses and those involved were undergraduates working on credit based group assignments. While the main goal of field assignments were to expose students to practical works and to bridge the theoretical knowledge gained in classes, the nature of field work, in each case study, was different. In each case study, students worked on different assignments which had different learning objectives, tasks and activities. Below is a summary of demographic characteristics of respondents and description of nature of group assignments in which students were engaged.

**Table 5.1: General demographic characteristics of respondents**

<b>Types of respondents</b>	<b>Number of groups and students</b>	<b>Percent of the sample</b>	<b>Percent of the sample in sex</b>
Students	Case 1: 28 students, 4 groups	Case 1: 36.8%	Females 31 (40.8%)  Males 45 (59.2%)
	Case 2: 18 students, 2 groups	Case 2: 23.7%	
	Case 3: 30 students, 3 groups	Case 3: 39.5%	
	<b>Total</b>	<b>100%</b>	<b>76</b>
Academic librarians	Case 1: 3	Case 1: 33.3%	Females 2 (22.2%)  Males 7 (77.7%)
	Case 2: 3	Case 2: 33.3%	
	Case 3: 3	Case 3: 33.3%	
	<b>Total</b>	<b>100%</b>	<b>9</b>
Teaching staff	Case 1: 2	Case 1: 33.3%	Females 1 (16.7%)
	Case 2: 2	Case 2: 33.3%	

	Case 3: 2	Case 3: 33.3%	Males 5 (83.3%)
	<b>Total</b>	<b>100%</b>	<b>6</b>

**Source: Field data, 2014.**

Students were assigned to permanent groups for the entire period of the field work. Case study 1 and 3 were different. In some activities two or more groups were temporarily merged together to form one large group.

### **5.2.1 Case study 1**

Case study 1 comprised second year students. They were engaged in group field assignments that would equip them with practical knowledge and skills in the field of forestry. Students were exposed to different collaborative tasks in the areas of Silviculture and tree improvements, agro-forestry and forestry resources assessments. Silviculture students were involved in identifying best practices and problems associated with establishing forest plantations, nursery establishment and management, tree improvements, forest regeneration and identification and documentation of different tree species. While agro forestry, students were involved in identifying and documenting agro forestry systems and practices in the study areas, interactions among animals, crops and land utilization. In Addition, forestry resource assessment students dealt with forestry harvesting procedures, identifying different forestry resources use, determining and appraising social, environmental and economic value of forestry resources. Four groups of students participated in the study. They will be labelled as case study 1, group 1, case study 1, group 2, case study 1, group 3 and case study 1 group 4 respectively.

### **5.2.2 Case study 2**

Case study 2 comprised fourth year architectural students. Students worked on group field assignments. The goal was to equip them with practical skills and knowledge in their area of specialty. The learning assignments were intended to enable students to apply theoretical

knowledge gained in the class to the real practical situations in the field. Students' field assignments were part of the large ongoing project of documenting and creating an inventory of buildings and open spaces in the city of Dar es Salaam. The nature of the group field assignments required students to identify and document different architectural designs as well as public and open spaces in city of Dar es Salaam. Students were allowed to trace historical and morphological changes of the study area using both first and second hand information sources.

In this case study students were divided into four groups. Two groups dealt with identification and documentation of buildings and architectural designs. These groups were also involved in identifying and recording past and present uses of existing buildings; ascertaining social, political and economic forces associated with evolving of different building designs in the city. The other two groups focused on identification and documentation of open spaces, assessing current status of buildings, comparing planned and current uses of open spaces as well as ascertaining social, political and economic forces associated with the changes in the uses of open spaces. Two groups were selected and they participated in this study. They are referred here as Case study 2, group 1 and Case study 2 group 2 respectively.

### **5.2.3 Case study 3**

Case study 3 included second year Botany and Zoology students. Students' field work was carried out within the protected area of Saadani National Park. The overall goal of students' field assignment was to equip them with practical skills and knowledge on the study of wildlife, sampling protocols, species identification and wildlife information related gathering techniques. The field work covered studies of wild birds, wild mammals, small vertebrates and plants. It also included studies of community conservation, and land use. Three groups were involved in the study and they are referred here as case study 3, group 1, case study 3, group 2 and case study 3, group 3 respectively.

### **5.3 Students' information needs**

The first research question in this study was “*what are the information needs of undergraduates working on collaborative academic assignments?*” To address this question, this study not only identified students' individual and shared information needs but also examined the antecedents that give rise to information needs of students. The preceding factors are examined within the context of collaborative tasks and embedded activities performed by students as well as the characteristics of environments in which students performed the tasks. In order to understand students' individual and shared information needs and factors that gave rise to the needs, the researcher interviewed students and field instructors. The researcher, and also observed and became familiar with different collaborative learning tasks done by students, their objectives and procedures they used to accomplish the tasks. In addition, the researcher took time to study physical environments where collaborative tasks were performed.

The findings indicated that students' information needs were numerous. Students' information needs also ranged from personal to shared information needs. It reflected students' physiological and cognitive needs. These include domain specific information needs such as need for information to fill students' knowledge gaps and completion of group assignments. The findings also revealed that students have collaborative tasks' supportive information needs which include the need for information; which is essential for supporting work logistics, familiarization with the working environments and information for their basic needs such as food, shelter and other cost of living.

Students' information needs were observed to be partly goal oriented as they emanated from collaborative tasks goal and objectives. Students worked in routine based group assignments with predefined goals and task objectives. Collaborative task objectives created information solving problems, which in turn, created demand for information. Students' information needs were viewed as part of students' information solving problems. These emerged as a result of an imbalance between what is known and what is unknown. There was also lack of understanding of collaborative working assignments. The following extracts, from focus group discussions

provide further illustration on how students' information needs were related to the collaborative task objectives:

*“...when we are in the field we require information that will help us to complement what we have learnt in the class with what we actually have seen in the field...” “We compare for example sizes of open space shown on maps with actual size found in the fields and related planned and actual uses of open spaces.”* [Case study 2, Group 2]

*“As part of group works we are supposed to collect information about different existing building designs available in the area. We also look for new building designs which were not taught by our lecturers during class sessions.”* [Case study 2, Group 1]

The above extracts highlight different students' perceptions of information needs including gaps resulting from lack of practical knowledge and desire to extend knowledge. Information needs of students is described as a need for information that would help them to bridge theoretical knowledge gained in the field as well as need to explore new information and knowledge.

Students were found working on different collaborative assignments with different learning tasks and activities. These differences which were part of disciplinary variations in the three case studies were responsible for the differences in types of information needed by students to complete their assignments. In Case study 1, students' domain specific information needs included information on best practices in establishing and managing nurseries, improving quality of tree products and types of existing agro forestry systems practiced by farmers in the real farming setting. They also needed information related to economic, ecological and social factors. Information that motivated farmers to engage in agro-forestry activities, information on the dynamics of forest stand and trees growth. Students also needed information on environmental and spatial aspects which determined the growth and quality of tree products and forestry product harvest strategies. This included information on best time for harvesting.

Information needs of architectural students seemed to reflect the characteristic of their field of study and objectives of collaborative learning tasks. Students needed information on physical characteristics of buildings and architectural designs of different buildings. Students also needed information on evolving nature of building types in the city over time and social, political and economic factors influencing their current uses. Other information needs included: the types of open spaces available in the city and their social, and economic uses. For example, explaining how information needs of students were related to their discipline of study, one of the students from Ardhi University commented that:

*“There are different new and old architectural designs in the city [referring to the city of Dar es Salaam] but there are also newly emerging designs as well...when we are in the field we are interested on observing different existing designs and factors related to changing urban morphology of the city... we collect this information by observing and talking to people.” [Case study 2, Group1]*

It is evident from the extract that, students need information regarding coexistence of new and old building designs and the reasons for changing urban morphology.

In the interview with students from case study 3 and from the field observations, it emerged that students had unique information needs which resulted from their collaborative work tasks and activities.

- Students needed information on the abundance of small mammals and characteristics of their habitats.
- They also need information related to plant behaviour and characteristics in relation to plant herbivores and how herbivores responded to plant’s adaptations.
- Information on forage nutritive, physical and organic impacts of fire on soil, plants and animals.
- In the ornithological field, students needed a wide range of information including, availability and abundance of different birds species in relation to the habitants, as well as information related to territorial and reproductive behaviour of birds.

- Students also needed information on how local communities participate in the conservation initiatives, local communities' natural resource utilization, existing wildlife corridors and land use conflicts and their mitigations.

Students' information needs were not only related to domain's practical knowledge, but also to support collaborative activities. Students admitted that they needed information to support procedural and logistic processes related to collaborative field assignments. The following statement extracted from group interview elaborates more on the role of information in supporting collaborative tasks and activities:

*“Although this is not my first time to come to participate in group field work, this assignment is different compared to what we did last year. ...the fact that we are working on different assignment is concerning. ... I was interested to know more about types of data that we will be collecting in the field and how we will be working as a team to accomplish different tasks.”*[Case study 1, Group 1]

It is evident that in the course of accomplishing different collaborative tasks students need information to enhance their understanding of how different activities are accomplished in a team.

Students' information needs were observed in relation to social environments in which collaborative assignments and work tasks were carried out. Students' social environment constituted both the physical work environment and people shaped characteristics of information needs. Students worked in different physical environments which did not relate to the conventional learning environments in their universities. Different information needs emerged as a result of working in a different learning environment.

In case study 1 and 3, respectively, students worked in the wild environment with potential risks from dangerous encounters. The nature of the working environment created a need for information among students on how to protect themselves from venomous and poisonous



creatures, predatory mammals, poisonous plants, falling trees, and stones. Students' information needs relating to work environment were mainly physiological. This includes safety and security needs in the fields. One student stated in an interview:

*“It is important for us to be familiar with the surroundings and situation where field work is conducted...We are also anxious to know potential risks that we might come across while we are in the field...This information would enable us to take preventive measures about potential dangers in the field...understand behaviour of different dangerous creatures including characteristics of their habitat so that we can take precaution”* [Case study 3, Group 2]

*“Last week when we were cutting down trees and taking measurements one of our group members was almost crushed by a falling tree... since that incident we have been taking all the necessary precautions...We need to know how to properly use different safety gears while we are in the field.”* [Case study 1, Group 4]

As indicated in the above extracts, it is evident that, working in a different physical work environment prompted students to have physiological information needs which are unique. These needs are related to the nature of the work environment.

Students also needed information that would enable them to familiarize themselves with the work places and coordinating different collaborative activities. This kind of need emerged even before the start of field work as well as during the field work. The respondents needed information on site locations and their characteristic, costs associated with field work including; accommodation, food, travel and time that would be spent in the field.

*“It is my first time to come to Saadani national park...Prior to the beginning of the field work I was curious to know more about this area especially the location of the area, physical environment and ecology of the area, types of services that are available and if I*

*should take mosquito net/repellent for preventing myself from mosquitoes and other insects.” [Case study 3, Group 3]*

The nature of work tasks and work environment shaped not only types of information needs but also characteristics of information needs. Students’ group information needs were also found to be dynamic and diverse, frequently change within and between different tasks. This behaviour was also attributed to the changing of learning tasks and activities, task situations and physical locations. Students to students’ interactions as well as interactions between students and other people influence the occurrence of new information needs. During these interactions, students were involved in discussions which shaped their understanding and perceptions of information needs. The findings revealed that information needs of students were constructed and reconstructed during the interactions among and between students and other people. Students also experienced multiple information needs within a single task. The following are statements from focus group discussion of case study 1, group 2 and case study 3 group 2:

*“Depending on what we want to achieve in different activities, we need to collect different information ... sometimes when we finish collecting information and start analyzing it we realize that we need more information as to complete the assignment. This requires us to go back and take measurements and start processing data. [Case study 1, Group interview 2]*

*“In this field work we are working on different tasks and each task is unique. When we finished studying behaviour of birds and characteristic of their habitants, our lecturers directed us to other different tasks in which we were interacting with local communities living nearby the national park...in this part of assignments we wanted to know how local communities were involved in conservations, land use and other natural resources utilization, conflicts resolution...As you can see this task is different from what we did in previous assignment [Case study 3, Group interview 1]*

The above descriptions provide two scenarios which both describe the dynamic nature of students' information needs. In the first extract the existence of multiple information needs within a single task emerged as a need to confirm, verify and complement what is already known or gathered. In the second extract, the dynamic nature of students' information needs is the results of existence of multiple collaborative tasks in the assignment.

It is evident from the field observations and interviews that during group work, students had the individual and shared information needs. Individual information needs included information for supporting physiological human needs, personal perceptions and feelings of inadequacy and lack of knowledge in relation to work tasks or work environments. On the other hand, shared information needs resulted from students' shared goals and tasks objectives during collaborative assignments.

Data collected through observations and interviews revealed that students' collaborative information needs identification involved, understanding the nature of collaborative tasks, creating shared understanding among group members and incorporating individual information needs into group information needs. Students' shared information needs were shaped by tasks in which they were involved and also group constructions and reconstruction of what constituted their knowledge deficits. It also includes shared perceptions on what information was needed to solve existing information based problems. Shared information need is not an aggregate of individuals' information needs, but a group perception of what information is needed to accomplish collaborative tasks.

During collaboration students work together to identify information needs related to collaborative tasks. The collaborative activities were interactive and inclusive. Students were observed engaging and interacting with each other and with other individuals outside their groups. Students' external interactions with other individuals from their groups exposed them to a wide range of ideas and resources. This shaped their perceptions of the nature of problems that they were working on and types of information needed to complete the assignments.

Information sharing is a common practice during the process of identifying and assessing collaborative information needs. Students engaged in a number of communicative activities such as group discussions, formal and informal meetings. In addition, they were involved in experts briefing sessions to help them uncover their levels of understanding, share what they know and identify what was not known.

#### **5.4 Channels of communication and sources of information used by students**

The second research question sought to ascertain the channels of communication and the sources of information used by students when working in collaborative assignments. The purpose of the question was to identify information sources and channels used by students and reasons for students' preferences for these channels and information sources. The results from observations and interviews indicated that students used a variety of information sources including textual information sources such as field guides, field manuals, printed herbarium, archival documents, text books, maps and electronic information sources. Students were also found to rely on colleagues within the groups as well as, knowledgeable and informed individuals within and outside their domain of study.

It was further noted that students preferred to use different channels of communications including observation of nature and human-made objects such as buildings, face to face interactions among students and between students and other individuals such as field instructors. These interactions were in the form of visits, formal and informal meetings experts' briefings and group discussions. Students also indicated that sometimes they browsed the Internet for quick references using mobile electronic gadgets. It was further noted that the use of library as the channel of information was common during the initial and final stage of learning tasks. The importance of the library as the channel of information was noted during the group interview as one student elaborates:

*“Despite the fact that we are spending most of the time in the forest, at the beginning of our assignments we have a chance to use our faculty library for consulting different*

*manuals that are important in the field. We will also use our university library and faculty library when preparing our field reports.” [Case study 3, Group 2]*

#### **5.4.1 Human sources of information**

In all three cases the use of people as sources of information was found to be a common practice among students during field work in all three case studies. Different people in and out of with students’ immediate work circles were consulted during collaborative information seeking. First, students were found to rely on colleagues within their groups and occasionally outside their own groups. The reasons behind students’ use of these human sources included. Physical proximity among group members and non-group members, existence of shared goals, shared disciplinary background and trust among group members. Data gathered through interviews confirmed that students preferred to consult their fellow students. Students admitted that they consult their fellow students because they know better the nature of the tasks that they are performing. It was observed that working allows them to generate information which was suited to the context of their collaborative assignments. The following interview extract illustrates students’ ‘preferences of consulting their fellow students while working in groups:

*“When we are in groups we have opportunities to ask each other questions or clarifications which enhance and improve our understanding and also the quality of our works. Through group discussion we learn from each other and we are able to achieve better results within a short period of time than one could have done it alone” [Case study 2, Group 2].*

Students consulted field instructors when they needed clarifications and guidance on particular issues such as, type of information to be collected and use of different instruments and measurements. Field instructors played multiple roles as supervisor, persons who provided guidance to students and also as important sources of information to students. During the field observations the researcher observed students consulting their field instructors for clarifications. Students also sought information from their field instructors during formal and informal meetings. Students preferred to use field instructors because they were accessible and readily

available. Field instructors were also preferred sources of information because they were perceived to be experienced with depth of experience, knowledge and authority. One of the respondents observed thus;

*“We work with the assistance of our lecturers as a group and on individual basis. We also frequently consult our instructors when we need clarifications or when we have failed to reach consensus in the group. Our lecturers in the field have experience; they know what we are doing because they are the ones who prepared the assignments.”*

[Case study 3, Group 3]

*“Even before the beginning of our field work, we would have been in touch with our instructors. They give us instructions on what to do while we are in the field... we are supposed to use different tools and instruments to assist us in data gathering process. Our lecturers instruct us how to use different tools and instruments and also brief us on what we are supposed to do when we are in the field. When changing tasks we also get orientation on new tasks that we need to do.”* [Case study 1, Group 3]

From the above extracts, it is apparent that the roles that field instructors assume in the field together with experience and expertise make students rely on them especially in situation where students needed information for verification or clarification.

Students also consulted professionals and experts including knowledgeable individuals from local government, conservationists in Saadani National Park, and experts from forestry research institutes. They also consulted technical staff from respective universities. In some cases, field supervisors influenced students’ selection of people with whom they would consult. These individuals were perceived by students as trusted sources of information because they had experiences and information needed by students. Students also identified other persons who they consulted. They consulted them because of their roles, their positions and because they were considered to be well informed. Figure 5.1 shows SUA students interacting with expert/instructor and also students-objects interaction.



Figure 5.1: Participants from case study 1 seeking information at TAFORI, Morogoro. This is a typical example of students-expert-instructor interaction and students non-human objects interaction.

As part of their assignments, students gathered information from various sources. In figure 5.1 students are collaboratively seeking information from experienced forester (a lady with black skirt and a students' supervisor (A professor with a note book in his hand) regarding shoot tip culture performed in-vitro.

The leaning assignments given to students had objectives. Students were required to consult different people who were well informed and experienced in relation to the students' tasks. These included individual members of local communities such as experienced farmers, people who lived adjacent to the protected areas who had relevant information and indigenous knowledge. Other individuals such as owners of houses, people who were engaged in business in open and public spaces were consulted on account of their roles. This was observed during field observations and reported from group interviews with students. The following extract illustrates different reasons for consulting people who were not necessarily experts in students' domains:

*“...only those residents who had resided in the areas for many years were consulted because they were believed to have historical knowledge on the development of the areas under investigation...We prefer to use information which is accessible, reliable and available. We also extract information from people who appear to know culture and those who work in open café.”* [Referring to café operated on open space] [Case study 2, Group 2]

It is evident from the above extract that students’ choice of information sources was influenced by both tasks objective and characteristics of information sources. Figure 5.2 below depicts experienced agro-forestry farmers. They were consulted by students during field work in Arumeru district, Arusha.



Figure 5.2: Experienced agro-forestry farmers consulted by students during field work in Arumeru district, Arusha.

Experienced agro-forestry farmers (a man with blue jeans and black cap and a woman with blue and white dots printed cotton wrap) provide information to students on different agro forest



farming products, different agro-forestry systems practiced on their farms and the availability of market for agro-forestry products.

#### **5.4.2 Non-human sources of information**

The term non-human source of information has been used as a generic term to include a wide range of information sources which are textual and non textual based sources. These include information sources such as printed herbarium, electronics and printed maps, field guides, archival documents and text books. Students also extracted information from nature through observation of living organisms' behaviour, as well as non-living objects such as buildings and open spaces. Students were not only interested in these objects or living organisms but they were also interested in the information they extracted about them. Figure 5.3 below shows students extracting information from non-living objects.



Figure 5.3: Students extracting information from sketches, diagrams, slice of wood logs and timber. Students are collecting valuable information regarding physical and mechanical characteristics of tree products. This was done in a tissue culture laboratory in Arusha.

There was emphasis on how living organisms are used as sources of information in the field, one student commented during the interview:

*“This work is also based on observing animals, trees and birds on their natural habitats. For example by monitoring different animals we are able to establish different population variables like their sexes and ages. We can also identify their behaviours in relation to the environment, or other animals. We are also observing animals and birds and gather information about their abundance and distribution within the national park.” [Case study 3, Group 1]*

The study also identified specific factors that influenced students’ use of particular information sources. These factors included collaborative tasks objectives, work tasks stages, characteristics of work environments, the time factor, and the physical field environments where students worked. Moreover, in work environments where there was limited access to textual information source students were given the choice of using any easily available and accessible information sources. One respondent stated:

*“This is a different learning environment where we do not have access to libraries. To be able to accomplish the assignments we must rely on observing what is available in the field, using our guides and brainstorming among ourselves.” [Case study 3, Group 3]*

In the above example, students’ lacked access to information available in the university libraries. This happened while they are in the fields and it was a factor for opting to use other sources such as human and objects.

The preference for particular sources of information was also influenced by both group learning goals, objectives and the stages of the collaborative tasks. Depending on the tasks students were working on they sought different types of information. This included facts, or opinions, evidence or even piece of information to validate particular issues. Consulting fellow students or other individuals was common in all stages of collaboration. The students noted that they anticipated consulting textual information sources alongside data collected in the field during the report writing stage. This is what one respondent observed:

*“Since we started our field work we have been doing different activities which require us to collect different data from different sources... depending on what we want to collect, we consult people like owners and users of open café, observing and taking measurements of different structures. There is also important information such as historical documents or photos of old building which have been demolished which cannot be obtained from people. These are important sources because they help us to compare what we see in the field and what actually existed before...” [Case study 2, Group 1].*

In the above example, students were motivated in accessing information sources which not only contained information that addressed their information needs, but also which could be used to verify, compare and complement what they knew as a group.

Another observation was made in the interview by students from case study 1 and case study 3. They admitted using different information sources within the same tasks on different occasions. They further stated that sometimes they had no choice as they were forced to consult information sources based on the tasks that they had accomplished. One respondent stated that:

*“When we were working on community conservation and land use conflicts we were mainly involved in observation of land use patterns within and around the protected area. But we were also supposed to collect information from local communities living around the national park regarding their involvement in conservation initiatives and the nature of conflicts related to land use and utilization of natural resources” [Case study 3, Group 1]*

The following interview extracts also highlights how task objectives influenced students choice of information sources:

*“While we are in the field we used SUA training forest and other forests as the valuable sources of field data...We have been collecting different forestal information through*

*observations and by taking measurements on forest stand. Sometimes we take measurements on the volume of trees, total number of tree in the area and also diameter of standing trees. In a group we discuss how to compile and use such information in the report. We also make use of field guide provided by our instructors...Most of the time we collect information based on its importance in supporting what we are doing in a group.”*

[Case study 1, Group 3]

The following example was taken from one of the interviews. This was conducted with students of case study 2. It elaborates how collaborative task stages also influenced students' choice of information sources:

*“At the beginning of the field work when we want to be familiar with the topic that we are going to deal with we frequently use the library to try to find useful information... we search for previous works, text books, works of other students and even maps of the city of Dar es Salaam.”* [Case study 2, Group 2]

### **5.5 Collaborative information seeking behaviour of undergraduate students**

The third question sought to understand students' information seeking behaviour in the context of their collaborative field work assignments. Collaboration in group assignments was the main concerns of students but information seeking was the dominant activity among them. During collaborative information seeking, students engaged in seeking information for problem solving and coordinating collaborative activities.

The findings revealed the interconnectedness of students' collaborative information seeking behaviour with information needs; characteristics of information sources accessed and used, and the nature of collaborative tasks which students were engaged in. Three main patterns of collaborative information seeking were identified namely: information seeking by recommendations or referral, information seeking by observation and information seeking by generating information. It is important to note these patterns are not distinct categories. On the contrary they overlap and sometimes intertwined.

### **5.5.1 Information seeking by observing nature**

Students' field observation played a vital role during the information gathering process, where systematic and guided observations of natural and man-made objects were essential part of collaborative information seeking process. Students were able to collect valuable and relevant information out of nature with the use of printed field guides prepared by field supervisors; and other references sources such as maps, herbarium catalogues, atlas of animals and birds.

The observation process was also complemented by measurements of different objects. Disciplinary differences, differences on tasks objectives and nature of the physical environment determined the way students engaged in the observation process. Depending on the nature of the assignments, students observed and sought information from various sources; tree plantations and nurseries, tree logs and snags, observed and monitored the movement and behaviour of living organisms such as animals, insects, birds, buildings, and other manmade structures.

### **5.5.2 Information seeking by recommendations**

The findings on information seeking patterns indicated that, students also seek information after receiving recommendations or reference from other people. It was observed that, field instructors played the role of information referees in identifying relevant information sources and they instructed students to seek information from the sources. Whether information was sought by observing natural environment or consulting other people, students' choice of information sources and decision to seek information were largely by recommendations given by their supervisors.

Prior to the commencement of the field work; instructors provided recommended sources of information that students would consult as part of field group work. Students were obliged to seek information based on recommendation they had been given by their instructors. Also, field instructors in some cases identified and referred students to experts and other well informed individuals who they considered to be more informed and knowledgeable on the subject matter. As one of the students said:

*“We had no knowledge of the existence of most of the people that we interviewed. Many people that we interviewed were identified by our lecturers...for many years our instructors had been working with different students on similar assignments for many years. They met different people who had relevant information and knowledge related to what we were investigating.”* [Case study 1, Group 4]

The findings of the study further revealed that students used snow balling technique to ask interviewees to recommend other key informants. In some cases students admitted that they consulted fellow students who participated in similar assignments in the past. These experienced students also provided recommendations to their fellow students regarding information sources to be used. The following statement was taken verbatim from group interview with students of case study 2.

*“When we don’t find relevant information we prefer to ask some of our colleagues who would have done similar assignments last year. They are more experienced and always recommend to us the right people to consult.”* [Case study 2, Group 1]

### **5.5.3 Discursive Information seeking pattern**

One of the benefits of working on collaborative assignment is that it allows students to seek information through interactions with fellow students. This is called discursive information seeking pattern. During collaborative learning process, students get involved in discussions in formal and information conversations. These face to face interactions are rich and valuable in that they generate contextualized information needed by students. Students were exposed to new ideas within a group when they worked together. These ideas locally generated within a group were an important part of information seeking process.

### **5.6 Collaborative information seeking mode**

This study investigated different information seeking modes demonstrated by students in the course of seeking information in groups. In relation to the information seeking patterns explained

in 5.5 above, the study identified five information seeking modes used by students when seeking information. These included active collaborative information seeking, collaborative information searching and accidental information seeking. Other modes of information seeking observed are, ongoing information seeking and information avoidance. These information seeking modes fall in two main categories which are active and passive modes. These modes of collaborative information seeking are presented in this study as distinctive processes but, in actual situation, the modes were observed to overlap and complement each other. For example, accidental information acquisition incidences also occurred when students were engaging on active information seeking process.

Active information seeking mode involves conscious and purposive information seeking activities from both textual and non textual sources of information. Three collaborative information seeking modes were demonstrated by students. They included collaborative information seeking, collaborative information searching and collaborative ongoing information seeking. Observation and interviews revealed that students engaged in active collaborative information seeking or searching modes when they have clear goals and identified information needs. These need determined course of actions in terms of what information sources to identify and access. Active information seeking modes were also common when students sought information from sources which had been recommended by their supervisors.

The results from observation and interviews further revealed that students actively engaged in information seeking by observing and extracting information out of nature. They also seek information from fellow students, subjects' experts, field instructors and other well informed individuals. Formal and informal meetings among students and between students and other actors provided platforms for students to actively acquire information. During the interviews, students admitted that they frequently sought information by consulting and talking to people within and outside their groups. One respondent observed that:

*“Before we started field work we familiarized ourselves with the tasks that were ahead of us. This gave us a clue of what kind of data that we needed to collect in the field...field*

*work also required us to find information from different people...we actually asked them questions and clarifications based on what we were supposed to accomplish as a group. This facilitated our understanding of new things which we would not otherwise learn by ourselves in a group.” [Case study 3, Group 1]*

From the students views explained in the extract above, it is evident that learning objectives were known to students, which made it easier for them to link the objectives with the available information sources needed to accomplish the tasks.

The term collaborative information searching has been used in this study to explain mode of information seeking which is mediated by technology. The observations and interviews suggest that students rarely used mobile retrieval tools such as, smart phones and digital pads to locate electronic information sources. These sources would provide quick references and quick answers to questions. Students also reported that at the end of their field work, they will use library OPACs and internet to locate and retrieve various information sources such as, reference books, in the preparation of the final initial field reports written by other students. When asked why they sometimes preferred to search information; one of the respondents from case study 2 explained:

*“Most of the maps that were available are out of date [referring to printed maps available in the libraries]... so it is easier to use my phone to find current information from Google map. With options of switching either from map view to satellite view we can get more information from the maps than what printed maps can offer. We use this information to compare with what actually is available on the ground.” [Case study 2, Group 2]*

Collaborative information searching was also characterized by both co-searching and single user searching processes. Co-searching involves students who collaboratively search information as a group. In single searching episodes students individually searched information and thereafter shared the results with other group members. The decision on whether to engage in co-searching or single searching was influenced by the relationship between students during search and the



different roles that students assumed during the collaborative tasks. Co-searching or single information searching patterns were also influenced by the types of information searching tools that were available. Students acknowledged that when using mobile information searching tools, one student was tasked with the responsibility of performing the search. The results obtained from the search were shared by all members in their groups. Availability and type of information searching tools influenced how the students searched for information. For example, a librarian from Sokoine National Library commented on how availability of computer terminals in the library influenced information searching behaviour:

*“There are a number occasions that undergraduate students come to the library to use available computers for locating and accessing information sources. We have limited number of OPAC computer terminals in our libraries. Sometimes students are required to search together in groups because of shortage of computers.”* [Individual interview 3, SUA]

Based on the librarian’s point of view, students’ decision whether to search collaboratively or individually was influenced by availability of information searching tools.

In many occasions, students were also involved in ongoing information seeking practices. In collaborative work context, ongoing information seeking is an active seeking mode that involves both group and individual efforts. Ongoing information seeking was influenced by the curiosity and desire to know more. This is beyond the objectives of collaborative learning tasks. Some students observed, were involved in information behavioural practices such as asking questions and seeking clarifications from experts. Such queries were not necessarily related to the objectives of their learning tasks but, were within their areas of specialization or study. Students also consulted other informed individuals and fellow students. They gathered general knowledge that they would use in the future. This kind of information seeking behaviour emanated from student’s inquisitive behaviour and intrinsic motivation. The purpose is to gain more information and knowledge for future use. During group interview one of the students from Sokoine University of Agriculture explained that:

*“I am very interested to participate in field work because I need to know more... I don't have work experience...this is the best opportunities for interacting with people who are experienced in the field and help me acquire knowledge that will make me more competent when I get employment.” [Case study 1, Group 1]*

In the above example it is evident that, students' ongoing information seeking mode is characterised by individual rather than a group desire to seek more information for future personal professional use. This was explained during group interviews with participants from case study 3.

*“When we are working together on different activities we learn different things. Although our ambition is to accomplish specific tasks set by group instructors, as a group whenever we find something interesting we either take photos or keep a record of it. We always believe that any information that we collect and not use will be used in one way or another in the future.” [Case study 1, Group 3]*

Ongoing information seeking was also observed to be collaborative effort in which students actively or passively continued to seek search information needed for confirming already known information. The same information seeking mode was common when new information needs emerged in the middle of information seeking, processing or use. For example, the study noted during information seeking, students concurrently engaging in evaluating information, addressed new gaps and searching for extra information needed to address the gap.

The second category observed was passive collaborative information seeking mode. When students were working in groups they had some expectations about the kind of information they needed. These expectations were not only a reflection of their information needs but also students' shared knowledge base. Despite such existence of intentional information seeking practices, passive information seeking was found to be a common practice among students when they worked in group assignments. This mode of information included information behaviour activities where students accidentally acquired relevant information in group or individually.

When information was passively acquired by individual students, it was later shared and collaboratively evaluated by group members.

Unintentional information acquisition did not occur in a vacuum but rather within the context of active information seeking. A wide range of collaborative activities and information behavioural activities were noted as facilitating occurrence of information encountering incidences. These included face to face interaction between students and other individuals, consultations and meetings. Students acknowledged that they encountered relevant information when they either engaged in active information seeking or when they performed different learning activities. This is evident in the statement made by one of the students from case study 2:

*“As part of learning process, we are supposed to apply what we have been studying in class in realistic situations. When we are collecting data we have our own anticipations regarding types of data that we need in our project...but sometimes you can be surprised that you come across information that you did not anticipate. We also review and collect preliminary information about different designs available in the study area. But when we were in the field we discovered that there were unique designs that were not taught in class...”* [Case study 2, Group 2]

The above interview extract suggest that encountering information which appeared to be relevant to students’ group work was a common phenomenon. Also, the following statement extracted from students’ group interviews explained how students’ interactions with members of local communities enabled them to accidentally acquire relevant information for their projects:

*“We discussed with a number of people when we were looking for information for our assignments. The good thing about talking with people is that you can have your list of questions based on what you want to know from them, but the moment they start talking to you ... then you realize that they have lot of information than what you expected to get.”* [Case study 3, Group 1]

*“When we went to the agro-forestry farmers I had what I thought was an exhaustive list of different agro-forestry systems that we had been taught in class...To my surprise, participating in field works exposed me to different agro-forestry systems practiced by local people which I was not aware they existed.”* [Group interview 1, case study 1: SUA]

Passive collaborative information seeking was also experienced in situation where students acquired information which appeared to be relevant in assignments conducted previously. This was commonly noted in case study 1 where field assignments were divided in sub-components. In each component students were expected to write groups reports.

Students’ information seeking behaviour was not limited to active and passive information seeking modes, but also active information avoidance. During observation and with complementary of data from interview, it was revealed that in some instances students consciously or unintentionally evaded acquiring relevant or potentially relevant information. Students’ information avoidance was observed and was associated with two factors which are time limitation and fear of seeking information which do not impress field instructors.

Time influenced the decision to avoid some information sources. This was reported during the interview with students. Students acknowledged that they did not have enough time and even if they had there were relevant information they would sometimes avoid due to limitation of time allocated to each assignment. Students from case study 2 admitted that when they anticipated that it would take more time to get information they wanted they avoided looking for such information. Instead they looked for another alternative. The statement below is from one of the respondents:

*“Even if we know that there are individuals who are more informed and who can give us relevant information concerning city planning, or previous uses of different government buildings, we prefer to use knowledgeable old local people than leaders or politicians*

who are very 'bureaucratic' [meaning people who take considerable time to make available information to students] [Case study 1, Group 1]

Perceived difficulties or barriers in accessing and acquiring information are explained in the above extract as decisive factors for students to either access or avoid information.

The findings showed that rather than enhancing their own views and perceptions students sometimes deliberately avoided seeking information for fear of contradicting the views of their instructors. When students anticipated that their instructors' views contradicted with particular information or sources of information they opted to avoid that information. During the interviews information avoidance is also explained as information behaviour which is externally imposed upon students: A student from case study 3 stated:

*“Based on our past experiences on using information sources from the Internet, we are worried to use such information during report writing because it will be rejected by our instructors as they always say that most of the information on the internet is not useful and authentic...”* [Case study 3, Group2]

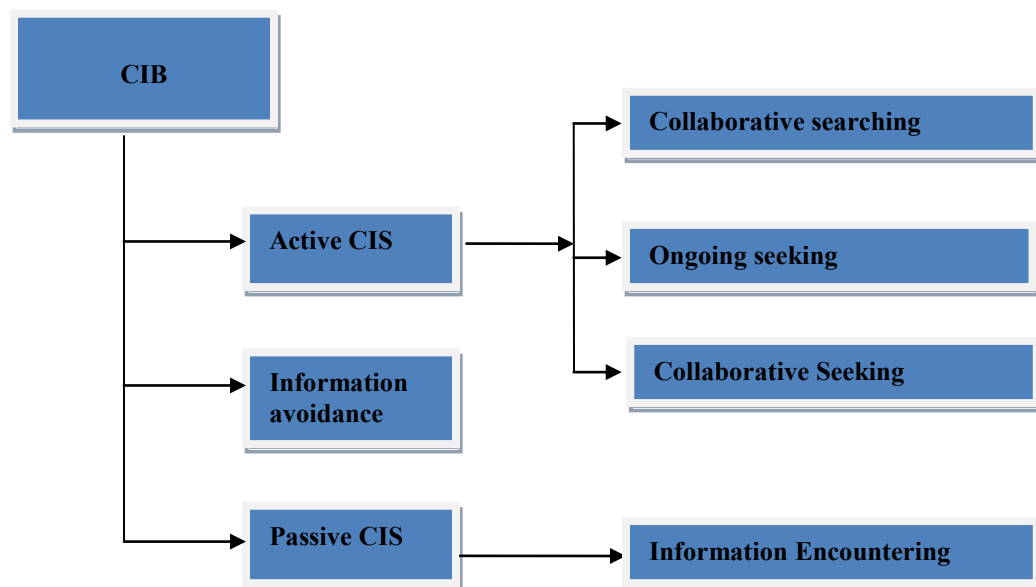


Figure 5.4: Students collaborative information seeking modes

The Figure 5.4 provides a summary of students collaborative information seeking modes discussed in this section. Information avoidance was noted as a temporary behaviour. In several interviews students admitted that in future they could access and use information that they had avoided depending on their information needs.

## **5.7 Factors shaping students collaborative information behaviour**

In attempt to examine factors that influenced the information behaviour of undergraduates working in collaborative academic settings, four aspects of students' collaborative information behaviour were studied. These aspects were information needs, collaborative information seeking, collaborative information evaluation and use. The findings from field observation and interviews indicated that, three broader sets of factors influence students' collaborative information behaviour when they work in group assignments. These broader contextual factors were collaborative work related factors, physical environmental factors and personal characteristics. These three broader sets of factors provided frameworks in which students collaborative information behaviour could be understood.

### **5.7.1 Collaborative work related factors**

Collaborative work and embedded tasks which students accomplished were the major factors that determined the way students behaved in relation to sources and channels of information. Three factors related to collaborative work tasks and include forms of collaboration, students' collaborative learning tasks objectives and the nature of the disciplines.

In all these case studies students were involved in explicit, credit learning based collaboration. In this kind of collaboration, students were supposed to accomplish different tasks with different learning objectives. Students were also evaluated as a group based on their work outputs. In relation to form of collaboration, it was noted that students' collaborative information behaviour was influenced by two intrinsic motivational factors. These factors are fear of failing to meet task objectives and expectations for reward after completing the assignments successfully. These two factors which are external to students' motivated them to work together and it has helped shaped

their information behaviour particularly with regard to information sharing patterns and individual contribution to the realization of group tasks objectives.

During group interviews students were also asked to explain the extent to which the types of collaboration they were involved in shaped the way they worked together in accomplishing different tasks. The following interview extract illustrates how the form of collaboration influenced students' information behaviour:

*“We are required to work cooperatively in this field work because it is part of our studies. We cannot graduate without participating and completing group field assignment... The degree programme will be incomplete and there is no way you can be employed as a graduate without the field work.”* [Case study 1, Group 2]

During the interviews students also acknowledged that involved in credit based learning collaboration motivated and enabled them to learn and acquire practical knowledge. Students noted that the goals of the field work helped them to link theoretical knowledge obtained in the classes with the practical knowledge which is essential in work places. Such motivations facilitated effective collaboration and shaped the way students shared and used information. The issue was further discussed in focus group sessions when respondents observed that:

*“Even if we were not assessed by our instructors, by working together we are benefiting more because group work enhances social learning... I am very interested to participate in field work because I have a desire to be knowledgeable practically so that we can be competent when we get employment.”* [Case study 1, Group 4]

Students' collaborative learning tasks had specific objectives which students were expected to accomplish. Understanding students' collaborative tasks objectives was an essential step in understanding students' collaborative information behaviours. Collaborative learning task objectives not only determined the outcomes of students' group works, but also determined students' individual and shared information needs and type of information sources required to

solve specific learning problems. Students' information needs mirrored collaborative tasks objectives in group assignments. Collaborative tasks objectives also influenced students' information seeking behaviour including preferences of information sources, information seeking patterns and information use.

Students who worked in groups in the field were required to perform different tasks with multiple activities. Collaborative tasks stages shaped students' collaborative information behaviour in two ways. First, task's stages determined the types of information behavioural activities to be performed. Students undertook various information related activities such as meetings, group discussions and site visits that aimed at gathering information and creating common understanding of the nature of the tasks. Second, collaboration information behavioural tasks stages influenced the types and nature of information sources that students sought and use.

It was observed that during the initial stages students explored the nature of tasks, interact to each other and consult of textual information sources. At this stage student sought information which was essential in enhancing their understanding about the nature of the learning tasks. Observations of the natural environment and people's consultations were dominant channels of information communication when students worked on actual field activities.

Students' information sources preferences were also influenced by nature of students' discipline of study. Participants from Case study 1, for example, preferred to use agricultural experts from local governments, forest research institutes and experienced farmers as their sources of information. By contrast, students from Case study 2 consulted building owners, people who lived in the Dar es Salaam for many years, planning officers and people who were doing business in open spaces. While Case study3, students consulted members of local communities living adjacent to the national park and conservationists from the park. Students explained how the nature of academic subject determined their information sources selection and use. Case study 2 students noted that:

*“In our field of architecture, buildings are valuable sources of information. By observing and examining various buildings we can collect large quantity of information related to*



*architectural designs, architectural heritage and history of buildings.” “Buildings are the most important source of information since it is through buildings that skills are manifested...Buildings have a story that one can get.” [Case study 2, Group 1]*

Academic disciplinary differences also shaped preferences, selections and use of information sources among participants from the Case study 3. Students had unique information sources which reflected the nature of their discipline. Students extracted information from living organisms such as birds, small mammals and uncultivated forests.

### **5.7.2 Factors related to social and physical environments**

These factors relate to the social and physical environments in which collaborative work was carried out. Social environment in which students worked and lived together with rules and norms that governed the way they worked and interacted are an important part of students' information world. Several factors influenced student information behaviour. These factors included collaborative work environment, social and group member relationships.

Students physical work environments included tangible work places and locations in which different collaborative activities were undertaken by students during the field work. In all three case studies students worked in physical environments which were different from conventional work environment that they were used to. Physical environment shaped students' information needs particularly some physiological needs which were important for collaborative works.

The physical environments allowed students to work frequently in close proximity. Such constant physical contacts among students influenced the way they shared information, the information sharing tools they used and the patterns of sharing the information. Physical proximity among students and lack of information sharing tools within the work environments encouraged students to use face to face information sharing information method. The physical environments in which students worked also influenced their information seeking behaviour.

Students' social environments included characteristics of group members, social and interpersonal relationships in and out of students groups and groups' norms and shared expectations. Group members' characteristics influenced students' collaborative information behaviour. The field observation and interviews confirmed that, group members' composition and group size and social and interpersonal relationship among students groups impacted students' information behaviour.

Group membership composition among the three case studies; suggest that group members' heterogeneity or homogeneity varied considerably. When compared to students from Case study 2 and Case study 3, students from case study 1, comprised of both in-services school students. This composition had implications for work and practical experiences. Many in-service students were more experienced than those directly from school. In relation to students' information behaviour, group member heterogeneity shaped students' perceptions and understanding of different collaborative task objectives. This shaped students' understanding of what constituted information needs, perceptions, what information sources to consult and the patterns of information sharing.

In situations where there were differences in experiences among students such as Case study 1, students were viewed as super information sharers. This was unlike those who were less experienced. In contrast situations where group members had equal experiences such as University of Dar es Salaam and Ardhi University; the findings indicated absence of students who were super information sharers.

Another social environmental variable that influenced students' information behaviour was variations in group size. Students worked in fixed groups, in some cases, depending on the nature of collaborative group work, different groups were combined to form large temporary group. This grouping system was not observed among the students of Ardhi University where students remained in their groups. The study indicated that group size influenced students' collaborative information behaviour particularly patterns of group members' interactions, individual contributions, information sharing and coordination of group activities. When students worked in

small groups, the degree of interactions among group members was noted to be high and individual participations and contributions to the group work were also high. Large groups increased difficulties of coordinating the group activities. In addition, large groups were associated with problems of social loafing or free riding. This was corroborated by the interviews with field instructors. The following verbatim extract from one of the interviews with field instructor in Case study 1 confirmed that:

*“The number of students in a group has to be carefully planned and arranged. Sometimes more students in a group might not yield fruitful results because some of the students tend to relax and leave the work to few which at the end you might not successful achieve the best outcome...In addition to that, as a supervisor you have to know the behaviours of your students in order to group them in a balanced way.”* [Case study 1, Individual interview 2]

The nature of collaborative learning tasks required students to be supervised by their instructors. Field instructors played multiple roles including setting learning goals and objectives, providing guidance and instructions to students on how to accomplish different tasks and evaluating students work progress and final work outputs. Interactions between students and field supervisor during the field work and the influence and authority that they had were decisive factors on the students work and behaviour. Students’ identification and selection of information sources, information seeking, evaluation, and use processes were highly influenced by their field instructors.

The study confirmed that group members’ level of education and previous knowledge of subject matter was an important group characteristic that influenced their information behaviour. Previous knowledge gained in classes was an added advantage to students, particularly with regard to information acquisition and information processing. Students acknowledged that the knowledge that they had acquired in classes made it easier for them to link what they observed in the field and what they were taught in class. The following extract from students’ interview elaborates how previous knowledge influenced students’ behaviour:

*“It is true that we are working with assignments which we have not done before. But I am confident that with prior knowledge that we have this will be like a repetition...most of the activities that we are practicing here remind us what we have covered during the coursework.”* [Case study 3, Group interview 3]

## **5.8 Students’ information sharing behaviour**

Among various collaborative information activities, information sharing is one of the dominant activities that students engaged in. In exploring information sharing behaviour of students, four key aspects were addressed. First the research sought to understand what constituted information sharing behaviour in students’ collaborative field assignment contexts. The study also sought to identify motives and patterns in which students shared information and the tools used by students to support information sharing process.

### **5.8.1 What constitute information sharing behaviour in collaborative field assignments?**

With regards to students’ information sharing behaviour this study not only examined what constitutes students’ understanding of information sharing, but also observed types of information that students shared when working in groups. The term information sharing and information exchange have been used to indicate differences in degree of reciprocity when information is shared among students. While information sharing has been used to indicate mutual benefits among information sharers, information exchange on the other hand, has been used to denote non-reciprocity and sometimes unequal power relationship. This study views information sharing as a process of sharing information related to collaborative information behavioural activities and collaborative related work activities.

Information sharing is an integral part of students’ collaboration where students share information in different activities. In relation to collaborative information behaviour, it was evident from observation that students’ information sharing behaviour was related to activities which were directly connected to other collaborative information behaviour activities such as identification and assessment of information need, information seeking, information evaluation

and use. Students embarked on activities of sharing information in all stages including the understanding of information problem and needs and information use.

Students were observed to engage in different levels of information sharing. This depended on the nature of students' collaborative tasks and stages in which they were involved. These ranged from simple act of exchange ideas, expressions or sharing of experience to accomplishing a task on hand or higher levels of information sharing. At the higher level of information sharing behaviour students were involved not only in sharing of ideas or information but also in social construction of meaning out of information. This included sharing of social realities, production of new ideas, meanings and interpretation of such reality.

The findings of the study indicated that students shared different information in different forms including sharing information orally, electronically or in the form of physical objects. The nature of work tasks and the physical collaborative work environments allowed students to share a wide range of information. This information included digital objects such as photos and videos taken in the field as well as maps and diagrams retrieved from the internet. Students also shared other information sources such as sketch diagrams which were drawn or produced by students during field works. Information sharing practices were also related to sharing of physical objects such as specimens, artefacts, printed maps, reference and textbooks, field guides, historical and archival documents.

One of the added advantages of sharing information orally was that it enabled students to share opinions, suggestions and ideas related to the work tasks and procedures on how to accomplish different activities. Information sharing also involved sharing of experiences among students and exchange of information in the form of experiences with the experts. Information sharing is initiated by the need to share experience among students or between students and other individuals. The process is characterized by one way information exchange rather than sharing of information.

It was further noted that students' information sharing practices related to the sharing of not only information that was generated in the field but also information and knowledge which was acquired in classes prior to the commencement of the fields. This was elaborated by students during interviews as follows:

*“Most of things that we are practicing here are not completely new as we have been taught in class... it true that we did not have a chance to learn in practice before, but it is true that we all have knowledge related to what we are doing and we benefit from each other by working together and sharing what we know.”* [Case study 3, Group, 2]

### **5.8.2 Non-information sharing behaviour**

Students were also observed to intentionally and implicitly engage non sharing information behaviour. In this information behavioural pattern students withhold information deliberately or unintentionally from other fellow students. Two factors influenced non sharing information behaviour among students which included intergroup competitions and students who work in group projects with different objectives. In case study 1 and case study 3 students were given assignments which had similar objectives. Students were assessed based on their final output. Students across the group competed with each other for good performance. During the interviews students mentioned that they could not share everything with students in other groups because they considered them as competitors as illustrated in the statement below:

*“I know that we have to work hard because this assignment is part of our coursework...other groups also are competing for better marks and they don't have time to assist us in anyway. As a group we have to cooperate and participate fully in the field and during preparation of field report.”* [Case study 1, Group]

Non information sharing behaviour was also observed to occur in situation where different groups were working in assignments with different objectives. This was noted at Ardhi Universities where students were divided into four groups and assigned different assignments.

This restricted information sharing practices particularly among groups which were working on different projects.

### **5.8.3 What are the motives and patterns of students' information sharing practices?**

Students' information sharing behaviour was characterized by three dominant behavioural patterns. These patterns were intra group information sharing, inter group information sharing and extra information sharing. Intergroup information sharing was common practices and included students who worked within the same group and shared similar goals and tasks. Students sometimes engaged in inter group information sharing. This was the common practice among students of Case study 1 and those from Case study 3. In each of these two case studies, students in all groups were given assignments which had similar objectives. Inter group information sharing was largely in the form of request for clarifications or feedback from other group members. Inter group information sharing was less common among students in Case study 2 because they were divided in groups and assigned different assignments.

Supervisors, technical staff, subject specialists and other knowledgeable individuals were also frequently consulted by students. Their presence in the field created a pattern of information sharing beyond group level. During site visit, students asked questions to clarify information that had been already obtained. This initiated information sharing between students in groups and non- group members. In this situation information sharing could be initiated by one person in a group but benefit all group members.

In an attempt to understand students information sharing behaviour, this study identified motives that influenced students to share information. The findings revealed that collaborative work tasks and work environments influenced students' decision to share information. Moreover, students who worked together with common goals and objectives were motivated to share information. This created the sense of collectivism, participation and individual contribution to the accomplishment of the tasks. One of the students stated that:

*“The good thing is we will be assessed as group and in comparison to what we have done in relation to other groups.... Everyone is supposed to put in efforts so that we can finish assignments that we have been given by our professor.” [Case study 3, Group 2]*

Shared tasks goals and objectives was not the only overriding motive for sharing information. Students admitted that they felt free to share information because they trusted each other. The students who study together for a long time and work together on a number of other group assignments create mutual trust for sharing information among themselves.

Division of roles and tasks among students during field work also created the need for sharing information. In situation where tasks were divided among group members, students were obliged to communicate and share information. Information sharing was a way of keeping up to date with work progress and coordinating different activities undertaken by different group members. Students also shared information as a way of confirming and counterchecking the accuracy of works done by different people in a group. This was corroborated by students during group interviews.

*“In some assignments that we are dealing with, our instructors want us to learn how to use different tools for taking measurements and recording data. This cannot be done by one person... we have to divide ourselves where every member is given tasks to do... when we finish each of us is supposed to present what he/she has done and we compile everything together.” [Case study1, Group 1]*

Division of labour and tasks is the motive for sharing information. This was observed and noted during the group interview with students from Case study 2. In one of the group interview one participant commented:

*“What I have learned from working with my fellow students is that when we work together the possibility of making errors is minimized because immediately we return from field work we spend some time to brainstorm and make corrections on what has*



*been done by every of the group member...even if different works have been done separately by individual students there is always a way of comparing what we have done so as to crosscheck and merge different activities.” [Case study Group 1]*

Students were asked to state what motivated them to share information among group members in and out of their groups, one student retorted that they were required to share information because some of the tasks required them to divide themselves in groups. Another student observed that:

*“We have been working on different activities since we started our field works including collecting data on distribution and availability of different small mammals, birds and invertebrates...to save time we divide ourselves and start collecting data by observing and recording... the process of compiling data and preparing final report will be done as a groups.” [Case study 3, Group 1]*

Division of activities in groups and the need to coordinate and get feedback on what has been accomplished by each group member is one of the reasons why students share information. In other situations, the need for sharing information emerged due to differences among students in terms of their practical experiences, level of understanding and even perceptions towards work and work situations. In Case study 1 some students during interviews acknowledged that they were learning from experienced in-service students who had certificates and diplomas in forestry. There are benefits of having experienced students in the group:

*“In our team there are students who are more experienced as they have been working in the government for many years. Even if we have been studying together in class I feel proud to work with them because unlike me, they know lot of things that we are supposed to learn here in Arusha...” [Case study 1, Group 2]*

Information is shared based on differences in experience and knowledge particularly between students and field instructors and other experts. While interactions between students and other experienced individuals were intended to expose students to different information, there were

also incidences of information exchange. Experts and other informed individuals were able to interact with students, demonstrate and clarify different issues and respond to students questions.

Information sharing was also facilitated by physical closeness among students. Students who worked closely are motivated to share information whenever they encountered problems or new issues that needed clarifications or consultations. This was also confirmed by one of the student who remarked during the interview:

*“... it is easy to share information face to face because we know each other ...most of the time we are working together... we spent entirely all day in group...”* [ Case study 3, Group 1]

The findings revealed that information sharing did not end when students completed their group assignments. Students admitted during the interviews that they will continue sharing information even after the completion of the assignments. At this stage information sharing was viewed as sharing of information on what groups had achieved after being assessed by their supervisors. As one student explains:

*“We are expecting to get results after completing our field work. From the past field experience we always communicated among ourselves when the results were out... sometimes our professors directed students to go and read field reports of some of us who had scored higher marks...”* [Case study 1, Group 3]

The anticipated information sharing practices were also reported during the interview with architectural students. These students who showed interest in sharing information even after the end of their field work. One noted that:

*“We will be presenting our final report in the interim presentation session and then the results will come out based on what we have prepared and presented to the department.”*

*As a group we are anxious to know our group results but also the results from other groups...*” [Case study 2, Group, 2]

It is apparent that students’ information sharing practices occurred during group work in the field, with other group members and during formal field report presentation at the departmental level.

Students were also asked to identify benefits that they got or anticipated when they shared information among themselves or with other people. Students reported that information sharing enabled them to engage in collaborative construction of meanings and creation of locally and contextualized information needed in a group. Students also indicated that when they shared information they became aware of work situation, and progress of different tasks and activities. They also admitted that information sharing increased their awareness about work environment and problem encountered or anticipated. The study confirmed that sometimes information sharing was a way of warning or alerting someone about the potential risks. One of the students comment during the interview:

*“Sometimes you are occupied with work and forget that you are on the wildlife natural habitat, surrounded by risks that may include being attacked by dangerous creatures such as snakes, insects, animals and poisonous trees. When a group member is suspicious about potential risks or has seen something that looks dangerous he/she has to inform others to take precautions.”* [Case study 3, Group 3]

#### **5.8.4 Ways in which information is shared during collaboration**

Students used different ways to share information among them. The choice of a particular tool or channels to be used for sharing information was determined by factors such as: extent to which collaborators were closed or dispersed from one another, types of information that was shared and stages in which collaborative work had reached. Information sharing was mainly done through face to face interactions. This channel of sharing was also preferred because students worked together in the same work environments. Daily group briefings and informal

conversations during field work facilitated students sharing of information within their groups. Information sharing was also facilitated by weekly or bi-weekly meetings between students and field instructors. These meetings were scheduled especially for students to provide oral field progress reports and discuss with instructors the challenges that they encountered. Students were observed sharing information with other students from other groups. Other face to face ways of sharing information included site visits, consultation with individual informants and expert briefings.

Students also used technology to share information. In some situations students took photos, videos and even audio files when they consulted different individuals or observed various objectives. Information collected was in digital format, and influenced students' use of electronic means to share information including the use of emails and mobile phones.

### **5.9 Collaborative information evaluation**

The evaluation of information in group based assignments involved interactions among students, between students and field instructors and students with various sources of information. This study investigated students' evaluated information, with regard to value, relevancy and usefulness during collaborative assignments. The findings demonstrated that collaborative information evaluation is a process which is interwoven with other collaborative information behaviour processes. Findings from field observation revealed that students were engaged in evaluating information from the beginning of their group assignments to the last stage of preparing final reports. In this regard, the process of collaborative information evaluation was inseparable from other collaborative information activities such as: identifying and assessing information needs, collaborative information seeking and process.

Students' evaluated information at different learning task stages. Information evaluation was not a straight forward process as it included both individual and group evaluations. In situations where different tasks or activities were distributed among students, information evaluation involved two levels namely: a) individual information evaluation b) collaborative information evaluation. Individual group member evaluated information sought prior to group information

evaluation. Likewise when students sought information from other persons, they each had a role of listening and asking questions or requesting clarifications. The information that was collected by individual students was subjected to group evaluation. Students were sometimes co-located and worked as a team on a single activity or task. In this scenario, when Information was acquired collaboratively students assessed information in relation to the needs that gave rise to information seeking.

Students were also observed and interviewed with the intention of understanding how they evaluated information at different stages of their collaborative work. It was noted that group information evaluation is an important information behavioural activity which helped students to make judgments on the relevance, appropriateness and usefulness of information in relation to collaborative work and collaborative information behaviour. During collaboration, the nature and motives of evaluation seemed to vary from one stage to another. Three stages were identified namely initial stage, actual task implementation stage and final stage.

At the initial stage of collaborative process, students engaged more in activities that focused on understanding learning task objectives, identification of shared information needs and potential sources of information for completing the tasks. Students were involved in brainstorming sessions and they sometimes consulted their instructors. During these interactions students generated information which was related to the problem. The information generated or presented during brainstorming was evaluated in a group before it was subsequently used. The following interview extract demonstrates how students evaluated information during the initial stage of their collaborative work:

*“At the beginning it is very important for all of us to comprehend what we are supposed to achieve at the end of the projects... group tasks may not be clear so it is important for us to work together closely asking each other questions, clarifying what is said by group members so that we can be sure that what we are doing is correct... it is important to understand and respect each other’ views and opinions...”* [Case study 1, Group, 1]

During the initial stage of the collaborative work students were involved in assessing information obtained from other objects and textual sources; most of the information evaluated was from human sources. Some of the primary goals of evaluating information during the initial stage of collaborative task were to compare and verify views, and understand the perceptions of students towards the tasks that were ahead of them. It was through face to face interactions and discussions that students collectively generated information in the form of opinions, suggestions, arguments or contributions. This necessitated the information collected within a group to be evaluated. The participants stated:

*“We are working as a group but the fact is we have different experiences, perceptions and also different levels of understanding various things... For us to be able to work as a team we need to make sure that we understand what we do. Even though everyone has a chance to talk and contribute not everything that is said by team members will be included in our work... sometimes we need to agree what information is suitable and what is not... [Case study 2, Group 1]*

According to the respondents, information evaluation not only enabled group members to verify the suitability of information prior to use, but also provided the opportunity for group members to have a common understanding about the information collected. The same sentiment was expressed by one of the participants in Case study thus:

*“The fact that we are working together guided by similar objectives does not mean that every process that we are dealing with will be smooth. Sometimes we spend more time debating about a way forward to proceed. But we always find best ways to proceed by each group member listening to each other, assessing the ideas of every group member and considering each group member’s ideas as important to the completion of our assignments. [Case study 1, Group, 1]*

The collaborative tasks implementation stage was also associated with different information behavioural activities such as identification of information sources, information seeking and

acquisition and evaluation of information sources and its contents. Information evaluation process was intended to assess the value, usefulness and appropriateness of information from various sources including human and non-human. At the implementation stage, students evaluated both information sources and the content of information they acquired from the different sources including people as well as textual and non-textual sources of information.

The evaluation process seemed more challenging when students extracted information through observing or monitoring objects, natural features, living organism or manmade objects. Students compared information they found from nature with what existed in their knowledge base. They also related the information to the known information and existing standards in their respective disciplines.

In the final stage students compared information sources found with the collaborative task objectives and information needs which emanated from the objectives. Collaborative tasks objectives and corresponding information needs were important factors which influenced students' information evaluation process. This process was explicitly stated by one of the students during the interviews:

*“When you interview people, they usually prefer to talk over and over. It is up to us to listen and pick up important information which we think is valuable and useful in what we are doing. This is a demanding as it requires us to be more focused and sort out what people say in relation to what we need to get from them...”* [Case study 1, Group 4]

One student from case study 3 also described his experience:

*“We collect as many data through observations, taking measurements and also asking people questions. Data collected in the field are compiled together and decisions on what to include in our reports are made as a group after comparing what we have and what we were supposed to collect and analyse.”* [Case study 3, Group 2]

In the interview some participants provided other factors that influenced students' collaborative information evaluation process. These factors were related to personal characteristics of the students including students' knowledge of information sources, students' past field experiences and group perceptions of what constituted relevant and valuable information. This is further elaborated by one of the student during the interview session as captured below:

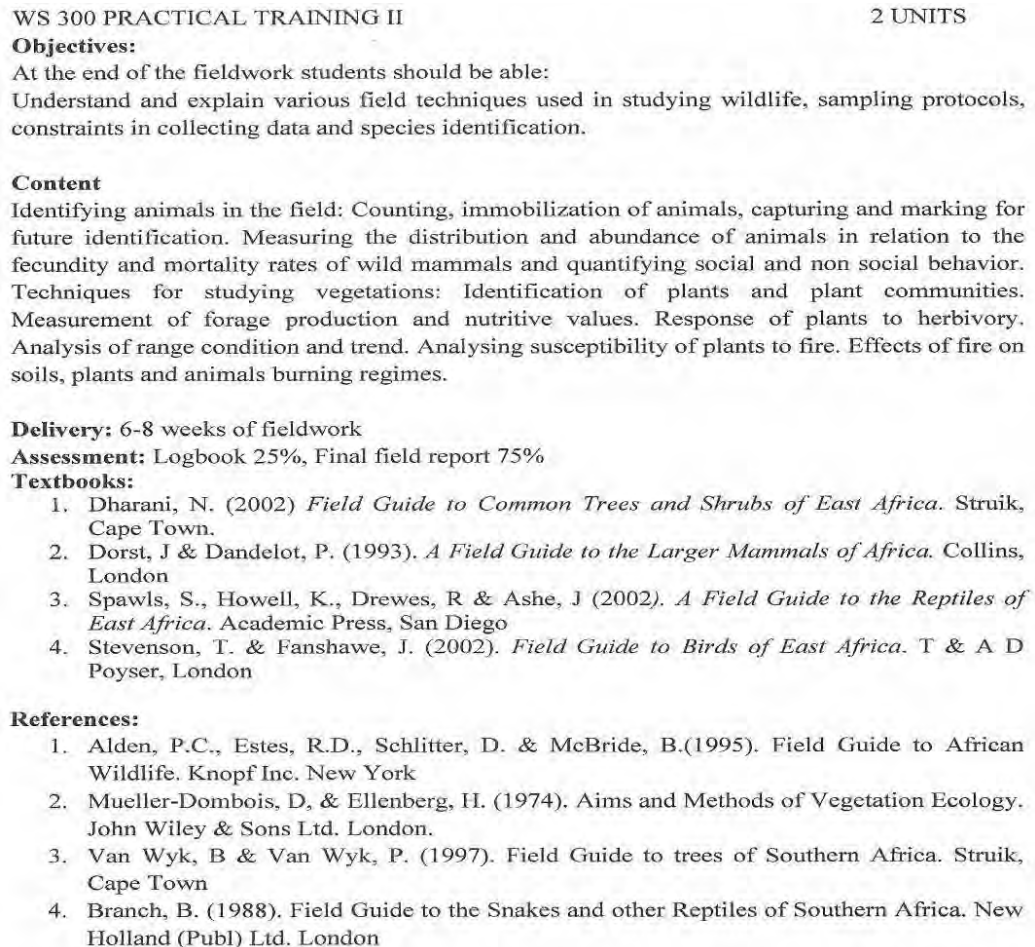
*“This is not our first time to work in the groups. We have been working together at the university and in the field as well. Some of us have also long working experiences as we have been working in government agencies and local government for many years. With this experience it becomes easy for us to know what is relevant and what is not relevant in our fields”* [Case study 1, Group 3]

It was observed that when students evaluated information they were not completely independent as they were subjected to the influence of persons outside their groups. While characteristics of information sources, work tasks objectives, work situation, discipline of study were the dominant criteria used by students to assess the value of information, the influence of supervisors, technical staff and other people in the evaluation process were also noted. Students received recommendations and suggestions on relevant information sources that they could potentially use during the fields. These recommendations were provided both orally and in form of writings including field manuals and list of recommended sources of information. Students used instructors' recommendations as the criteria for evaluating the value of information. The source recommended by field instructors was considered useful and relevant. The field instructors were knowledgeable; more experienced and they were in-charge of the students. The students noted that;

*“In this assignment our lecturers play significant roles by providing guidance on where to find information and what type of information we are supposed to find. They anticipate us to consult relevant information sources which they have indicated in the list of field guide together with information that we have collected in the field.”* [Case study 1, Group 2]



Figure 5.5 below shows an abridged students' field guide for case study 3. The guide shows recommended sources of information that students were supposed to use during the fieldwork.



**Figure 5.5: An abridged students' field guide for Case study 3. The guide contains a list of recommended sources of information**

Also during the interviews with faculties, the role of field instructors in the information evaluation process was noted. The following interview extract elaborates:

*“As a supervisor my main roles are to authenticate every document, submissions and contents of presentations in order to avoid any misunderstanding ... I had to visit the students in their field sometimes without informing them to provide some clarifications*

*encourage them to submit approval forms from respective respondents and through interim presentations track their progress.” [Case study 2, Individual interview 1]*

In such situation field instructors not only supervised students, but also worked as information verifiers during and after fieldwork as well.

### **5.10 Collaborative information use**

Information use, just like other information behavioural activities entails human interaction with source and content of information. Collaborative information use is not a separate process or a last stage in collaborative information behavioural process. This is a cross cutting process which takes place in different stages of students’ collaboration. The idea of information use in collaborative work assignments is a multi-layered phenomenon which includes various processes and practices in which students engage to solve collaborative information needs and accomplish collaborative learning tasks.

This study addressed aspects of information use in relation to three sub-themes; which are students’ perceptions of information use, dimensions of information use and types of information use by students during collaboration. While there are different conceptions of information use, aspects presented in this study exclude cognitive aspects of information use. Information use was viewed as the external processing of information rather than internal mental process of integrating information in human knowledge base. From the field observations the study found that information use by students can be understood within the context of collaborative learning tasks and work environments. This made students’ information use both goal-oriented and subject specific.

#### **5.10.1 Students’ conceptions of information use**

Understanding students’ perceptions of information use in the context of their tasks was essential because in collaborative learning assignments not all information uses are directly related to the information needs which initiated information seeking processes. There are different ways in

which students use information when working in groups. These include the use of information to solve a collaborative learning problem, the use of information to support collaborative logistics and decisions making. Information is also used for coordinating and communicative purposes such as informing others. Information use by students in collaborative assignments was not a standalone process within collaborative information behaviour but rather cross a cutting process.

In an attempt to understand what constituted collaborative information use from the perspective of students, the researcher sought not only types of information sources used, but also different conceptions that students had in relation to information use. This also required a researcher to understand what students were doing in relation to collaborative work assignments and collaborative information behaviour activities. Through observations and interviews different conceptions of information were identified. These conceptions included: information acquisition and process, sharing and discursive conception and information application conception. Figure 5.6 below presents different information behavioural processes that constitute information use in collaborative learning process.



**Figure 5.6: information use conceptions**

From the group interviews and field observation, it was revealed that students conceived information use to include physical processes, activities and practices that are related to

acquisition of both textual and non-textual information and processing of information. These also included acquisition and processing of other crude form of information such as data, opinions, and suggestions. Students seemed to relate information use to activities such as seeking information and data, searching and retrieving electronic information mainly from mobile digital information searching tools, accessing various sources of information and making interpretations of information acquired. The following verbatim extract from the interviews elaborates further:

*“There are different ways that we use information including reviewing and documenting information from various sources such as historical documents and also sketching designs of different objects and structures that appeared to be of interest to us. We also extract information from maps, books and even consulting people...”* [Case study 2, Group, 2]

From the above interview extract, different terms were used to explain the concept information use including extraction of information, consulting people, reviewing documents and sketching diagrams. Information use also meant activities such as understanding acquired information, and collectively synthesizing information.

Information use was also described by students as a process of discussing and sharing information. Two interrelated processes are included under this conception. First, information was used discursively during group discussions, brainstorming meetings and informal conversations. Students identified these events as observable indicators of collaborative information use. In discursive information use each student was considered as source of information to be used by other students within and outside their groups. Secondly, during interviews students also acknowledged that they considered information use as a process of sharing information among group members and outside their groups. The following extract explains this thinking:

*“When we work together we are benefiting from each other. Collaboration saves time as during collaboration we know... learning from each other, multiply knowledge...”* [Case study 3, Group 1]

This concept also views information use as a task based process in the sense that, it is related to social use of information, such as the use of information as a communicative tool or for coordinating different activities. The emphasis is the use of information to create awareness and shared understanding among collaborators. Students were using information as a tool for creating work related situation awareness, common understanding of nature of works. One respondent noted that:

*“I find it more effective to work in a team like this because it exposes me to new ideas coming from my fellow students... we also have opportunities to remind each other what we have learnt in class... This helps us to improve the quality and accuracy of our works.”*  
[Group interviews 2, Ardhi]

From the interview with forestry students of the Sokoine University of Agriculture, one of the respondents remarked;

*“Even though these assignments intend to enhance our understandings of what we had been taught in class, working in group is more rewarding as it involves group discussions which generate new knowledge... it also enhances cross pollination of ideas and knowledge, hence at the end of the day we achieve better results within a short period of time than one could have done it alone.”* [Group interview 4, SUA]

The same sentiment was expressed during the interview with one of the field instructors who noted that students’ collaborative learning tasks involve not only learning process but also collective creation of information and knowledge. He added:

*“I wanted the students to cooperate with each other which on the other positive side will help to fill the gap in their knowledge since different ideas and eyes perceive things differently...it is by working together in a learning project that students can share their understanding.”* [Case study 2, Individual interview 2]

Discursive information use was also evident during students’ consultation with individuals such as field instructors, professional and experts in the discipline and other informed parties. Students consultations with different experts not only provided opportunities for collecting information, but also for engaging in discursive use of information through asking questions, seeking clarifications and taking notes.

Information use was also conceived as application and reproduction of information. It is directly related to the objectives and goals of students learning tasks. Information use as the application and reproduction of knowledge was noted to be the most dominant conception of information used among students. The dominance of information use conception was goal oriented and is directly related to existing learning objectives, and information needs.

Students also admitted that they were involved in physical information use particularly prior to the commencement of actual field work and at the end of field assignments. In the following interview script student explained how physical documents in library were important especially in helping them to comply with requirement of the field reports:

*“The fact that we spend more time in the field talking to people and learning through observation does not prevent us from using books and other materials in our library. The library also has valuable source of information which we are planning to use during final stage of report writing. We have to visit the library so as to obtain information such as maps and also previous reports which I guess will guide us in writing reports.”* [Case study 2, Group 2]

Information was also used for knowledge reproduction purposes in the form of final reports. These included analysing, processing and documenting acquired information and enhancing their knowledge through learning. The use of information was related to future or anticipated use after completing the assignments. The findings also suggest that students anticipated using and reproducing information that they had acquired in the future. One of the respondents admitted:

*“This fieldwork exposed me to different information and practical knowledge that are important not only in my life as a student but also as a future forester ... I am very eager and I believe I will apply the knowledge that I have gained when I get employment. [Case study 1, Group 2]*

The above extract shows how students expected to apply both theoretical knowledge acquired in classes and practical information acquired in field in the work places.

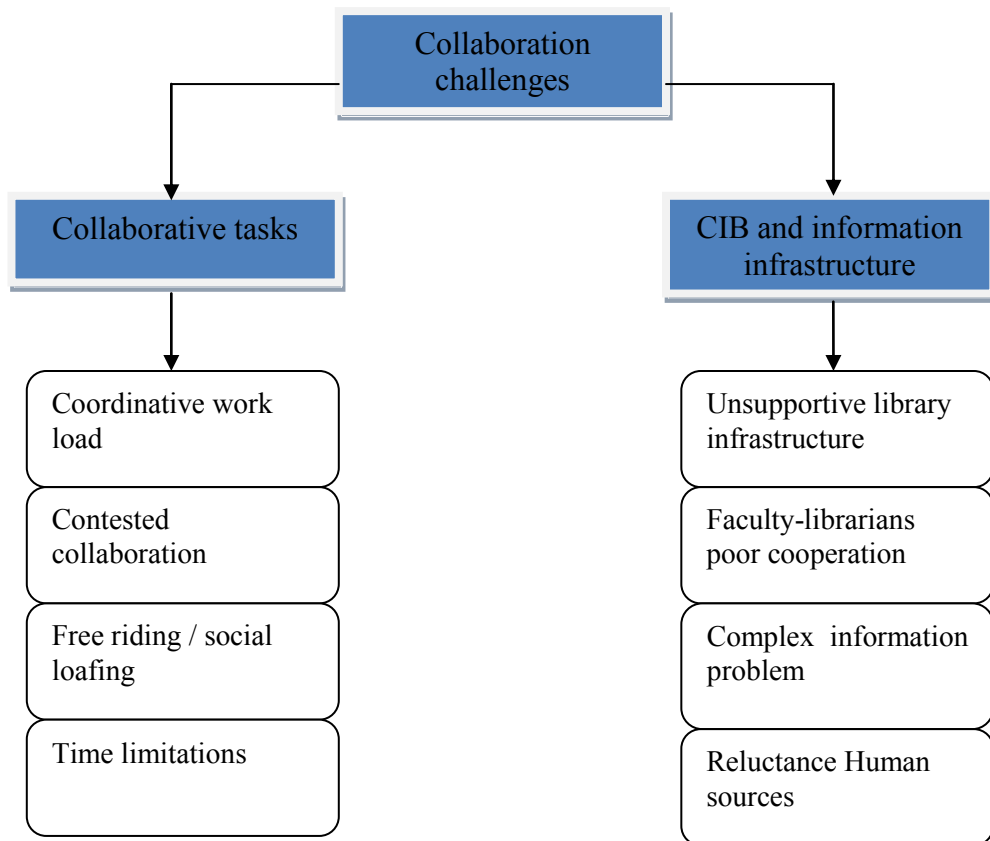
### **5.11 Collaborative challenges encountered by students**

It was noted from the interviews that collaboration was advantageous to students especially with regard to the information seeking, processing and use. Interviewees reported that collaboration in learning is more effective in terms of solving complex problems that individual students could not easily solve. When students worked together their potentials multiplied and they were likely to come up with inventive solutions in their learning assignments. Individual students were not able to do this within a short period of time. The following interview scripts taken from one of the interviews elaborate on the benefits of collaboration:

*“I prefer working in group because we can share what we know and come up with more innovative solutions to the problems that we encounter”...When we work in a group, each group member is supposed to contribute. This makes us dependent on each other for the completion of assignments” [Case study 1, Group, 2]*

From the verbatim extract above, it is apparent that from the students' perspective, collaboration in learning process encouraged sharing of knowledge and contributions from individual group members in the realization of task objectives.

Despite numerous benefits that collaboration brings to students, there were a number of challenges that students encountered during the field work. To understand what challenges students encountered when working in collaboration, researcher observed the relationship between information behaviour and collaboration. Figure 5.6 below outlines different challenges that students experienced in collaborative tasks. The role of information infrastructure in supporting collaboration noted. Explanation of each challenge is also provided.



**Figure 5.6: Collaboration challenges**



With regard to the nature of students learning assignments, it was obvious that students were working in collaborative assignments for which they required information to accomplish. Collaborative information behaviour is a sub-set of collaborating learning assignments. The challenges that students encountered were related to both collaborative information behavioural activities and collaborating learning assignments.

One of the challenges that students encountered was difficulties in coordinating different activities done by different groups. Coordination was an essential part of students' collaboration. In some occasions group members divided themselves into different tasks and later combined activities done by different individuals. Also, students worked in non-hierarchical form of collaboration in which no one assumed leadership roles. As result coordinative responsibility was left to every group member.

Information seeking and processing tasks were complex due to the complex nature of information needs and learning objectives. It was apparent from the observation and interviews that students' collaborative information seeking and processing were not straight forward processes. During information gathering process students performed different activities which sometimes involved the use of instruments for taking measurements. They also involved in counting, taking photos, monitoring and sketching. As a result, the information seeking process was tedious, time consuming and a complex undertaking. The following verbatim extract from students' group interview elaborates more:

*“Most of the time data collection process is tiresome, repetitive and time consuming. Last week we were involved in taking measurements of total volumes of all tree trunks...This involved cutting down trees, using instruments such as clinometers and tape measures to determine height of trees and calliper for measuring trees diameters at breast height... some of our group members were processing data using calculators and recording measurements. This is not the end because when we finished collecting data we were supposed to sit down as a team and start compiling and analysing data that we had collected.”* [Case study 1, Group 4]

As indicated in the extract above, students' collaborative information seeking is a non-linear process, which is shaped by types and characteristics of different activities within collaborative task. In relation to challenges it is obvious that students' information seeking process was cyclic, time consuming and requires coordination of results.

As part of information seeking, students were also obliged to collect information from people who had relevant information. Working with people proved to be challenging for the students. There was a lack of trust and social capital between information seekers and those who were supposed to provide information. One of the respondents commented that:

*“If you consult a person for information there is no assurance that you will get what you want...Even if we had a permit and letters of authorization some of the key informants refused to provide information fearing that they are being spied on.”* [Case study 2, Group, 2]

Similarly another respondent added:

*“...Sometimes you visit an open space which has been occupied by encroachers and when you ask for information which appeared to them to be personal they refuse to respond. It was easier to obtain information through observation than asking people particularly those who considered us as strangers.”* [Case study 2, Group, 2]

This study reported that students preferred to use people as the sources of information, as indicated by results presented in sub-section 5.4.1. It was also noted that students sought information from other individuals especially those who were not familiar to them. Lack of trust between students (information seekers) and informants was reported as a contributory factor to such a challenge.

The interviews with librarians revealed that the time which students were allocated to each tasks, and the time frame of students to accomplish their field work was a challenge. They were unable to make effective use of information sources available in the libraries. One librarian expressed this concern in the interview:

*“When students have prepared themselves for the field at the end of the year, they are also busy working on final examinations...most of the time when students are in the field they do not have time and access to use information from our library.”* [Case study 2, Individual interview 3]

From the librarians’ perspective, time is a contextual factor of students’ collaborative information behaviour, imposed challenges particularly on accessibility and use of information sources available in university libraries.

The study also identified some challenges that students encountered which were directly related to the students as collaborators. These challenges included unequal contributions by group members or “free riding behaviour” existence of contested collaboration due to differences in understanding and perceptions, and difficult in harmonizing group interests with individual interests. Through observations and interviews it was noted that some students deliberately decided not to participate or contribute fully to the accomplishments of tasks. It was further noted that the size of the groups influenced individual contributions. In the groups there was a higher possibility of having more people who contributed less in the accomplishment of group tasks. The following scripts taken from different students’ interview elaborate more:

*“There is a tendency for some of students not to contribute equally when we are working in groups especially when they see ‘yapo majembe yatakayofanya kazi’ [meaning that there are hard-working students in a group who can do all the works].”* [Case study 1, Group 1]

As indicated in the extract above, the free riding behaviour of some group members was common when different groups merged together and formed one large group or when there were some dominant members in a group.

Moreover, students also faced the challenge of how to deal with individuals in group who were naturally dominant. The focused group discussion highlighted that there were some group members who preferred to be dominant as they did not want other group members' views to be heard and included in the group discussion. This also prevented other group members from contributing to the group work as explained by one of the respondents below.

*“Among us there are members who all the time want to show that they know more than others...they prefer to raise complicated ideas...they also want to be dominant and not agree with other students' views and opinions.”* [Case study 1, Group 2]

Results from field observations and interviews also revealed that when group members' interests, perceptions and levels of understanding differed there was a possibility of opposition within the groups particularly when group members failed to resolve their differences. This was in some cases caused by the failure to have common understanding or the presence of a few group members who wanted their ideas to be final and conclusive without considering ideas from other members. One respondent noted:

*“I believe challenging each other is good but we have to be focused...what I don't like is sometimes we spend more time disputing instead of working.”* [Case study 1, Group 3]

As it is described by the respondent in the above extract, one of the main collaborative challenges encountered by students was: how to reach consensus in situation where group members did not share common understanding.

Lack of cooperation between librarians and faculties was also indentified as a challenge that indirectly affected students' participation in collaborative field assignments. Despite their

potentials as information intermediaries, academic librarians were not fully involved and utilized during students' field work. It was noted during the individual interviews with librarians that there is a feeling among librarians that faculties do not consider the important role played by librarians in information provision. In the interview with one of librarians it was noted that:

*Even if students' field work is part of their degree programs, the involvement of library and librarians is a problem...Cooperation between librarians and academicians is a challenge and librarians are not considered as part of students learning process. I think it's the right time now for the lecturers to establish communication with librarians and encourage students to make use of information sources available in the library to support their group field works. [Case study 3, Individual interview 3]*

The infrastructures of the university libraries were also identified by students as an obstacle for them to use information. Students also admitted that they faced difficulties when they wanted to use the libraries as groups. This happened while they are in field and in universities learning environment. Students observed that sometimes they preferred to have remote access to libraries information sources through their mobile digital gadgets especially when they wanted to prepare reports. Students explained during the interview:

*"I know there is lot of information in our library in Dar es Salaam. I sometimes want to make use of them but I can't because of distance..." [Case study 3, Group, 3]*

Another respondent added:

*"The role played by our library in assisting us when we are working in groups is limited. The services provided by the libraries are not designed specifically to provide assistance to students working in group and in different working locations like here we are now."*  
[Case study 1, Group 1]

As indicated in the above extract, lack of supportive information infrastructure which enable students to access wide range of information sources while they are away from the university. Lack of or supportive information infrastructure also inhibited access and use of information sources and services available in the academic libraries.

### **5.12 Applicability of Wilson's (1996) model of information behaviour to students' collaborative learning assignments**

The study assesses the extent to which Wilson's (1996) model of information behaviour was applicable to the context of students' collaborative learning assignments. Specifically this study compared the findings on students' collaborative information behaviour with the stages and process described in Wilson's (1996) general model of information behaviour with the intention of unveiling the extent to which the model is applicable in the group work setting.

Wilson's (1996) model of information behaviour has been used specifically in this study for testing its applicability in group context due to number of reasons. First, the model of information behaviour is generic and comprehensive, covering a wide range of information behavioural aspects including information needs, information seeking modes, information processing and information use. Second, in terms of its originality, development and evolution Wilson's (1996) model is not only built on the foundation of the predecessor, Wilson's (1981) model of information behaviour, but also relies on contributions from a wide range of empirical studies from social psychology studies, consumer behaviour, studies on health communication, information systems and decision making particularly in organization setting. The model is also based on empirical research from different studies and was considered suitable for studying collaborative learning.

The model has core information behavioural components that include information needs, information seeking behaviour, information processing and information use. In an attempt to examine the applicability of the model, the study examined how different collaborative information behaviour processes were related to the variables and mechanisms identified and described in Wilson's (1996) model of information behaviour. Wilson's incorporation of different theoretical constructs in his model was aimed at showing how different human

information behavioural processes are linked to theoretical ideas. This study also examined the different theoretical constructs suggested by Wilson with the intention of relating them to behavioural patterns revealed by students.

Generally, the findings of the study showed that despite its comprehensiveness, Wilson’s (1996) model of information behaviour was found partially appropriate in both understanding and describing students’ information behaviour in group context. The other section presents the applicability of Wilson’s (1996) model to specific findings in this study. Table 5.2 below summarizes some similarities and dissimilarities of Wilson’s (1996) model and the field results with the intentions of proposing a new model of students’ collaborative information behaviour. The presentation is based on six information behaviour components which are: information needs and activating mechanism, intervening variables, information seeking modes, information processing and information use.

**Table 5.2: Comparison of Wilson’s (1996) model of information behaviour with students’ collaborative information behaviour**

IB components	Wilson’s (1996) model	Field results	Applicability of Wilson’s model and implications for the proposed model of collaborative information behaviour
Information needs & Activating mechanisms	Person-in-context & Stressful situation	Group of users-in-context	Co-existence of shared and individual Information needs Stressful condition, common grounding and shared understanding
Intervening variables	Influence user’s decision to seek or not to seek information	Influence of intervening variables to students CIB is in	Intervening variables influence students during information seeking, processing and use

		different stages	
Information seeking modes	Active and passive modes	Active and passive modes Information avoidance	No passive attention in students' CIB Active / purposive information avoidance is part of students CIS Ongoing information seeking is a macro and micro process. Also occurred during processing and evaluation
Information processing and use	Information processing and use as a final stage and loopback to information needs	Information processing and use occur in all CIB stages	Information processing and use as a cross cutting and multistage processes in collaboration

**Source: Field data, 2014**

From the table above the findings indicated that in groups, students have both individual and group information needs and that decision to seek information is influenced by not only stressful situation but also the extent to which group members understand and agree on the nature of the information needed. With regard to the role of intervening variables, the findings indicated that their influences in shaping students collaborative information behaviour go beyond information seeking stage to include other collaborative behavioural processes such as collaborative information seeking, collaborative information processing, collaborative information use and sharing.

In table 5.1, the findings also indicated that students' collaborative information seeking behaviour is an ongoing process which includes not only active and passive information seeking but also deliberate and unintentional information avoidance. Passive attention or serendipitous information seeking mode does not constitute students collaborative information behaviour. Likewise, students' collaborative information processing and use was found to be cross cutting processes experienced in all stages of students' collaborative process. Detailed presentation of



findings on the applicability of Wilson's (1996) of information behaviour in students' collaborative assignments is presented on sub-sections 5.11.1 to 5.11.8 below.

### **5.12.1 Information needs and activating mechanisms**

Wilson's (1996) model is a human centred model as it focuses on the individual user in relation to information need(s). While human is the focus of the model, Wilson (1997) also asserts that information needs are derivation of human information behaviour. This conforms with information needs of students working in collaborative learning assignments. The findings of this study confirmed the conceptions that information needs are contextualized and situation related. Students' information needs relate to the context of academic learning and different work situations within group learning assignments. Students' information needs also relate to the objectives and goals of collaborative learning tasks, roles as well as physical environments in which students worked.

Students' information needs were diverse and ranged from individual information to shared information needs. Individual information needs were found to relate to physiological needs such as needs for information related to personal security while they were working, and information related to basic necessity such as living cost while they are in the field including food, accommodation and travel costs. Shared information needs were more cognitive and related to needs for learning and curiosity to acquire information to enhance practical knowledge.

However, the use of Wilson's (1996) model as the basis for understanding information needs in students' collaborative learning assignments has some limitations. Involvement of multiple users changes the concept *person-in-context* to *group of users-in-context*. This had implication to both characteristic of information needs and mechanisms which influenced students to seek or not to seek information. In the context of shared information needs, the decision to seek or not to seek information was not only influenced by stressful situation as suggested by Wilson (1997) but also by group members' and their characteristics. When students identified information and created shared understanding of information needs, they also locally generated information among themselves. The same locally generated information could be used as the basis for

making decisions whether to continue seeking information to satisfy the need or not. During the stage of identification and creation of common understanding of the problems, some information needs were either assimilated or resolved depending on information generated within a group.

### **5.12.2 Intervening variables and collaborative information behaviour**

Wilson's (1996) model hypothesizes that even if the need has been identified, information seeking is not a straightforward course of action; on the contrary, there are factors which either inhibit or foster individuals to engage in information seeking. Wilson's (1996) model identified sets of intervening variables which influenced users' decisions to seek or not seek information. Wilson's intervening variables can be used to compare different factors that influence students to seek information while working in groups. While Wilson (1997) considers the influence of these variables to be limited to the stage of information seeking, the study showed that these variables were applicable to other processes such as information processing, information use and information sharing.

### **5.12.3 Group members' characteristics**

Drawing mainly from studies of personality (social psychology), health communication literature, consumer research, and innovation studies, most of the intervening variables under personal characteristics were found to be closely related to individual information users rather than group users. While the concepts of cognitive dissonance and selective exposure were noted to influence students' information seeking process particularly choice of information sources, these processes were also influenced by other factors such as the influence of some group members, field instructors and other experts in the fields. Group's behaviour of avoiding information sources that were considered to contradict other people's interests or selecting information which not only met the needs but also impressed other people were observed.

Despite the fact that Wilson's (1996) model identified education and income as attributes of personal characteristics that influenced information seeking, in relation to students' information behaviour only education was observed to be an added advantage to students particularly on information acquisition and processing. Within individual characteristics, physiological,

emotional and cognitive characteristics were also found not applicable in group context. While these factors were drawn from studies of health information seeking behaviour, students' collaborative information seeking behaviour particularly the decision to seek information were not shaped by these variables. Although Wilson's (1996) emphasises influence of demographic factors such as age, sex and marital status on human information seeking decisions, as indicated on sub-sections 5.7.2 and 5.9 respectively it was found that group members experiences and knowledge were among the overriding factors that influenced students collaborative information behaviour particularly in evaluation and sharing of information.

Wilson's (1996) model of information behaviour identified two variables within economic factors which are direct economic cost of engaging in information seeking and value of time. The findings of this study as elaborated in sub-section 5.4.2 indicated time factor was responsible for influencing students' choice of information sources and information seeking modes where students due to limitations in time, preferred to use information sources which were convenient and available.

#### **5.12.4 Social/Interpersonal factors**

Collaboration is about patterns of relationships and more specifically how individuals relate to each other when working in groups. Different patterns of interpersonal and group relationships existed among students that included intra group relationships; inter group relationships and extra group relationships. The later was characterized by interactions between students and other individuals who were not students. The influence of social and interpersonal factors as described in Wilson's (1996) model were observed to shape the students decision to seek information and information sources preferences. Three variables within social and interpersonal relationship were found to relate to Wilson's (1996) descriptions. These are trust, authority and attitudes.

As indicated on sub-section 5.8.3, trust motivated information sharing among students. Similarly, lack of trust made it difficult for students to acquire information from others. The trust that existed among students not only contributed to effective collaboration, but also influenced students' information seeking behaviour. It was evident in the way they relied on themselves as

potential sources of information. Likewise, as it was elaborated under section 5.4.1, field instructors had authority and experiences which were the motivating factors for students to consult them as reliable sources of information.

The findings also show that, social factors such as students' attitudes to information gatekeepers in the government were an obstacle to information access and seeking. Students admitted that they preferred to consult people who were not only thought to be knowledgeable and informed but also accessible, reliable and available.

#### **5.12.5 Contextual factors**

The Wilson's (1996) model also identifies a set of environmental factors such as social cultural environmental, economic and political factors and geographical location as some of the variables that hamper or enhance information seeking activities. While these factors may be applicable in other contexts, in relation to this study, only few variables were observed to influence students' collaborative information seeking behaviour. Since students were working within particular time frames, the choice of information sources to be used in their assignments was also influenced by time limitation. Students preferred to seek information which was considered to be accessible and which did not require more time to access.

It was noted that the influence of culture on students' collaborative information behaviour was limited to group and inter group levels. There were few cultural variables which were found to influence students' information seeking behaviour. These included the sense of collectivism among group members and group norms. Collectivism which is an element of group culture was noted to influence students' information seeking behaviour. With regard to shared goals and objectives; students worked in collectivist culture, depended on each other in the process of seeking, processing and using information. This increased effective collaboration in terms of information sharing and common understandings. Also, established and implied norms and rules that governed students' patterns of working in groups influenced how they sought information and the sources they accessed and used. This created normative behaviour within which students were expected to behave.

Wilson (1997) stipulates that differences in geographical locations including rural-urban residency may be attributed to differences in information behaviour. The effect of geographical factors on the students' collaborative information behaviour was at the lower level of physical work location. Proximity among students and characteristics of physical work environments were the two variables which had influence on students information seeking, sharing and using behaviour. The physical closeness among students allowed them to rely on each other as sources of information. The characteristic of physical work environments also influenced types of information sources and objects used by students.

#### **5.12.6 Characteristics of information sources**

Wilson's (1996) model identified a number of intervening variables which are related to characteristics of information sources. These include accessibility, credibility of information and channel in which information is accessed. It is evident that in his model, Wilson (1996) is making reference to characteristics of information sources and not content of information. Students preferred information sources based on characteristics such as form of information sources, accessibility and trustworthiness. Interpersonal sources of information were preferred by students because students not only acquired information, but also they had opportunities to get advice, and suggestions by asking questions and clarifications from human sources of information.

#### **5.12.7 Activating mechanisms**

The Wilson's (1996) model also suggests that even when intervening variables that could hamper decision to seek information are overcome; there are activating mechanisms that determine users' success in meeting information needs. These mechanisms relate to two theoretical constructs namely risk reward theory and self-efficacy which are part of social learning theory. In relation to the findings, three types of risks described in the risk reward theory were found to influence students' behaviour. These are work situation risks such as security related risks, time mismanagement risks and risk of underperforming collaborative tasks.

In relation to reward, students identified a number of rewards which were motivating factors for information seeking. These included prospects for scoring high marks. Self-efficacy construct was also noted to influence students desire to seek and acquire practical related information and knowledge needed not only to accomplish collaborative assignments but also needed in the work places. The concepts of need for performance accomplishments, and learning from others were noted to be common practices which enhanced students' self- efficacy.

#### **5.12.8 Information seeking modes**

The findings of the study on students' collaborative information seeking behaviour were partly confirmed with the modes identified in Wilson's (1996) model of information behaviour. Students' collaborative information seeking modes included active and passive information seeking. Unlike modes of information seeking suggested by Wilson and Walsh (1996), students' information seeking modes included not only active collaborative information seeking, collaborative search, information encountering and ongoing information seeking, but also information avoidance. The findings also did not confirm the existence of passive attention seeking mode among students. The findings further confirmed that the relationship between these information seeking modes and other collaborative activities were not linear. For example, when students evaluated and processed information, they were concurrently engaging in ongoing search by addressing new gaps, collaboratively scrutinizing and consulting with the aim of making clarifications.

#### **5.12.9 Information processing and use**

Wilson's (1996) model includes information processing and use as the final stages in the human information behaviour processes. According to Wilson (1997), this stage involves human's effort to incorporate into individual's framework of knowledge, belief and value. The minimalist view of the concept of information use suggested in the model is not related to how students used information in group assignments in this study. Unlike Wilson's (1997) views that information use is the process in which information is incorporated in one's *knowledge* base to solve problems which prompted needs for information, the pattern in which information is used by

students suggest a rather broader view of information use. As the findings of this study revealed in, sub-section 5.10, students collaborative information use is inseparable and cross cutting process. Information use was observed to be a multi-layered process where students used information during information acquisition and process stage. This process happened when they shared and discuss among themselves and when they applied information it to solve problems.

Wilson and Walsh (1996) suggested that information processing may include process such as repetitive exposure, vicarious experience and imitation of others. In relation to information processing, three aspects were found to reflect students' information processing behaviour. These processes are group reasoning, selectivity and decision making and time factors. While group reasoning was the dominant form of information processing, selectivity and decision making were also parts of information processing. The fact that students were working within specified time frame, their engagement on information process was also characterized by time pressure.

### **5.13 Chapter summary**

This chapter presented the findings on study of students' collaborative information behaviour. Generally the findings showed that students' collaborative information behaviour is highly contextualized and relates to the characteristics of their collaborative learning assignments and social and physical environments in which the assignments are carried out. Regarding information needs the findings revealed that students' information needs were numerous and ranged from individual to shared information needs. Face to face interactions and observations of nature and human-made objects were the most preferred channels of information sharing used by students. The use of Internet and library as information channels were limited and related to specific types of information. In terms of information sources the study found that there was heavy reliance on human as source of information and other non-textual sources of information such as objects, images and living organisms.

Students' collaborative information seeking behaviour was observed to take three different paths which are information seeking by recommendations, information seeking through observations

and discursive collaborative information seeking. In relation to intent for seeking or not seeking information, the study found that information seeking behaviour of students was characterized by passive and active information pattern. There were four modes of information seeking. They include: collaborative information seeking, collaborative information searching, ongoing information seeking and information encountering.

Information sharing practice is an integral part of students' collaboration and collaborative information behaviour. Sharing of information was observed to be a cross cutting process as well as a sub-set of students collaborative information behaviour. Like information sharing, information evaluation process was also found to be a cross cutting process. The method students used to evaluate information and the purpose of evaluating information varied from one stage to another during collaboration.

This study also examined the applicability of Wilson's (1996) model of information behaviour in students' collaborative learning tasks. Generally the findings of the study have shown that despite its comprehensiveness and wider applicability in other field of studies, Wilson's (1996) model of information behaviour is partially appropriate in describing and understanding students' information behaviour in group context. In the following chapter detailed discussions of research findings is provided.



## CHAPTER SIX: DISCUSSIONS AND INTERPRETATIONS OF RESEARCH FINDINGS

*“The measure of greatness in a scientific idea is the extent to which it stimulates thought and opens up new lines of research”* (Paul Dirac, The pontifical academy of science, 1968)

### 6.1 Introduction

In this study, collaborative information behaviour of undergraduate students working in group learning assignments was studied. This study is guided by the following specific research questions:

- What are the information needs of undergraduates working in collaborative learning assignments?
- What sources of information do undergraduates use when seeking information to accomplish group learning assignments?
- What factors shape information behaviour of undergraduates working in collaborative learning tasks?
- How do undergraduates share information when engaging in collaborative learning tasks?
- How do undergraduates evaluate information during collaborative information seeking and use?
- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?
- To what extent is Wilson’s (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

This chapter discusses and interprets research findings in the light of research questions presented in chapter one and relevant literature reviewed in chapter three. The findings are also discussed and interpreted in relation to the related models and theories of human information behaviour discussed in chapter two and more specifically Jaeger and Burnett’s (2010) theory of information worlds which underpins this study.

The chapter is structured based on the following sub-themes: Students' information needs in the context of collaborative learning assignments, sources and channels of information acquisition used by students, collaborative information seeking behaviour and factors influencing students' collaborative information behaviour and students' information sharing and non-information sharing behaviour. Other themes discussed in the chapter are motives for information sharing, mechanisms and channels used to share information, collaborative information evaluation, challenges encountered by students during collaborative learning and collaborative information use behaviour. The chapter concludes by proposing and discussing a new model of students' collaborative information behaviour. In addition a recap of major issues discussed in the chapter is provided.

## **6.2 Students' information needs in the context of collaborative learning assignments**

The discussion on information need is based on students' information needs in the context of collaborative learning along with the situations and circumstances that gave rise to information needs. A link between antecedents and triggers of information needs on one hand and characteristics and types of information needs on the other hand has been established. The findings presented in section 5.3 have indicated that students' domains of study, objectives of collaborative group assignments, collaborative learning environment and task situation are the key variables that determined occurrence and characteristics of information needs. These variables are also important frame of reference in understanding what triggered information needs and variations of types of information needs within three case studies.

It has been noted in the study that despite having shared objectives and information needs, students within groups had unique individual information needs. Coexistence of individual information needs alongside shared information needs may be explained by factors such as individual's curiosity to gather information beyond what is required in a group and the need for information to support physiological needs that are not directly related to core collaborative learning activities. Personal inquisitiveness of an individual in a group creates unique individual information needs. These needs do not directly relate to information needs of a group.

The results presented in section 5.3, reveal that students' information needs include needs for information to accomplish core learning task objectives, need for information to coordinate collaborative tasks and verify or confirm what is already known by students. Working in new learning environments and situations was one among the factors that created need for information that can be used by students to acquaint themselves with work environments. Collaborative learning tasks were designed in such a way that students were required not only to understand task objectives and requirements but also associate tasks objectives and requirements with information needed to accomplish different collaborative tasks. In such blended learning approach, information is not only needed as an ultimate goal, but also as a resource used to support different collaborative learning activities. Characteristics of students' information need can be understood in relation to role of information in collaborative learning.

The results have also indicated that students have a wide range of information needs due to working in different learning environments with multiple tasks and multiple learning objectives. In each collaborative learning stage including task initiation, task performance and tasks completion students experienced different types of information needs. Byström and Järvelin (1995) categorize information needs into three groups namely problem information need, domain information need and problem solving information with each type of information need being dominant on specific task stage. Such categorization is in contrast with the findings of this study as different type of information needs overlap across different learning task stages. For example this study established that domain information needs may exist experienced during tasks initiation, tasks performance and task completion.

With regards to domain-specific information needs it is apparent that students' collaborative information needs partly emanate from lack of domain practical knowledge and experiences. This created a need for information to address practical knowledge gap. Such students' knowledge gaps are not similar across all case studies due to disciplinary differences. This is one of the reasons for having different domain specific information needs among students in three case studies. Like in the works of previous researchers (Ingwersen and Järvelin, 2005, Hansen, 2011 and Cole, 2011), this study confirmed that students information needs are partly triggered

by knowledge discontinuity, in this regard discontinuity between theoretical knowledge and practical knowledge. The findings for example showed that desire to enhance group and individual understanding on what has been taught in classes with what actually exist in the real world triggered learning based information needs which are purely cognitive and domain specific information needs.

According to the social constructionists (Allen, 1997 and Niedźwiedzka, 2003) people who are in similar work situation and work environment are more likely to experience similar information needs. Such view is in compliance with the findings of this study particularly on how collaborative learning environments and tasks situations triggered and shaped students' information needs. Albeit, other antecedents of information needs such as task objectives and task requirements were largely found to determine occurrence and characteristics of information needs, being in a different learning environment also triggered the need for information to understand the dynamics of new work environment and situations. This observation is also noted by Niedźwiedzka, (2003) who found that information users may have different information needs following changing of environment and roles. This shows that in some circumstance students information needs were more or less reactive to learning environment and situation rather than proactive.

According to the model of information needs developed by Cole (2011), user's information need is described as a stable phenomenon which cannot evolve or change. Such argument put forward by Cole (2011) does not reflect the results of this study. The results suggest that existence of multiple sub-tasks and objectives within a single learning task creates not only multiple information needs but also make information needs to dynamic. The dynamic nature of information needs is also attributed by the fact that students experienced changing learning environment and situations which was characterized by among other things constant interactions with different sources of information including human sources. Constant interactions with information sources including humans made students to change their perceptions about information needs. The physical learning environment in which students were part of was also unpredictable. For example individual and group information needs for self-protection while in

the field may drastically change as a result of a new threat in the environment. In this context information need evolves as the way of individual or group adapting to changes within the learning environment. In relation to the findings of this study Botha and Bergenholtz (2013) identified potential factors that may attribute changes of information need over time. These factors include user's information needs may change due to multiple factors including in the physical environment, changes in the situation which created information needs, changes within users and changes in interpretations of information needs.

Students were involved in group communication and interactions which were accompanied by verbal and non-verbal conversations, exposed students to new ideas, information and opinions. These dynamics affect students' perceptions and understanding of what constitute task requirements and eventually information needs. Such dialogistic and discursive interactions which characterized students' collaborative information behaviour and collaborative learning in general made information needs to be dynamic. The results are in line with social constructionist views where information need is described as a dynamic phenomenon which is socially constructed as human beings interact to each other, exposed to and share new information or ideas with others (Campbell; 1995, Allen, 1997; Timminis, 2006; Zhou and Stahl, 2007; Hertzum, 2010; Hansen, 2011, Poltrock; 2013 and Takazawa and Twindale, 2013). For example, it is generally established by Campbell (1995), Lundh (2010), Takazawa and Twindale (2013) and Savolainen (2006) that information needs may change with time as the results of users exposed to or encountering by new information or when users engaged in dialogue.

Though some previous studies have noted that existence of shared information needs as the prerequisite for people to collaborate (Poltrock *et al.*, 2003, Shah, 2010a, Paul, 2010), this was found to be not the case. Having common information needs is a not a factor that initiated collaboration, but one of the preconditions for successful and effective collaboration. Shared objective and information needs facilitated group cohesion and bound together group members towards the realization of desired learning goals. Within the same vein Lin, Eisenberg and Marino (2010) and Rieh, *et al.*, (2013) noted that collaborative information activities may not necessarily be initiated by existence of shared needs.

Students information needs identification was observed to be a complex process that required students to get involved not only in understanding and translating collaborative tasks objectives into information needs, but also constructing and reconstructing group understanding. Information needs assessment can be viewed as collaborative undertaking in which different collaborative processes are involved including information sharing and assimilating some individual information needs into group information needs. Group members' traits such as past work and learning experiences and individual perceptions of task requirements influenced group construction of shared understanding and identification of information needs.

Generally, discussions on information needs have highlighted issues that are important in understanding information needs of students in the context of learning tasks. The discussions have contributed to our understanding on how collaborative task objectives, users' domains of study and collaborative learning environment can be used as frames of reference in understanding the emergence and characteristics of information needs. Information need triggers other collaborative information behavioural activities, in most cases; acquisition of new information may prompt a new information need.

### **6.3 Sources and channels of information acquisition used by students**

Part of the discussion on sources and channels of information acquisition used by students is covered under section 6.6 and 6.9 respectively of this chapter. This current section focuses on sources and channels of information most preferred by students during collaborative learning process and the determinant factors influencing students' information sources and channels selection. The section does not focus on actual use of information. This area was addressed in section 6.9 of this chapter.

According to the theory of information worlds (Jaeger and Burnett, 2010), human information behaviour is influenced by multiple forces external and internal, of users immediate information world. Generally, the findings have also revealed that there were multiple factors which influence students' behaviour towards information sources preference and selection. The

findings revealed that students prefer different information sources. These sources ranged from human sources of information to printed and electronic information sources.

Despite wide range of information sources accessed by students, they preferred human sources of information and systematic observation of living and non-living objects within the natural environments. Students observed and extracted information from objects such as manmade structures, living and non-living organisms. The term natural environment as the source of information has been used broadly to include physical environment, together with the living and non-living objects available within the environment. Task requirement was among the reasons that influenced students' reliance on information objects. Few studies have researched the importance of natural environment as the source of information (Smith, 2010). The findings on the use of the natural environment as the source of information are reported in this study. It has attempted to address the paucity of empirical evidence on the use of natural environment as the source of information particularly in collaborative learning.

It was evident that besides living and non-living objects, students heavily relied on human beings as one of the main sources of information. Students' reliance on each other as sources of information was attributed to factors such as, sharing similar field of study, having common learning objectives and sense of trust that existed among group members. Students' preference for subject experts including field instructors and other informed individuals can be attributed to factors such as trust. Subject experts were trusted specifically because they were believed to be knowledgeable, authoritative, reliable and experienced individuals in their fields. Previous studies have also indicated that trust is one of the attributes that motivates people to use other people as sources of information (Hertzum, 2000, Hertzum, 2010 and Hertzum, Andersen, Andersen and Hansen, 2002). Generally human sources of information were also considered to be accessible, easy and readily available especially when social ties and trust had been established.

Earlier studies have emphasized on some challenges that users may encounter when choosing people as sources of information (Johnson, 2004), the findings of this study have highlighted the

importance of human sources of information especially in a group based information task where human interaction is inevitable. When students seek information from different human sources, there is an added advantage, as they also seek clarifications, opinions and recommendations and sometimes they are engaged in discussions which contribute more to their understanding. One to one dialogues between students and other human sources of information helped to enhance students' understanding about the nature of information sought.

This observation is supported by number of previous empirical works (Saleh and Large, 2011; Saleh 2012; Smith, 2010; Meyers, Fisher and Marcoux, 2009; Zhou and Stahl 2007; Reddy, 2003; Poltrock, *et al.*, 2003; Hertzum, Andersen, Andersen and Hansen, 2002 and Hertzum, 2000). These studies have identified a number of benefits that people get when seeking information from other human beings. These reasons include information that from people is easy to access and understand (Smith, 2010), Humans are best sources of information when users seek practical experience (Hertzum, 2000) and human sources of information are considered to be reliability (Meyers, Fisher and Marcoux, 2009).

Other determinant factors for information sources selection are related to nature of collaborative tasks, particularly task objectives, task requirements and tasks stages. A complete task completion cycle involved three stages which are task initiation, tasks performance and task completion. In addition to tasks stages, there were multiple activities within each task which create the need to consult multiple information sources. It is evident from this observation, that the dominance of some sources of information on specific task stages was not only based on students' preferences of information sources, but also what students were suppose to accomplish.

The term channel of information has been used to include ways and mechanisms in which students communicate, acquire, transfer and share information in different forms. The findings presented in section 5.4 indicated that students preferred to use interpersonal channels of information acquisition with limited use of technological based channels of information. Different forms of face to face information channels were used including informal conversation, formal meetings, site visits, expert consultations and group discussions.



The dominance of interpersonal channel of information acquisition can partly be interpreted using time and space dimension used by Ellis, Gibbs, and Rein, (1991), Spence, (2005) and Shah (2010a). In time and space dimension, collaboration can be synchronous or asynchronous, co-located or remote. Students spent time in synchronous and co-located collaboration which facilitated the use of face to face channel of information acquisition. Also, proximity between students and other agents such as instructors and experts made students more receptive to face to face channel of information acquisition. The use of technology to support information acquisition was rare. This is partly associated with situation where collaborators were either remotely located or sought information in electronic format.

The field observation and interviews (see 5.4.1), revealed that students' learning environments were mostly populated by human and non electronic information sources. Such characteristic of information sources found within collaborative learning environment was attributed to over dependence on use of face to face and oral channel of information acquisition. Likewise, the way collaborative learning assignments were designed encouraged students' self-learning with minimum supervision from field instructors. This learning approach allowed students to take ownership of learning the process which enhanced students' interactions with interpersonal communication, a dominant channel of information acquisition. The same learning pedagogical approach restricted students from using technological based channels of communications.

#### **6.4 Factors influencing students' collaborative information behaviour**

The findings on factors that influence students' collaborative information behaviour are discussed in relation to types and forms of collaboration, collaborative tasks objectives and requirements. The discussion in this section is also based on two sets of variables which are students' collaborative learning environment and influences of external environment.

#### **6.4.1 Forms of collaboration, collaborative task objectives and requirements**

Different dimensions of collaboration can be used to support the discussion on the influence of forms of collaboration on students' collaborative information behaviour. Students worked in different forms of collaboration including explicit collaboration, peer to peer or symmetrical collaboration, interventionist collaboration and credit based collaboration. These categorizations are based on intent of collaboration, non-hierarchical relationships among collaborators, group forming process which is random and mode of group work assessments respectively.

Working in multiple forms of collaboration impacted students' collaborative information behaviour differently. In explicit and symmetrical collaboration students had common goals which determined course of actions toward task accomplishment and how each group member involved in different information behavioural related tasks. In relation to information sharing, working in explicit collaboration created a moral obligation and a sense of responsibility among group members to shared information. Such explicit information sharing behaviour which is motivated by shared goal was also noted by Capra, Valasco-Martin and Sams, (2010). Similarly their involvement in credit based and symmetrical collaboration, where assessments were done on group basis, was a motivating factor for intra group information sharing and a deterrent to inter group information sharing practices. Group based evaluation creates a sense of group identity and inter group competitions which promote information sharing within groups and restrict group members from different groups to share information.

In this study it has been noted that learning tasks have considerable influence on students' collaborative information behaviour, including emergence of information needs, modes and patterns of information seeking, as well as information sharing and use behaviour. Similarly, learning tasks and stages determined how students select, access, share and use information. Inclusion of learning task as a contextual aspect of information behaviour studies is not a new phenomenon. Previous studies have indicated that in a learning process, information behaviour mirrors learning objectives and associated tasks (Ford, 2004). Studies have also indicated that learning based tasks greatly influence users' information behaviour (Saleh, 2012, Saleh and Large, 2011 and Poteri, 2007). Poteri, (2007), Saleh and Large, (2011) and Saleh (2012) for

example found that divisions of labour and tasks stages are the factors that shape information behaviour of students working in groups learning projects. Other studies outside the academic domain have also indicated that, task based information behaviour is shaped by characteristics of tasks including task objective and requirements and tasks complexities and changes of task stages (Byström and Järvelin, 1995, Poteri, 2007 and Hansen, 2010).

Information seeking, sharing and use behavioural patterns relate to task stages of task initiation, tasks performance and tasks completion stages. There is a correspondence between learning tasks stages and information behaviour. This includes information seeking pattern and modes, intensity of information sharing and information use (see results presented in 5.4.2). The reason for such relationship between information behaviour and task stages is that each task stage has unique requirements with distinctive procedures. These learning tasks requirements enabled students not only to access and seek information in different ways but also to evaluate, share and use such information in a different way.

While students accessed and used different information sources, the intensity and preferences in using particular sources of information varied across different stages. At the initial stage, students heavily relied on human sources of information with little use of printed information sources. Observation and extraction of information from the natural environments and use of human sources of information was dominant information behaviour during task performance stage. The final stage which involved field report writing was characterized by use of people and printed sources of information. Such information access and use patterns were conditioned not merely by students' preferences but also by specific learning task requirements. The relationships between learning tasks and collaborative information behaviour depicted in this study have been also noted by Byström and Järvelin (1995) who explained that tasks and multiplicity of information need required users to access different information sources. Likewise, it has been observed in this study that having multiple tasks and activities implied that students experienced frequent changes of work situations. Such changes led to evolving of information needs, students employing different information seeking modes and patterns and use of different sources of information.

The findings have also indicated that students' information seeking behaviour regularly shifted from individual information seeking to collaborative information seeking. While such shift was associated with division of tasks among group members, there were also other possible explanations; including the use of mobile information searching tools which did not support collaborative searching. Users were obliged to search information individually and then share search results with other group members. In the same way, differences in group members' inquisitiveness and intrinsic desire to know more, beyond learning task objectives, encouraged group members to seek information to satisfy their personal cognitive information needs. Existence of solitary information seeking practices during collaboration has implication for collaborative workload. On several occasions students were required to share, evaluate and synthesize information gathered from different individuals before using information as a group.

The nature of collaborative learning assignments required students to engage in multiple task and activities concurrently. This is one of the factors which contributed to students' information behaviour as to be non-linear. For example, based on observation on modes and patterns of information seeking behaviour (see results in 5.6), it is apparent that collaborative information seeking patterns and collaborative information seeking modes were found to be super imposed. While students were seeking information through observation of natural environments, they also were involved in different information modes such as active information seeking, accidental information acquisition and information avoidance. Seeking information through observation of nature characterised with other information behavioural activities such as evaluating, making sense and sharing information. Students' information avoidance behaviour does not only relate to information misbelieving as suggested by Goldbold (2006) but also on active avoidance due to time factors, and fear that information may contradict other people knowledge base.

#### **6.4.2 Factors related to collaborative learning environment**

There are several factors that influence students' collaborative information behaviour. These have been identified in previous chapter (see results in 5.6). They include characteristic of group members, group social norms and shared values. Other factors include time factor, students' domain of study and characteristics of information sources including people within and outside

students' immediate physical learning environment. With regards to characteristics of group members, it is evident that despite working in similar tasks and belonging to similar field of study, students were not completely homogenous. Differences in perceptions and practical experiences among group members created differences in understanding and translating tasks objectives into information needs.

Formal and informal group norms and rules were important factors in determining students' information behaviour. Students were working in time scheduled and goal oriented tasks with predetermined mode of evaluation and deliverables. These are norms which defined how students collaborated at the group level and how their performance and deliverables will be assessed. Ultimately, these norms and rules influenced not only students' performance but also their collaborative information behaviour. According to the theory of information worlds (Jaeger and Burnett, 2010, Burnett and Jaeger, 2011) social norms provide members of a small group with common understanding and shape individual's behaviour. Common understanding was an important aspect of students' collaborative information behaviour. Existence and adherence to shared norms facilitated creation of common understanding among group members.

Few studies have incorporated and discussed the role of time as a contextual factor that influences information behaviour (Suzuki, Hashimoto and Ishii, 1997; Reddy, 2003; Ford, 2004; Melnyk, 2009; Botha and Bergenholtz, 2013 and Zhang 2014). It is also submitted in this study that time as a social factor has a role to play in shaping students collaborative information behaviour (see results in 5.6). Two aspects of time, which are progression or passage of time and time as a limitation factors are noted and used in this discussion as the frames of reference. Time as passage or temporal phenomenon had considerable impact on students' information behaviour. The findings have revealed that in many occasions the relevance of information may change when students progress from one learning stage or one activity to another (see results in 5.7.2). In the study of learning related information behaviour, Ford (2004) posited that in learning practice, the same piece of information may be valued and perceived differently as the learning process progress from one stage to another. In collaborative learning tasks, such

progressive change of information value may be attributed by group members' dialogue and interactions between group members and other agents.

The findings revealed that information behavioural practices such as decision to share information or to avoid particular information were partly determined by time. Students admitted that they used some information which they had avoided while they were in the field (see results in 5.6). Influence of time on students' behaviour was also a result of changing students' perceptions on different aspects of tasks and behavioural processes over certain period of time. Deadlines and time limits assigned to each tasks created situations in which students had limited time to accomplish specific activities. As a result, students avoided information which was perceived to be difficult to access.

Previous studies have indicated that information behaviour of individuals vary across disciplines of study (Sheeja, 2010). The findings in the current study revealed that a domain of study was one of the determinant factors of information sources preferences, differences in information value perception and information use. For example while observation of buildings and architectural designs was one of the dominant practices among students of Case study 2, for Case study 3 observations of living organisms including animals and plants was one of the main method of information acquisition. While this can partly be linked to objectives of learning assignment, it is equally important to stress the influence of students' field of study in shaping their information behaviour. Each case study represents a different domain of study with some unique information sources identified, preferred and recognized by members of the discipline, including students and their instructors.

Students' collaborative information behaviour can best be understood from the perspective of both immediate students learning environment, external environment forces and influences external to students learning environment. While collaborative learning tasks were designed to enable students to engage on self regulated learning and expose students to wide range of information sources, it is apparent that students were not absolutely independent when making different decisions related to learning process. In some occasions, students avoided seeking or

using information simply because of fear that particular information would not impress field instructors or other experts who participated in the field evaluation process. When students made decisions to avoid or not to avoid information, they did so by considering whether information to be sought and used was desirable or undesirable not only to them, but also to other people. The findings of this study are not distinct from the findings of some of previous studies particularly studies on health information seeking behaviour (McClain and Buchman, 2011), communication and information science (Case, 2012; Melnyk; 2009; Yang and Kahlor, 2012). These studies showed that social norms and people close to users' social environment strongly influence the way users make decision on whether to seek information or to avoid information on climate change.

Characteristics of information sources found within and outside students learning environments also determined how students behaved in relation to information sources. Mode and patterns in which information was sought, evaluated, shared and used were largely determined by nature and characteristics of information. For example, when relevant information was in electronic format, information searching became a dominant mode. Likewise, it is the characteristics of information source which determined how information was shared among group members.

The discussion of factors influencing students' collaborative information behaviour has shown that leaning related information behaviour is a complex phenomenon which is shaped by multiple factors. The factors identified in previous studies have motivated individuals to collaborate in information related activities. These factors impact information behaviour of individuals in group they include characteristics of information needs (Reddy, Bernard and Spence, 2010), existence of common information needs (Spence, 2005 and Kubmann, Elbeshausen, Mandal, and Womser-Hacker, 2013) and nature of tasks requirements (Saleh and Large, 2011). Interpretation of the results have indicated that existence of complex information needs required students to consult multiple sources of information and use different channels of information acquisition. Having common information needs was also the driving force and motivational factor for students to engage on persistent information and knowledge sharing. On

the other hand, learning objectives and requirements created demand for information and eventually initiated other information behavioural practices.

### **6.5 Students' information sharing behaviour**

The findings of this study revealed that, information sharing behaviour was perceived as a set of collaborative activities in which individuals in a group deliberately or implicitly shared information in the different stages of tasks accomplishment. Information sharing behaviour includes activities which range from sharing of ideas, data, views, opinions, experiences to the higher level which includes sharing of information and knowledge. Such holistic view shows that information sharing is not a standalone process but a collaborative activity that is dominant in different stages of learning tasks. This observation is supported by different studies including Sass (1999), Talja (2002), Hansen (2011), Poteri (2007) and Shah (2010). Shah (2010) developed a set-based model of collaboration which provides four levels of collaboration namely communication, contribution, coordination and cooperation. Shah's (2010) model is important to the current study is that information sharing seems to be embedded within all four collaborative sub-processes.

The nature of collaborative learning activities allowed students to share a wide range of information including information about work requirements, information needs and sources of information needed. Other facets of information sharing include sharing of information about work situation, work progress and problems encountered. Information sharing practices are characterized not only by the sharing of information but also by the sharing of information during collaborative construction and interpretation of meanings. These are attached to different information objects and other forms of information.

Previous studies have described information sharing as a process in which individuals voluntarily decide to share information with other people (Poteri, 2007 and Sunner, Cantiello, Cortelyou-Ward and Noblin, 2012). The findings of this study have indicated that information sharing is more than voluntary behaviour. It both involves voluntary and involuntary exchange, sharing, presentation and dissemination of information. Depending on different circumstances, sharing of



information may occur on different platforms such as: group discussions, brainstorming sessions, questions and answers sessions, report writing and formal presentations of field reports. Some forms of information sharing are considered to be involuntary because students were obliged to share information with others. Information sharing was part of collaborative learning tasks requirements. In such situation information sharing becomes normative and involuntary behaviour as it is motivated by explicit social norms that operate at the group level and college level which shape students' conducts during field study.

While students' information sharing behaviour existed entirely in all stages of collaborative learning, the intensity, patterns and types of information sharing varied considerably across task stages and activities. Such variations were attributed to tasks' requirements, which differed across task stages, patterns of tasks distributions among group members and characteristics of information sources shared. Different patterns of information sharing are discussed including intra-group, inter-group and hierarchical or directive information sharing.

Pre fieldwork preparation was characterized by intergroup and intra group information sharing practices where information was mostly shared verbally. The pre field preparation stage was also characterized by hierarchical information sharing where students shared information not only with their colleagues but also field instructors. During tasks initiation, performance and completion information sharing behaviour was mainly characterized by intra-group information sharing with minimal intergroup information sharing practices. The findings have indicated that students shared information even in the post field phase. One way in which students shared information even after completing their fieldworks is through preparation of final field reports and presentation of field reports to fellow students and faculty members in their respective departments.

Collaborative interactions among students within groups facilitated intra-group information sharing activities. It has been noted that during field work students rarely shared information with other students outside their groups. Different explanations can be advanced to support such behavioural pattern. Firstly, there was existence of temporary boundaries which differentiate one

group from another. Working in assignments in which students are assessed as a group inhibit information sharing across groups. Each group considered the other as competitors and withholding information is regarded as a competitive advantage. Secondly, restriction on information sharing across groups was also attributed to other factor such as working on assignments which have different objectives was the case in Case study 2.

The relationship between students and their field instructors was hierarchical. Students occupied a subordinate level. There were hierarchical relationships between students and field instructors or technical staff. This allowed information sharing to be characterized by giving, receiving and exchanging of information. Students became recipients of information in the form of instructions, directives, answers or clarifications. Similarly, lack of direct mutual benefits and shared learning goals between students and their superiors made directive information sharing process non reciprocal as students needed more information from their superiors than they were able to offer.

Existence of non-reciprocal information sharing practice is not a new phenomenon. Talja (2002) confirmed existence of non-reciprocal information sharing between junior and senior researchers in academic communities. Wittenbaum, Hollingshead and Batero, (2004) also noted that users information sharing behaviour is characterized by directive and participative information sharing. Despite such correspondence, the idea that directive information sharing is unidirectional as suggested by Talja (2002) and Poteri (2007) is in contrast with the findings of this study (see results in 5.8.3). For example, in situations where students asked questions or seek clarifications from their superiors and the superiors provide answers. The process is typical directive or instructional as it involves a two way exchange of information.

## **6.6 Students' motives for sharing and non-sharing information**

It was deemed necessary to discuss the factors that motivated students to share or not share information and ways in which information was shared. To get an insight into why students shared information, one has to view information sharing as part of group communication, coordination of learning activities and individual contribution towards tasks accomplishments.

Communication, together with collaborative interactions, creates enabling environments for students to share information. On the other hand, information sharing facilitates common understanding and creates situational and work related awareness processes which are essential in group task coordination.

### **6.6.1 Motives for sharing information**

Within task related factors, information sharing was motivated and facilitated by existence of common goals and anticipated rewards which were equally distributed to all group members. There are important factors that motivate individuals to share information. Having mutual goals and objectives have been noted in other studies as important factors (Talja, 2002, Rafaeli and Raban 2005 and Kim and Lee, 2015). Using Bandura's (1977) outcome expectation construct, Kim and Lee (2015) relate information sharing with positive outcome expectations. Such observation is consistent with the findings of this study. Students admitted that they shared information because of positive expectations. Sharing contributed to better group academic performance and rewards. Positive outcome expectations are linked to the concept of trust. Pre-established trust is built on the foundation of shared domain of study. Also because students had common learning goals it easier to share information as they studied together.

Division of tasks used as a time saving strategy and part of task requirements made information sharing an inevitable part of students' collaborative information behaviour. There are a number of explanations relating to the relationship between task division and information sharing. Firstly information sharing is viewed as a feedback mechanism and way of cross checking accuracy of information collected by individual group members. Secondly, information sharing was used as a tool for coordinating individual activities toward achieving common goals.

Within the context of physical environment, time and location were the variable noted to be of importance in shaping students' information sharing behaviour. Working in proximity with constant face to face and synchronous collaborative interactions encouraged students to frequently share information. Students were subjected to time limitations as a result they could not share everything that group members had. This observation is supported by Zhang (2014)

who describes time as one of the contextual factors which create constraints and potentially inhibit information sharing behaviour.

It is important also to emphasize characteristics of information sources found within students learning environments. The object information sources available within the physical learning environment contained information which was crude and unprocessed. Such information sources were not ready for use. Students were obliged not only to extract information from different objects but also to add meaning during information sharing platforms such as discussions, brainstorming and conversation.

Drawing from the social learning perspective information sharing is described as part of the group learning and collective problem solving process (Yuen and Majid, 2007 and Kim and Lee, 2015). With regard to learning process, students' information sharing behaviour is linked to and motivated by desire to increase shared understanding, participate in knowledge creation and learn from others.

The findings in the current study revealed that similar disciplinary background motivated students to share information. Each case study represented specific domain of study with shared theoretical domain knowledge and experiences. With prior theoretical knowledge, students had a sense of domain expertise and confidence to share information with their colleagues. Such motivational factor is described by Kim and Lee (2015) as information self-efficacy which relates to personal confidence to share information with others.

Another parameter that can be used to explain why students shared information is related to the construct of social norms (Jaeger and Burnett, 2010, Kim and Lee 2015). Information sharing was partly a normative human information behaviour controlled by group norms as well as rules and regulations governing students' way of conducting fieldworks. Social norms which function at the group and university levels determined students' way of conduct including how information ought to be shared. Prior to the commencement of fieldwork students were aware that they had to share information in form of formal oral presentations. Sharing information in

form of presentation and written reports was a compulsory way of providing feedbacks and creating basis for assessments.

### **6.6.2 Motives for not sharing information**

It was interesting to note that students were also involved in non-information sharing behaviour. Despite existence of different factors which attributed to non-information sharing behaviour, it can be speculated that non-information sharing is typical human behaviour. Under normal circumstances and within the span of human capacity, students could not be able to recall sharing all learning tasks related information. It is obvious that in some cases students were not aware that particular piece of information had to be shared. This may be related to the limitation on human capacity to recall and share information with other members.

It is worth noting that in some situation the relationship between groups was characterized by competition rather than collaboration. Fear that one group will perform better than other groups which were considered as competitors inhibited inter-group information sharing. Information sharing across group was restricted as a way of increasing group competitive advantage over the other. Fisher and Naumer (2006) noted that group bias and temporal boundaries between groups made students to identify themselves as groups rather than students. Rafaeli and Raban (2005) and Davies (2013) also found that in competitive groups it is hardly likely for group members to share information with other members outside their groups. Rafaeli and Raban (2005) associate such information behaviour with groups' competition and selfishness. The fear of sharing information on the basis that one group may outperform another is also reported by McLure and Faraj (2005).

### **6.6.3 Methods and ways used to share information**

The choice of information sharing methods and tools to be used largely depends on what kind of information is shared and why is it shared. The importance of proximity as a factor for determining how information is shared for example can be eclipsed by characteristics of information sources and the need in which information is used. The choice of information

sharing methods is influenced by multiple reasons including characteristics and forms of information sources, needs in which information is put into use and geographical factors including degree of dispersion among students. Absence or presence of technological enabled information sharing infrastructure for example is not the only reason for students to either use or not use technology in sharing information.

Face to face information sharing method was the most dominant means of sharing information among students and between students and their supervisors. Possible reasons for dominance of face to face information sharing method include forms of collaboration in which students had constant physical, face to face collaboration. Also, working in groups encouraged constant interactions in which face to face information sharing was common practice. Advantages of face to face information sharing are noted including making use of non-verbal signs and quest for more than information including clarifications. The types of information sources found in naturalistic environments made information sharing practice less dependent on technologies. This was due to lack of supported technological infrastructure.

### **6.7 Collaborative information evaluation**

In relation to the findings of this study two questions were used to guide discussion of collaborative information evaluation. These questions which directly relate to research objective on collaborative information evaluation are: (i) what constitutes information evaluation in collaborative learning process? (ii) Why and how students collaboratively evaluate information? The findings presented in 5.9 shows that in a group context, information evaluation involved making collective judgment regarding what information to access, seek and use in different stages of collaborative learning processes. From the findings it is important to emphasize that in group learning process, information evaluation is more than making judgment of the value of information sought from various sources. It also involves evaluating information when information is shared, exchanged and presented by individual group members. This observation was also confirmed by Raban (2007) and Sonnenwald (2005) who noted that evaluation of information is not necessarily a final stage in information seeking process as sometimes the process of evaluating information can precede information seeking or use.

The findings indicated existence of two dimensions of information evaluation which are individual information evaluation and group information evaluation. Despite the fact that information evaluation was partly individual and partly group undertaking, it is very important to emphasize that, the social aspect of information evaluation override individual information evaluation dimension. Two factors are discussed in relation to the existence of individuals and group information evaluation. When people, including group members were used as sources of information, or when information was sought individually by each group member, evaluation process was done both at individual and group levels. Group information evaluation was common when group members work synchronously in identifying information needs and seeking information. Group information evaluation is also linked to situations where students work together to synchronize information gathered by different individuals as a result of task division.

With regards to individual and group information evaluation, the key observation is that the two dimensions can be discussed in terms of levels of working together. At the lower level individual group members were supposed to evaluate information before presenting or sharing it with other group members. At the higher level of information evaluation process, group members collaboratively evaluated information obtained from various sources including fellow group members. Existence of the two levels of information evaluation was a typical example of check and balance mechanism in information evaluation process.

Findings from previous studies have established different frameworks for evaluating information, user subjective framework, rational approach, behavioural approach and social evaluation framework (Raban, 2007).

It is apparent that information value construct described in social evaluation framework is in conformity with the findings of this study on students' information evaluation. While the basis for evaluating information during collaborative learning process varied considerably, it is clear that information value is one of the central constructs in the understanding of students' collaborative information evaluation behaviour. Burnett and Jaeger (2008) and Jaeger and Burnett (2010) defined information value as shared sense of importance of information in

relation to content of information, group norms, perception of utility and potential benefits that members of information world can get out of information sought. In this regards it is the value of information in terms of content and group perception that guide evaluation process.

Within the same framework of social evaluation, human interaction is considered to be an important process that shapes individuals decisions and perceptions of value of information to be used (Raban, 2007). Within the context of group learning, social interactions are an important part of group learning process. Students' interactions with group members and other people outside their groups including their field instructors greatly shaped their evaluative decisions on what information to access and use. This is described as external appraisal influence on the perception of information value (Burnett and Jaeger, 2008). Rieh, *et al.*, (2013) also described such phenomenon as embedding value of information as a result of suggestions or recommendations on potential information sources provided by others.

It should be also emphasized that evaluating information was partly objective oriented and partly normative in character. The observation that information evaluation is goal and objective oriented process corresponds with the idea that when people evaluate information they are partly focus on information content or the degree to which information gathered corresponds to the tasks that create needs for information (Raban, 2007; Burnett and Jaeger, 2008). It is the value of information in relation to the needs that is used as a metric in information evaluation. On the other hand, there is normative behaviour where the findings have identified that within each case study, there are sources of information which is considered by the members of the disciplines as trusted and recommendable sources of information (see chapter 5.9, figure 5.5). In some circumstances, students evaluate information based on what is considered as relevant and reputable by professionals in the field. How students evaluate information depend partly on suggestions, perceptions, directives and views of other people in their profession. Such observations correspond with what has been noted by Niedźwiedzka, (2003), Sonnenwald (2005), Harrison (2009) and Rieh, *et al.*, (2013).



Characteristics of information sources used in each stage together with related tasks requirements also provide justification for students' motives to evaluate information. At the initial stage the rationale for evaluating information was based on the fact that most of the students relied on what Trace (2007) described as group stock of knowledge as the source of information. Such stock of knowledge is based on group members experiences shared during group interactions. This necessitated for a need to compare, evaluate, comprehend and verify information generated and gathered from various group members as well as non-group members. Information evaluation process took different shapes in later stages of collaborative learning process following inclusion of different sources of information. It is the type of and characteristics of information here which determined why and how information is evaluated.

The findings have also shown that characteristics of information users such as: individual and group domain expertise, knowledge of information sources and previous field experiences partly influenced how information is evaluated in group. Previous field experience and familiarity with different information sources combined with work experience as in the case of in-service students, influenced students' perceptions of value and relevance of various information sources. It is noticeable that in some circumstances students prefer to use information which is known or which has been previously used in related undertakings because it is known to be relevant and useful.

As a general remark on students' collaborative information evaluation behaviour, it should be reiterated that not all previously established metrics for evaluating information were found to be applicable in this study. Students used wide range of criteria including comparing the relevance of information with learning tasks objectives, using reputation and authority of information sources. Students were also found to be influenced by external factors such as evaluating information based on recommendations from field instructors. Some of the metrics that are used by students in making decisions regarding evaluating information were also observed in other previous studies including Rieh and Hilligoss, (2008), Saleh, 2012), and Head and Eisenberg (2010).

## **6.8 Students' collaborative information use behaviour**

Information use was not among the specific research questions addressed in this study, but one of the key variables of this study. The inclusion of information use component is also based on the main research objective which sought to explore information behavioural patterns of students in which the process of information use is embedded. While acknowledging that information use constitutes both internal and external process, this study focused on information use behaviour as externally and physically observed process and practice. This concept is directly related to the main objective of this study which aimed at understanding what students do with information rather than what is the outcome of information use to the students' knowledge base. Information use is linked to different forms of human interactions with information sources including human to human interactions as described by Kari (2007) and Davies (2013). The discussion on information use is based on researcher's observation on how students interacted with and made use of various sources of information. Such approach aimed at understanding students' information use from researcher's perspective as well as students' perspective.

The findings of the study provided in 5.7 indicated that students' collaborative information use behaviour is highly contextualized and it is embedded within the context of collaborative learning process and social environments in which learning process took place. Students have diverse conceptions of what constitute information. The reasons for having multiple conceptions of information use are discussed. There were multiple uses of information during collaboration; some uses were not related to information needs that initiated information seeking. Multiple uses of information were the results of having multiple learning tasks, sub-tasks and activities which reflect needs for diverse information sources. The information used collaboratively in group is also attributed to multiple conceptions of information use. It is important underlined here that in group learning process information use may involve the group's construction of new ideas or group members making comparison between information sought and what is known in a group.

The instrumental role of information is also emphasized in this discussion of information use. As evident from results in 5.10.1, students used information instrumentally both as a resource and tool for creating awareness, coordinating activities, solving learning problems and making

informed decisions. The instrumental role of information use indicates that in collaborative learning context information use process is not necessarily a final stage but, rather an integral part of students' collaborative information behavioural activities. This can occur at any stage. The findings of this study concur with observations by Byström and Hansen (2005), Kari (2007), Shah (2010) and Davies (2013) who all emphasize that in information related tasks information is constantly used throughout the tasks. Kari, (2010) also noted that information use is a multiform phenomenon with multiple meanings. This happens even within a single task or situation. The study also reaffirms assertions made by Taylor (1991) in his information use environment model (IUE). The model views information use as a problem oriented. When using information users may have multiple purposes such as sense making of work situation, problem understanding, coordinating collaborative activities and verification of other piece of information and solving a problem. This is what is described as a social use of information in which information is used as a resource for creating and maintaining group work situation awareness, work environment awareness.

Existence of multiple conceptions of collaborative information use (see results in 5.10.1) was largely attributed to the fact that students used different forms of information with different characteristics. It is evident from these findings that students partly perceived information use with relation to characteristic of information sources accessed. The results in 5.4 show that students accessed variety of information sources ranging from raw information such as: objects, data and oral information to highly processed forms of information sources such as digital objects, books and manuals. Depending on the forms, characteristics and how crude or processed information source is, information use may include behavioural activities such as extraction and interpretations of information, taking notes, sketching diagrams, asking questions and listening to other people. The Focus on crude or raw information such as data collected from objects or living organisms clarifies that information use entails processing, analysing, discussing and modifying data into meaningful form. The observation supports previous works including Kari (2010) who also views information use as phenomenon with multiple conceptions.

It is evident that information use is also more than integrating information into individual knowledge base as suggested by scholars such as Wilson (1997, 2000). It is established in this study that information use involves information acquisition, information sharing and other forms of human interactions with information sources such as note taking, processing, extracting, discussing and application of information. Such view of information use provides a broader understanding of different constituents of information use and show how information use relates to other information behavioural process.

Existence of multiple individuals working in explicit collaboration made human interactions integral part of collaborative information uses. These interactions occur during formal meetings, group discussions and brainstorming sessions as well as informal conversation. They were important grounds for information use. It should be noted that within such information use grounds, information use rarely takes form of reading or writing. On the contrary, it involves using information generated during discussions and information extracted from living and non-living information objects.

The findings confirmed that collaborative information use involves collective attempt by students to apply information and generate new knowledge. Students had prior information and knowledge related to the areas of their study before they began the field work. The combined the knowledge and information with information gathered in the field were important ingredients in the knowledge construction process. Students engaged in mandatory field report writing which is a clear example of how they analysed, processed and synthesize information gathered from various sources. At the end they used that information to produce a physical document. This is a typical example of knowledge construction aspect of information use.

Information application and knowledge generation should also be viewed from a long term perspective. This includes students' anticipations of using information and knowledge after completing field work. The scope of this study does not offer an investigation of students' information use behaviour beyond the context of their collaborative field work. However, students argued that they will apply knowledge and information beyond the world of academia.

Such anticipated use of information highlights important information behavioural pattern which relates to ongoing information use. The ongoing information use behaviour shows how students intended to apply information obtained not only to the academic world but also in work places in the future.

### **6.9 Collaborative challenges encountered by students**

Understanding the challenges that students encountered during collaborative learning process requires a thorough investigation of the relationships between collaboration and information behaviour. According to Shah (2010a, 2012) two scenarios can be used to explain the relationships between collaboration and information behaviour. On one hand, collaboration can be viewed as a tool used to support complex information behavioural activities and on the other hand, information behavioural activities may be used to facilitate collaboration (Shah, 2012). In this discussion of challenges encountered by students during collaborative learning is based on collaborative information related challenges encountered by students during collaborative learning process.

The findings have shown that despite numerous benefits that students gained from working together in group learning assignments, they also encountered a number of challenges. Four sets of challenges are discussed including: a) collaborative tasks challenges, b) collaborative information behavioural related challenges, c) group composition related challenges and d) collaborative infrastructure related challenges. The distinctions between these sets of challenges may appear to be unclear as they are all linked to students' collaborative information behaviour.

Regardless of whether collaboration was synchronous or asynchronous, coordination was an essential part of students' collaborative information behaviour. Students reported that multiple tasks and sub-tasks increased their coordinative workload. Students were required to coordinate various information activities such as, information seeking and gathering and processing which occurred concurrently. Students also faced the challenge of coordinating information activities which were undertaken by individual group members. The time frame in which students were obliged to accomplish different learning tasks was also a challenge.

The findings have also indicated that in situations where students share common goals, collaborative information behavioural practices are not always easy. There are incidences of contested collaboration or what Meyers (2010) described as existence of confrontation instead of collaboration among group members. While Sonnenwald (1995) uses the concept contested collaboration in a broader sense. Sonnenwald (1995) discusses multifaceted patterns of social relationships in a group or organization. In relation to this study, the term is used to include differences among students in priorities, interests and previous experiences which affect their perceptions and understanding of tasks objectives and requirements. The reasons for the existence of negative collaboration within individual groups are discussed in this study. These include, students' lack of common understanding of particular phenomenon, students disagree rather than take decisions on which course of action to be taken and failure to harmonize group and individual interests. Discussion without agreements is time consuming and also it limits information sharing as some students opted to be submissive during contestations.

Similarly, there was unique pattern of intergroup relationship develop among multiple groups. This is characterized by intergroup competition rather than cooperation. Competitive collaboration among groups emerged as a result of group based assessment. Each group wanted to outperform the other. As a result of this fear the benefits of intergroup collaborative interactions, where information is shared, is loss. It also restricted members from using other groups as potential sources of information.

Studies of social psychology have identified a number of challenges that emerge as a result of people working in groups. This includes problem of social loafing and "free riding" behaviour (Koh, Wang, Tan, Ee and Liu, 2008, Holmes, and Beins, 2015). This study also reported the challenge of free riding. There are two reasons why students do not contribute to the accomplishment of group goals. First, some students acknowledged that they have contributed less in some activities because they realized that even if they do more at the end credit will be given to all group members. Second, some students prefer to "free ride" when instructors merged two or three of them together. The number of person in a group influences that groups participation.

The use of human sources of information was noted to be a dominant information behavioural practice. It was sometimes difficult to access information as often informants did not trust students and as a result, they withheld information. This prevented students' information access and use. As a result, students opted not to seek information from human sources because they anticipated some difficulties. The relevance and usefulness of information, as criteria for selecting information sources, were overshadowed by perceived accessibility and easiness.

Two parameters of times are worth discussing as they were noted to be limiting factors. Time as duration or temporal period and the timing in which collaborative learning process took place were also noted to be limiting factors. Regarding the timing of fieldwork, it has been noted that fields' preparations coincided with end of year examinations. During field work preparation students were occupied with other academic activities including end of year exams and completion of semester course work. This posed some challenges in the way they prepared for field works. The duration of the fieldwork was between 6 to 8 weeks. Within this time students were required to accomplish different tasks, a situation which created pressure to meet deadlines for each task. In relation to collaborative information behaviour, the timing of the fieldwork and time limit had implications on accomplishing tasks, identification of information sources, access, seeking and use of information. For example, it can be argued that students did not identify or use information data because of time constraints. Earlier studies have also identified factors such as inconveniences (Connaway, Dickey and Radford, 2011) and time (Melnik, 2009 and Savolainen 2006) as the factors that influence users' information behaviour. Connaway, Dickey and Radford, (2011) concluded in their study that inconvenience or convenience influence selection and use of information as well as time dedicated to seek information.

Students' collaborative learning process does not occur in isolated context, but it exists alongside other contexts within and outside students' learning environment. It is important to understand students' collaborative information behaviour and the challenges associated with them. These behaviours include external factors such as the role of parent organizations and impact of global developments on human behaviour in particular, the development in ICTs. For example, in all three case studies it was noted that there were unsupportive and underdeveloped information

infrastructure with limited use of ICTs by university libraries to support students' remote access to information sources during fieldwork. The finding reiterates Jaeger and Burnett (2010) and Burnett and Jaeger (2008) observations that human information behaviour particularly access and use of information is not only shaped by immediate information world, but also, the forces from large information world such as development in Information and Communication Technology.

Social type is defined as the way in which roles are described and perceived in a group. This is one of the theoretical construct in the theory of information behaviour (Jaeger and Burnett, 2010). The role of librarians in supporting students' collaborative learning process was found to be very minimal. Some of the challenges noted were lack of cooperation between librarians and faculty members. It was reported by librarians that faculty undermining the role of librarians in supporting students' collaborative learning process. At the root of these challenges is how collaborative learning assignments are blended and how field instructors perceived the role of librarians in the collaborative learning assignments. Librarians were type cast as less relevant players in supporting students' collaborative information practices. Effective and meaningful cooperation between librarians and faculty members will enable students to benefit more from services and resources provided by their university libraries.

### **6.11 Summary of the chapter**

The aim of this chapter was to discuss and interpret key findings on the study of students' collaborative information behaviour. Generally, the findings have indicated that students' collaborative information behaviour is highly contextualized and it is an inseparable part of their collaborative leaning process. The discussions on information needs have highlighted collaborative task objectives, users' domains of study and collaborative learning environment and how this can be used as frames of reference in understanding emergence and characteristics of information needs. With regards to information need, the discussion has highlighted multiple variables attributed to dynamic nature of information needs.



In the discussion consideration was given to different internal and external factors which influence students' information behaviour while they worked in collaborative learning assignments. The discussion explains that learning related information behaviour is a complex process which is shaped by multiple factors. Collaborative learning was not a linear process. Students' information behaviour is non-linear where different collaborative information behavioural activities are connected.

## CHAPTER SEVEN: SUMMARY, CONCLUSION AND RECCOMENDATIONS

*“Every discovery opens a new field for investigation of facts, shows us the imperfection of our theories. It has justly been said, that the greater the circle of light, the greater the boundary of darkness by which is surrounded.”* (Collected Works of Sir Humphry Davy, 1840)

### 7.1 Introduction

Conclusion and recommendations are important parts of PhD study. The purpose of conclusion and recommendations is to explain not only how research problem and research objectives have been addressed in a study but also to show contributions of a study to knowledge, practice and policy. Study conclusion and recommendations therefore have to reflect research problem and research questions addressed in the study and relate the findings to the reality (Lam, 2012) and set directions for future research.

The purpose of this study was to investigate Collaborative Information Behaviour (CIB) of undergraduates in three Tanzanian universities. The study was guided by the following research questions:

- What are the information needs of undergraduates working in collaborative academic assignments?
- What sources of information do undergraduates use when seeking information to accomplish group academic assignments?
- What factors shape information behaviour of undergraduates working in collaborative learning tasks?
- How do undergraduates share information when engaging in collaborative learning tasks?
- How do undergraduates evaluate information during collaborative information seeking and use?
- What challenges do undergraduates encounter during collaborative information seeking, sharing and use?

- To what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?

This chapter provides a summary of key issues discussed in previous chapters. The chapter begins with a review of research problem and research questions. This is followed by a brief summary of key research findings and conclusions, study contributions to policy, practice and theory and study limitations. Finally, recommendations and suggestions for further research areas are provided.

## **7.2 Research problem and research questions**

Collaborative learning has become an increasingly essential part of learning process in universities. However, the confluence between collaborative information behaviour and collaborative learning has received less attention in the field of library and information science (Lee, 2013 and Saleh, 2012). This thesis focused on information behaviour of students from collaborative learning context. The study investigated collaborative information behaviour of undergraduate students through collaborative learning assignments. The intent is to broaden the understanding of the influences of different contextual factors on students' group based information behaviour.

In addressing the research problem and research questions, the study used interpretive research paradigm as the lens to highlight the researcher's observations and constructions of meanings from respondents' words. In connection with interpretive research paradigm, qualitative research design was used. The use of qualitative research design with ethnographic multiple case study approach allowed researcher to observe, probe and uncover different collaborative information behavioural processes and social interactions as they occurred on natural settings. This approach was essential in generating rich and in-depth information which is necessary in drawing inferences, conclusions and recommendations. The data collection method used included field observation, blended focused group discussion and individual interviews.

### **7.3 Conclusion and summaries of key research findings**

This sub-section presents the summary of key research findings and major conclusions. The following key research findings and conclusions are presented in thematic order:

#### **7.3.1 “What are the information needs of undergraduates working on collaborative learning assignments?”**

- The findings showed that students’ had different types of information needs ranging from need for information to solving learning based problems, coordinating collaborative learning activities, creating and maintaining task and situation awareness. It also includes the need for information about relevant sources of information.
- The findings also showed that students’ information needs comprised of both individual and shared information needs. Individual information needs emerged as the need for additional information which supported individual physiological needs that are not directly related to core collaborative learning activities.
- Students’ information needs were found to be dynamic. The dynamic nature of information needs was attributed to students’ social interactions and exposure to new ideas, information and opinions and working on multiple learning tasks.
- Group members’ traits, such as past learning experiences and perceptions of task requirements influenced how students constructed shared understanding and how they defined information needs.
- Identification of information needs is largely a collaborative process which involved understanding and translating collaborative tasks objectives into information needs. Information sharing was an important part of collaborative information need identification. Information sharing facilitates construction of shared understanding about the nature of tasks objective and information needs.

- In conclusion, collaborative learning, learning task objectives, students' learning environment and domains of study are the factors that determined the occurrence and characteristics of students' individual and shared information needs.

### **7.3.2 What sources of information do undergraduates use when seeking information to accomplish group learning assignments?**

The results of the above research question are reiterated below followed by the conclusion:

- Students preferred wide range of information sources including human sources, living and non-living information objects, to printed and electronic sources of information. Information sources' preferences varied from one collaborative learning task stage to another and from one learning tasks to another.
- Humans and information objects available within students' immediate collaborative learning environments were the most preferred sources of information.
- The main factors which contributed to students' preferences on human sources of information include working on similar domains of study, sharing common learning goals and objectives together with established trust among students and with other people.

From these findings it is evident that in group learning process there is no single factor that can be used to explain students' information sources preferences. The choice and preferences of information sources are largely determined by myriad of factors some of which are external to students' learning environment.

### **7.3.3 What factors shape information behaviour of undergraduates working in collaborative learning tasks?**

The results of the above research question revealed that:

- Learning related information behaviour is complex and it is shaped by multiple internal and external factors.

- The factors that shape students' collaborative information behaviour are multiple and they include the nature and characteristic of collaborative tasks, forms of collaboration and group task division. Other factors include: characteristic of group members, group social norms, students' domains of study and characteristics of information sources and time factor.

#### **7.3.4 How do undergraduates share information when engaging in collaborative learning tasks?**

The question how undergraduates shared information when engaging in collaborative learning tasks revealed that:

- Information sharing behaviour comprised of voluntary and involuntary sharing, exchange, presentation and dissemination of information. Information was shared in different forms including ideas, data, views, opinions, experiences, knowledge and objects.
- Information sharing was a dominant process during collaborative learning. However, the intensity and patterns of information sharing and type of information shared varied considerably across different task stages and activities.
- Three patterns of information sharing were noted which included: intra-group information sharing, inter-group information sharing and directive information sharing.
- Non information sharing was also part of students' information sharing behaviour. Non information sharing was used as a strategy by group members to increase one group's competitive advantage over the other groups. Intergroup competition, students' group assessment and students' working in different groups with different learning tasks

objectives inhibited inter-group information sharing and at the same time promoted intra-group information sharing practices.

- Information sharing practices were motivated by multiple factors including work on explicit collaboration with mutual goals and objectives, positive outcome expectations, well established trust and sharing similar discipline of study. Other factors included division of tasks which required group members to get feedback from each other and working in proximity with ongoing face to face and synchronous collaborative interactions
- Geographical proximity, characteristics of information sources, including types and forms of information used were among the factors which determined how information was shared in and out of groups.

Based on the preceding results, it is evident that the presence or absence of shared learning goals and objectives, implicit and explicit social norms, trust, task divisions and geographical proximity were the factors for students to share or not to share information.

### **7.3.5 How do undergraduates evaluate information during collaborative information seeking and use?**

The results of the following research question revealed that:

- Information evaluation involved two dimensions. These are individual information evaluation and group information evaluation.
- Students used a wide range of criteria. They compared the relevance of information with learning tasks objectives, using reputation and authoritativeness of information sources. Students were also influenced by external factors such as the evaluation of information based on recommendations from field instructors or selection of sources based on what is considered authoritative and reputable by professionals in the fields.

- Collaborative information evaluation was found to be partly objective and partly normative in character among the respondents surveyed. The former refers to information evaluation based on information content while the later is based on normative and social perceptions of information value.

Based on the results, in group learning assignments information is objectively evaluated based on information content and its relation to tasks objectives. Information is subjectively evaluated based on social norms, value, standards and recommendations from instructors other people. Therefore collaborative information evaluation is determined by the subjective and objective judgment of the value of information.

### **7.3.6 Findings on information use**

There was no specific research question on students' information use behaviour. The inclusion of information use in this discussion is based on the fact that information use as one of the key variables included in the main research question. The following are the summary of research findings on information use:

- Students' collaborative information use behaviour is highly contextualized and it is embedded within the context of collaborative learning process and social environments in which learning process takes place.
- In group learning process, information use involves group's construction of new ideas and knowledge, processing of raw information, making sense of information, applying information and sharing of information.
- Information use is not necessarily a final stage in information behavioural cycle but rather an integral part of students' collaborative information behavioural activities which can occur at any point during collaboration.



- Information use is a continuous process which continues beyond field work in which the respondents are engaged. Students' future anticipation of using information and applying knowledge in the academic world and the work places was evidence of ongoing information use behaviour.

In conclusion, students' information use is a multifaceted process in which students interact with different forms of information sources including human beings. In addition, information use is not a final point in the information behavioural processes. Students use information at different stages to construct new ideas and knowledge, create awareness, coordinate activities and solve learning problems.

### **7.3.7 What challenges do undergraduates encounter during collaborative information seeking, sharing and use?**

With regard to the research question: What challenges do undergraduates encounter during collaborative information seeking, sharing and use? The results showed that:

- Students encountered multiple collaborative challenges including existence of contested collaboration, increased coordinative workload, competitive inter-group relationships, existence of free riders within groups and challenges related to time management. Lack of developed information infrastructure that support students' access to information while they are in fields and lack of cooperation between faculty members, students and librarians were also some challenges encountered by students.

To conclude, challenges that students encountered during collaboration were inherently part of collaborative learning process and could be understood from different perspectives such as, the way group works, characteristic of group members and characteristics of learning environment.

### **7.3.8 To what extent is Wilson's (1996) model of information behaviour appropriate for studying collaborative information seeking, information sharing and use?**

The results of the above question revealed that:

- Wilson's (1996) model of information behaviour cannot be used completely to describe students' information behaviour in the context of collaborative learning. Number of collaborative processes such as common grounding, collaborative information need identification, collaborative information evaluation and collaborative information use are not reflected in the model.
- The results on the applicability of Wilson's (1996) model of information behaviour in collaborative learning context showed that the model has some shortcomings. Despite the comprehensive nature of, the model, it needs to be revised in order for it to be able model different collaborative information behaviour of students. Based on these findings, a new model of students' collaborative information behaviour is proposed (see sub-section 7.4.2). The model views students' information behaviour as a reflection of three major dimensions which are collaborative learning tasks, collaborative learning environment and influences of external environment.

### **7.4 Contribution of the study**

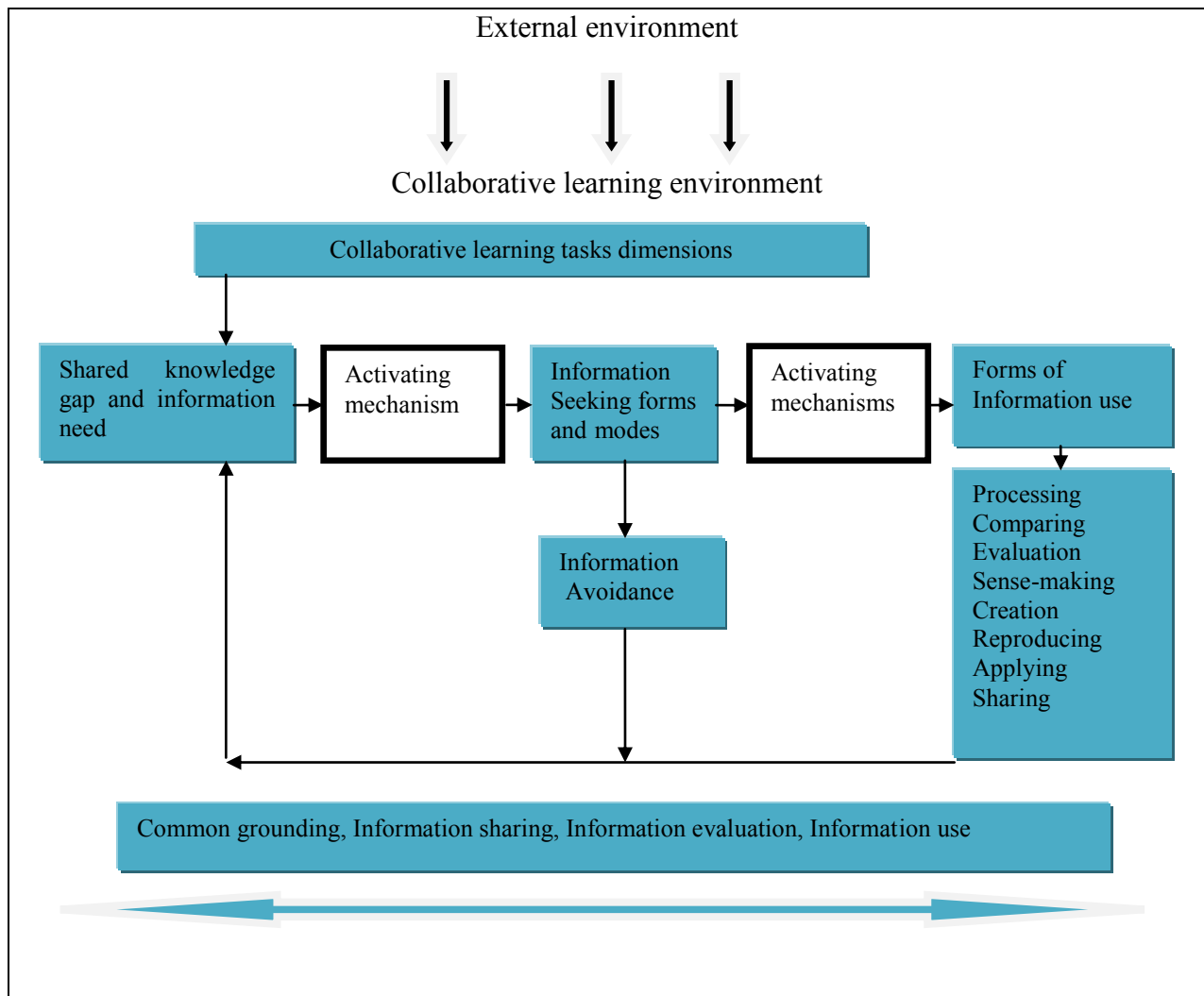
It has been established in chapter one (see results in chapter 1.3) that there is paucity of research on collaborative information behaviour in the context of students' collaborative credit based assignments that are conducted in naturalistic learning environment. The findings of this study constitute a significant contribution to the existing body of knowledge on human information behaviour and collaborative learning in higher education. It adds to theory, provides basis for existing policy improvement and provides a different view of the way information behaviour is practiced among students.

#### **7.4.1 Contribution to theory**

This study was underpinned by Jaeger and Burnett (2010) theory of information worlds. The theory provides theoretical explanations on how and why human information is influenced by different contextual factors that exist and operate in different levels of a society. Jaeger and Burnett (2010) acknowledge that theory of information worlds is a newly developed theory which is required to be tested in different studies so as to improve its scholarly and social value. The use of this social theory of information behaviour to guide the study has two theoretical implications. First, the use of theory of information worlds (Jaeger and Burnett, 2010) in studying students' collaborative information behaviour has contributed to the improvement of its scholarly and social value in guiding research on human information behaviour. Second, the theory has contributed to our understanding of the role of various social influences such as; social norms and values, social types, immediate, intermediary and external environments in shaping students' access, seeking, evaluation and use of information.

#### **7.4.2 Proposed model of Students' collaborative information behaviour**

As part of theoretical contribution, a model of students' collaborative information behaviour has been developed and presented in this study. The model is built on the framework of Wilson's (1996) model of information behaviour with some expansions that reflect collaborative information behavioural processes in the context of collaborative learning. The proposed model is also based on empirical findings of this study and review of literature in information science, scholarly collaboration and social psychology. Based upon this model, collaborative learning information behaviour is a set of observable, interrelated collaborative processes and activities that are goal oriented and tasks determined. The model has contributed to enhancing conceptual clarity of different collaborative information behaviour processes. This includes common grounding, collaborative information evaluation, collaborative information use and information sharing. Figure 7.1 provides graphical representation of the model:



#### 7.4.2.1 Collaborative learning environment

The proposed model is built upon the concept of collaborative learning environment and external environment. The former consists of students' immediate collaborative physical and social environments. The existence of collaborative learning environment and the interplay between physical environment and social environment provide framework of understanding different patterns of students' collaborative information behaviour. The key elements of collaborative learning environment are the physical setting in which different information and learning activities are carried out norms, rules and regulations governing students' way of conduct. It also includes sources of information and presence of human beings as sources of information and

actors in collaboration. Students' collaborative learning environment is characterized by social interactions which are shaped by explicit and implicit norms.

In this model, the concept of external environment is used in connection with Jaeger and Burnett's (2010) concepts of intermediate and large information worlds. Students' external environment include the roles and influences of parent institutions in collaborative learning process and the influence of global forces such as developments in IT on students collaborative information behaviour.

Like Wilson's (1996) general model of information behaviour, this model remained users' centred but collaborative in character. The relevance of including *person(s)-in-context* in the model is still valid. Unlike Wilson's (1996) model which describes person-in-context as a solitude situation in which individual experiences a gap between situation and information use (Wilson, 1996 and Dervin, 1998), this model incorporates *Persons-in-context* within the broader context of collaborative environment. *Persons-in-context* is a situation characterized by existence of multiple interactions as well as interpersonal and intergroup relationships that are associated with collaborative learning tasks dimension.

#### **7.4.2.2 Collaborative learning tasks, shared knowledge gap and information needs**

Users in groups need to establish and understand shared knowledge gap and shared information needs before they begin other collaborative information behavioural process. The model insists that group understanding of task goals, task objectives and work situation is essential not only at the initial stage but in the entire collaborative information behavioural process. The model emphasized that not all information needs are related to the core collaborative task goals and objectives. Some information needs are unpredictable and they emerged in the middle of information behavioural process or evolve and collaborative learning process progress. Some information needs also emerged as a reaction to the changes in work environment, work situation or perceptions and understanding of work requirements. Similarly, the model indicated that in the context of collaborative learning, users may experience both shared and individual information needs.

### **7.4.2.3 Activating mechanisms**

This model repackaged and reserved two sets of activating mechanisms used in Wilson's (1996) model. In contrary, the model does not relate factors that initiate information behavioural activities to any specific theory but to different variables that activate different information behavioural processes. Different variables such as group task objectives, anticipated risk, rewards, fear, desire and curiosity can be used to explain why students select particularly sources of information, seek, share and use information.

Activating mechanisms can influence group and individual information behaviour at any stage of information behavioural process. For example, the stressful situation may exist even during information seeking and acquisition. Stressful situation may be eliminated when the information sought is used to solve a problem or when students receive feedback from their instructors during formal oral presentation of reports. Likewise, different variables that related to self -efficacy can be used to explain why students seek, share and use information. For example while information may be shared in different stages, individual sense of subject expertise, previous learning or working experience may influence decision to share or not to share information with others. Self-efficacy can be used to explain why students avoid some information sources. Students will evade from human sources of information for example, when perceived to be unapproachable or not corporative in providing information.

### **7.4.2.4 Intervening variables**

Unlike Wilson's (1996) model of information behaviour, the proposed model views intervening variables as part of learning environment. The role of intervening variables in hindering or initiating students' decisions to engage collaborative information behavioural activities is not limited to a single stage. Trust among students for example may initiate intra-group information sharing and preference for human sources of information. Interpersonal relationship in and out of groups may foster collaborative interactions and determine the way information is sought, shared and used. Also, information sharing activities may be hindered by the lack of supportive information sharing technology. Another set of intervening variables incorporated in this model relate to the characteristics of information sources, including forms of information sources as

well as accessibility and trust of information sources. These characteristics may inhibit or foster students' decision to seek, share or use information. Users may decide to seek information from other individuals not only because of trust, but also because people are considered to be readily available and accessible.

Other intervening variables incorporated in the model include characteristics of information users and time factor. Previous domain knowledge or work experiences may influence users' information sources selection, information sharing decisions, as well as evaluation, processing and use of information. Group members' informational self-efficacy which improves with experience motivates students to share information. The model also incorporated time factor, as one of the intervening variables which shaped users collaborative information behaviour. Time, imposes limitations which are in the forms of deadlines. The limitations create pressure on users in relation to information sources to be sought and used within specified period of time on the basis of accessibility, usability and availability.

Some elements of group culture particularly collectivism and cohesiveness are included in the model as part of intervening variable. Desire to share or not to share information for example may be facilitated by culture of collectivism among users. Likewise, the presence of explicit and implicit group norms, are also part of group culture, which create normative patterns of information behavioural practices which group members are obliged to adhere to.

#### **7.4.2.5 Collaborative information seeking: modes and patterns**

Collaborative information seeking includes deliberate and accidental seeking and acquisition of information. This model differentiates information seeking modes and information seeking patterns. The former denotes an intent of seeking information while, the later implies ways in which information is sought. Thus, information seeking pattern includes seeking information through observation of nature, receiving recommendations from other people, discussion and extraction of information from group's knowledge.

Collaborative information seeking processes as presented in the model appeared to be compact but when the processes are unpacked, different information seeking behavioural processes are revealed. With exception of information avoidance and information encountering, information seeking modes included in Wilson's (1996) model of information behaviour largely correspond with the modes presented in this model. The model also incorporates information encountering as one of the modes of information seeking. Information encountering is more than accidental acquisition of information. It involves extra effort to understand and compare encountered information with information needs. The temporal characteristic of information avoidance is also emphasised in the model. The factors that attributed to information avoidance behaviour include: a) time limitations, b) changing perception of relevance of information overtime, c) social influences.

#### **7.4.2.6 Information use**

The proposed model views information use as a goal oriented, multidimensional and cross cutting process. In the new model, information use is described as a collective and individual process in which users create process, share, compare, reproduce and apply information for various learning purposes. The holistic view of information use presented in this model intends to provide a wider understanding of the concept. It explains not only the internal processes of information use but also observable and tangible actions and processes.

The social construction approach is used to explain information use. In this approach information use is viewed as a social process of constructing, utilizing and reproducing information through discursive actions such as social conversation and discussion (Tuominen and Savolainen, 1997, Savolainen, 2009). Information reproduction as an information use process may occur in form of report writing, notice taking and reading. The proposed model also incorporated other forms of information use including sharing and comparing. In addition, users may share or even compare information sought with group or individual stock of knowledge.



#### **7.4.2.7 Other broader collaborative information behavioural processes**

Common grounding, information sharing, information evaluation and information use are also included in the model. They are the broader collaborative information behavioural processes which are dominant in all collaborative learning stages. This model adopts and expands the concept of collaborative grounding used by Karunakaran, Spence and (Reddy 2010) to refer to a continuous process of creating and nurturing common understanding throughout the entire collaborative information behavioural cycle. Common grounding involves using information to create common understanding of learning task and learning environment and situations.

#### **8.4.3 Contributions to research methodology**

The current study has also made some contributions in methodological aspect. Focus group discussion as a data collection method has been used widely in studies of human information behaviour (Prabha, Connaway, Olszewski and Jenkins, 2007; Weiler, 2004; Young and Von Seggern, 2001). This study has made some contributions in research methodology by introducing blended focus group discussion technique for studying human information behaviour. This method integrated information literacy training and focus group discussion as part of data collection method. The use of blended focus group discussion method intended to introduce students to key issues related to collaborative information behaviour practices and basic information literacy skills so as to enhance the effectiveness of focus group discussion.

#### **8.4.4 Contributions to the knowledge**

Collaborative learning based information behaviour is an emerging research area in Library and Information Science. Few researchers have studied collaborative information behaviour in learning context (Limberg, 1999; Limberg, 2005; Kuhlthau, 2004; Eskola, 2005; Harrison, 2009; Saleh, 2012; Salah and Large, 2011). Among these studies, very few have focused on collaborative information behaviour of students in group based learning (Harrison, 2009; Saleh, 2012; Salah and Large, 2011; Kim and Lee, 2012; Lee, 2013 and Pérez, 2015). The results of this study have made several major contributions. For example, the findings of this study have shed some insights into an understanding on how students seek, share, evaluate and use information to

accomplish different learning objectives. Also, the study has contributed to the understanding of how students' learning based information behaviour is shaped by contextual factors including learning environment, learning goals and requirements. Most of the studies on learning based collaborative information behaviour have focused on studying online collaborative information behaviour (Lee, 2013; Pérez, 2015) and single domain of study such as engineering (Saleh, 2012; Salah and Large, 2011). This study employed a cross disciplinary and multiple disciplinary case study approach to study collaborative information behaviour of students in four disciplines of: botany, zoology, forestry and architecture. This research has increased our understanding of the domain specific factors that influence students' information behaviour including information sources preferences, information seeking and sharing and information use.

Previous studies have also reported that students prefer to use different information sources including printed sources, electronic sources and human sources of information (Saleh, 2012, O'Farrel and Bates, 2009 and Zhou and Stahl, 2007). The results of this study have shown that beside the use of other forms of information sources, students also prefer to observe the natural environment and extract information from different natural and human-made information objects. These information objects include buildings, structures, living organisms and remains of some living organisms. Little has been discussed on the importance of using nature as the source of information (Smith, 2010; Alexandersson and Limberg, 2003). This study has contributed to the existing knowledge by providing empirical evidences on how students use natural and manmade information objects to support their collaborative learning assignments.

Studies that have focused on students information behaviour and collaborative learning in higher learning institutions are few (Saleh, 2011; Salah and Large, 2010; Harrison, 2009; Hyldegård, 2006a; Hyldegård, 2006b; Hyldegård, 2009a). The findings of this study have contributed to the existing knowledge on human information behaviour by providing new empirical evidence on the role of information in supporting collaborative learning. Also, little attention has been paid to how students collaboratively evaluate information during collaborative learning process. The findings of this study have highlighted how students evaluate information and what factors influence information evaluation process in group learning context.

#### **8.4.5 Contributions of the study to practice**

For many years Library and Information Science practitioners have engaged in seeking to understand information behaviour of different segments of society with the intention of providing better services to users. Understanding collaborative information behaviour of students while they are involved in group learning assignments is essential for Library and Information Science practitioners. This aids in providing information services and resources that best suit the needs of students. The findings may be used to assist Library and Information Science practitioners in designing library building and information services and infrastructure to accommodate the needs of users who work in academic collaborative activities.

The findings presented in chapters 5 section 5.11 and chapter 6 sub-sections 6.9 have also indicated that students encountered a number of collaborative learning challenges that were related to collaborative tasks, group composition and learning environments. These challenges included *social loafing* problem where some students contribute less in groups, lack of corporation between faculty members and academic librarians, limited time allocated for field preparation and existence of contested collaboration. The practical implications of these research findings are twofold: First, the findings have unveiled how the current mode of field assessment contributes to social loafing problem. Based on this observations, field instructors can modify students' assessment in a way that each group member is assessed both individually and as part of group. This can eliminate problem of social loafing and free riding. Second, the forgotten role of academic librarians in facilitating collaborative learning process implies that Library and Information Science practitioners have to be considered as important part of collaborative learning process. The universities may take initiatives to increase the number of subject librarians who can provide subject based information services to students working in group works.

#### **8.4.6 Contribution of the study to policy**

This study was not an action research. It does not intend to address immediate practical problems. Some of the findings however, have global, regional and local policy implications. Higher learning institutions (HLIs) play an important role in contributing to the realization of

MDGs. HLIs engage in practical fieldworks which intend to impart skills to students and future professionals. This is essential for addressing societal problems such as unsustainable rural agriculture, poor urban planning and poor natural resources management. The findings presented in 5.8.3 and 5.11 respectively) have revealed that despite the challenges encountered by students, collaborative learning is beneficial as it allows students to seek and generate information, new ideas and knowledge through collective intellectual efforts. It is within this context, that the findings of this study may be used by policy makers particularly in educational sector to revise teaching programmes and teaching approaches, to prepare future professionals to become critical thinkers in solving social problems. This thinking is emphasised by Mohamedbhai (2007) who insisted that universities are supposed to develop and reorient their teaching programmes to be multi and inter-disciplinary, team work and project-based in order to make contributions to the realization of MGDs. This may also include developing education and training policy guidelines which acknowledge scholarly collaboration as part of university teaching and learning practices.

The desire to build a well-educated and learned society is one of the attributes of the Tanzania development vision 2025. The vision stipulates that knowledge and quality education are essential attributes needed by Tanzanians to attain competitiveness in the global economy and that Tanzania should:

*“Be a nation with high quality of education at all levels; a nation which produces the quantity and quality of educated people sufficiently equipped with the requisite knowledge to solve the society's problems, meet the challenges of development and attain competitiveness at regional and global levels.”* (United Republic of Tanzania, 2000)

This study focused on how information is accessed, shared and used collaboratively to support students' group learning process. In relation to the above vision statement, it is apparent that the objectives of the vision can only be attained if access and effective use of scholarly information to support students' learning in higher learning is considered to be important. The findings presented in sub-section 5.4.1 indicated that students preferred to use human information sources including local knowledgeable people. These findings may be used by policy makers to create

programs and guidelines that can be used to strengthen Academic-Community-Partnership (ACP) for information and knowledge sharing. This is essential in linking learning process with social and economic developments.

### **7.5 Recommendations**

The findings have indicated that students encountered a number of challenges including failure to effectively make use of available information services provided by university libraries while they were in the field. It is therefore recommended that the parent organizations and respective university libraries develop information infrastructure that support collaborative learning of students in their universities. This may include adoption of new technology for supporting not only collaborative learning but also access to information, collaborative information use and information sharing.

As it was noted in the findings students' collaborative learning activities has created new challenges for university libraries regarding the provision of information services that correspond to changes in teaching and learning. Based on these findings, it is recommended that University libraries and their respective universities design and refurbish their library buildings and spaces to accommodate different collaborative information behavioural activities of their users. The existing physical learning and reading spaces in libraries should be restructured to meet the changing needs of library users. In case new library buildings are designed and constructed, consideration should be taken to make sure that the new structures accommodate the needs of users who are working in collaborative information activities. Universities should ensure that their libraries are restructured and designed in such way that they include collaborative learning facilities such as, collaborative study booths to enable users to discuss and accomplish different collaborative academic tasks. Other collaborative information services may include collaborative information searching facilities, and remote user assistance.

The findings also indicated that librarians are not well prepared to provide services and information to users who have collaborative information needs. Librarians should be trained and be prepared to serve users who require shared needs. While librarians may have relevant skills,

knowledge and experiences in assisting and providing information services and resources to different users, there are still new areas that academic libraries should train their staff and equip them with necessary knowledge and skills in supporting scholarly collaboration. Specific areas may include: a) planning for collaboration, b) evolving collaborative learning environment c) use of technology to support collaborative information activities.

It was noted that in some instances students relied on knowledge of local people .Some of these people are known for possessing rare indigenous knowledge in areas such as agro forestry, environmental conservation and wildlife. For effective immediate and long term utilization of such knowledge and information, it is recommended that Academic-Community-Partnership (ACP) should be established and strengthened. This may include establishing different community outreach programs aimed at knowledge and information sharing and links between university and local community.

Library and information practitioners and faculties have developed different criteria that are used to evaluate information sources. Unlike solitary information evaluation, it is clear from the findings that collaborative information evaluation is a complex process that involves group members' subjective and objective judgments of the value of information. It is recommended that since information evaluation in group learning is both objective and normative process, the conventional criteria for evaluating information should be used with modifications. The criteria should focus not only on characteristics of information sources, but also the nature and requirements of collaborative learning tasks and activities. In addition to the established criteria for evaluating information such as credibility, authority, accuracy, objectivity and relevance of information source, the following criteria are recommended: a) Social or group perception of information value, b) group member interest, c) external influences, d) recommendation or influence from other people e) value of information in relation to the learning task requirements, f) agreed norms and standards within specific domain of study.

The findings of this study revealed that information sharing behaviour is one of the dominant aspects of students' collaborative information behaviour and collaborative learning processes. To

embrace students' interdisciplinary and cross disciplinary information sharing practices it is recommended in the future, that the design of collaborative learning assignments should be cognizance of the importance of technology use in supporting information sharing.

### **7.6 Suggested areas for further research**

Collaboration is an inherent part of students' academic life. Every day, students explicitly or implicitly collaborate in different academic undertakings. This study focused on a form of collaboration in which students were explicitly collaborating while field instructors and technical staff provided guidance. Further studies that seek to understand collaborative information behaviour is recommended. The focus should be on different forms of collaboration such as: classroom group discussion, joint projects, seminar preparations and hierarchical collaborations between students and faculty members.

It was observed in this study that students rarely used technology to seek and share information as well as to and facilitate different collaborative activities. This finding was partly caused by learning tasks objectives and nature of learning environment. To expand the knowledge it is recommended that collaborative information behaviour of students working in virtual collaborative environment be explored. This study will explain how technology shapes students' group information behaviour.

Furthermore, collaborative information use has proved to be a controversial concept with many meanings and interpretations. In order to continue making contributions in developing the clarity on the concept of collaborative information use, a comparative study of students collaborative information use is recommended. The study should comprise students from different academic backgrounds and explore different ways and patterns in which students use information in the learning process.

This study has made some contributions in addressing the problems of lack of empirical evidence on how human beings use natural environment as the source of information. In different disciplines such as architecture, archaeology, forestry, zoology, botany and geology students and

scientists use natural environment and objects within the environment as valuable sources of information. There is limited understanding on how scientists seek, evaluate and use information extracted from various living and non-living information objects found within and beneath our natural environments. A study is therefore recommended to investigate the potential of natural environment as the source of information and how information behaviour of students and scientists manifest when they seek and use information from natural environments.



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## LIST OF APPENDICES

### Appendix 1: Letter seeking research permit from Sokoine the University of Dar es Salaam



## UNIVERSITY OF KWAZULU-NATAL

University of KwaZulu-Natal  
College of Humanities,  
School of Social Sciences,  
Private bag X01, Scottsville, 3209  
Pietermaritzburg.  
12 April 2014

To: Vice Chancellor,  
University of Dar es Salaam,

Att: Principal, College of Natural and Allied Sciences  
Director Library Services

RE: Introducing Mr Faraja Ndumbaro – PhD Student at University of KwaZulu Natal

This letter serves to introduce and confirm that Mr Faraja Ndumbaro is a duly registered PhD (Information Studies) candidate at the University of KwaZulu Natal. The title of his PhD research is **“Collaborative Information Behaviors (CIB) of Undergraduates in Three Tanzanian Universities.”**

The outcome from the study is expected to improve practice, inform policy and extend theory in this field of study. As part of the requirements for the award of a PhD degree he is expected to undertake original research in an environment and place of his choice. The UKZN ethical compliance regulations require him to provide proof that the relevant authority where the research is to be undertaken has given approval.

We appreciate your support and understanding to grant Mr Faraja Ndumbaro permission to carry out research in your organisation. Should you need any further clarification, do not hesitate to contact me.

Thank you in advance for your understanding

Prof Stephen Mutula (Information Studies Programme)  
Supervisor and Academic Leader, Development Cluster

University of KwaZulu Natal  
Private Bag X01 Scottsville 3209  
Pietermaritzburg  
Email: [mutulas@ukzn.ac.za](mailto:mutulas@ukzn.ac.za)  
Tel: +27 33 260 5571; +27 712 750 109

## Appendix 2: Letter seeking research permit from Sokoine University of Agriculture



University of KwaZulu-Natal  
College of Humanities,  
School of Social Sciences,  
Private bag X01, Scottsville, 3209  
Pietermaritzburg,  
12 April 2014

To: Vice Chancellor,  
Sokoine University of Agriculture,

Att. Dean, Faculty of Forestry and Nature Conservation  
Director Library Services

RE: Introducing Mr Faraja Ndumbaro – PhD Student at University of KwaZulu Natal

This letter serves to introduce and confirm that Mr Faraja Ndumbaro is a duly registered PhD (Information Studies) candidate at the University of KwaZulu Natal. The title of his PhD research is "**Collaborative Information Behaviors (CIB) of Undergraduates in Three Tanzanian Universities.**"

The outcome from the study is expected to improve practice, inform policy and extend theory in this field of study. As part of the requirements for the award of a PhD degree he is expected to undertake original research in an environment and place of his choice. The UKZN ethical compliance regulations require him to provide proof that the relevant authority where the research is to be undertaken has given approval.

We appreciate your support and understanding to grant Mr Faraja Ndumbaro permission to carry out research in your organisation. Should you need any further clarification, do not hesitate to contact me.

Thank you in advance for your understanding.

Prof Stephen Mutula (Information Studies Programme)  
Supervisor and Academic Leader, Development Cluster

University of KwaZulu Natal  
Private Bag X01 Scottsville 3209  
Pietermaritzburg  
Email: [mutulas@ukzn.ac.za](mailto:mutulas@ukzn.ac.za)  
Tel: +27 33 260 5571; +27 712 750 109

### Appendix 3: Letter seeking research permit form Ardhi University



**UNIVERSITY OF  
KWAZULU-NATAL**

University of KwaZulu-Natal  
College of Humanities,  
School of Social Sciences,  
Private bag X01, Scottsville, 3209  
Pietermaritzburg.  
10 February 2014

To: Ardhi University,

Att. Head, Department of Architecture  
Director Library Services

RE: Introducing Mr Faraja Ndumbaro – PhD Student at University of KwaZulu Natal

This letter serves to introduce and confirm that Mr Faraja Ndumbaro of the University of Dar es Salaam, is a duly registered PhD (Information Studies) candidate at the University of KwaZulu Natal. The title of his PhD research is “**Collaborative Information Behaviors (CIB) of Undergraduates in Three Tanzanian Universities.**”

The outcome from the study is expected to improve practice, inform policy and extend theory in this field of study. As part of the requirements for the award of a PhD degree he is expected to undertake original research in an environment and place of his choice. The UKZN ethical compliance regulations require him to provide proof that the relevant authority where the research is to be undertaken has given approval.

We appreciate your support and understanding to grant Mr Faraja Ndumbaro permission to carry out research in your organisation. Should you need any further clarification, do not hesitate to contact me.

Thank you in advance for your understanding

Prof Stephen Mutula (Information Studies Programme)  
Supervisor, Academic Leader- Development Cluster and Dean-School of Social Sciences

University of KwaZulu Natal  
Private Bag X01 Scottsville 3209  
Pietermaritzburg  
Email: [mutulas@ukzn.ac.za](mailto:mutulas@ukzn.ac.za)  
Tel: +27 33 260 5571; +27 712 750 109



## Appendix 4: Research permit from University of Dar es Salaam

# UNIVERSITY OF DAR ES SALAAM

## DIRECTORATE OF RESEARCH

P.O. Box 35091 ■ DAR ES SALAAM ■ TANZANIA

General Line: 2410500-8 Ext. 2084

Direct Line: 2410727

Website: [www.udsm.ac.tz](http://www.udsm.ac.tz)



Fax: 255 022 2410743

255 022 2410023

E-mail: [research@udsm.ac.tz](mailto:research@udsm.ac.tz)

Ref. No: AB3/12(B)

Date: 4<sup>th</sup> February, 2014

Dean of Students  
Dr. Wilbert K Chagula Library,  
Principal CoNAS  
**University of Dar es Salaam.**

### UNIVERSITY STAFF AND STUDENTS RESEARCH CLEARANCE

The purpose of this letter is to introduce to you **Mr. Faraja Ndumbaro** who is a bonafide student of the **University of KwaZulu Natal** and a member of staff of the University of Dar es Salaam.

**Mr. Ndumbaro** has been permitted to conduct research titled "**Collaborative Information Behaviors (CIB) of Undergraduates in three Tanzanian Universities**".

The period for which this permission has been granted is from **February, 2014 to June, 2014** and will cover the following areas: **Office of the Dean of Students, Dr. Wilbert K Chagula Library, Departments of Botany and Zoology,**

It will be appreciated if you could grant the researcher any help that may facilitate him to achieve research objectives.

A handwritten signature in black ink, appearing to read 'R.Y.M. Kangalawe'.

Prof. R.Y.M. Kangalawe  
**DIRECTOR OF RESEARCH**

## Appendix 5: Research permit from Ardhi University

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# ARDHI UNIVERSITY

DIRECTORATE OF HUMAN RESOURCE MANAGEMENT  
AND ADMINISTRATION

Tel: +255 22 2775 446  
Fax: +255 22 2775391  
Telegrams: ARDHICHUO



P. O. Box 35176  
Dar es Salaam  
e-mail: [hrma@aru.ac.tz](mailto:hrma@aru.ac.tz)  
website:  
<http://www.aru.ac.tz>

**Our Ref. No.** ARU/AD.105/SF.3

12<sup>th</sup> February, 2014

University of Kwazulu-Natal

College of Humanities

School of Social Sciences

Private Bag X01, Scottsville, 3209

Pietermaritzburg

Att. Prof. Stephen Mutula (Information Studies Programme)

Supervisor and Academic Leader, Development Cluster, Acting Dean

**RE: INTRODUCING MR. FARAJA NDUMBARO - PhD STUDENT AT  
UNIVERSITY OF KWAZULU NATAL**

Reference is made to your letter dated 15th January, 2014 with the above heading.

Kindly be informed that the request of allowing Mr. F. Ndumbaro to carry out research at Ardhi University for his PhD studies has been accepted.

Salakana, A. R

For: Deputy Vice Chancellor

Planning, Finance and Administration

For Deputy Vice Chancellor

Planning, Finance and Administration



## Appendix 6: Research permit from Sokoine University of Agriculture

		<b>SOKOINE UNIVERSITY OF AGRICULTURE</b> DIRECTORATE OF RESEARCH AND POSTGRADUATE STUDIES		
Our Ref:	DRPGS/R/7	Our Date:	25 <sup>th</sup> June 2014	
Your Ref:		Your Date:		

University of Kwazulu – Natal,  
 College of Humanities,  
 School of Social Services,  
 Private Bag X01, Scottsville, 3209,  
 Pietermaritzburg.

Att. Prof. Stephen Mutula (Information Studies Programme)  
 Supervisor and Academic Leader, Development Cluster, Acting Dean

**RE: INTRODUCING MR. FARAJA NDUMBARO – PHD STUDENT AT  
 UNIVERSITY OF KWAZULU NATAL**

Reference is made to your letter dated 12<sup>th</sup> January, 2014 with the above heading.

Kindly be informed that the request of allowing Mr. Faraja Ndumbaro to carry out research at Sokoine University of Agriculture for his PhD studies has been accepted.

Yours Sincerely,



Prof. V.R.M. Muhikambele  
 Director, Research and Postgraduate Studies

Director  
 Research and Postgraduate Studies  
 Sokoine University of Agriculture  
 P.O. Box 3151, Morogoro  
 TANZANIA

Postal address:	Telephone:	Fax:	Telex:	E-mail Address:
P.O. Box 3151 Morogoro, Tanzania	+255 23 260 4388	+255 23 260 4388	55308 UNIVMOG TZ	drpgs@sua.ac.tz

## Appendix 7: Letter of introduction from the researcher requesting respondents' consent



University of KwaZulu-Natal,  
College of Humanities,  
School of Social Sciences,  
Private bag X01, Scottsville, 3209  
Pietermaritzburg.  
12 May 2014

Dear Respondent

Informed Consent Letter

**Researcher: Faraja Ndumbaro**  
Institution; University of KwaZulu-Natal  
Telephone number: +27718040520 / +255 758997381  
Email address: [213529783@stu.ukzn.ac.za](mailto:213529783@stu.ukzn.ac.za)

**Supervisor: Prof. S. Mutula**  
Institution: University of KwaZulu-Natal  
Telephone number: +27 (033) 260 5571  
Email address: [Mutulas@ukzn.ac.za](mailto:Mutulas@ukzn.ac.za)

I, Faraja Ndumbaro, of University of Kwazulu Natal, Pietermaritzburg, kindly invite you to participate in the research project entitled "**Collaborative Information Behaviors (CIB) of Undergraduates in Three Tanzanian Universities.**" This research project is undertaken as part of the requirements of the award of PhD (Information Studies), which is undertaken at the University of KwaZulu-Natal.

Participation in this research project is voluntary. You may refuse to participate or withdraw from the research project at any stage and for any reason without any form of disadvantage. There will be no monetary gain from participating in this research project. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Department of Information Studies, at the University of KwaZulu-Natal.

If you have any questions or concerns about participating in this study, please feel free to contact myself or my supervisor at the numbers indicated above.

Thank you for participating in this research project.

Signature

Date

I ..... hereby consent to participate in the above study.

Name: ..... Date: ..... Signature: .....

**Supervisor's details:**

**Prof. S. Mutula**  
Institution: University of KwaZulu-Natal  
Telephone number: +27 (033) 260 5571 /  
+27 712 750 109  
Email address: [Mutulas@ukzn.ac.za](mailto:Mutulas@ukzn.ac.za)

**Student's details:**

**Faraja Ndumbaro**  
Institution; University of KwaZulu-Natal  
Telephone number: +27 718 0405 20 /  
+255 758 997 381  
Email address: [213529783@stu.ukzn.ac.za](mailto:213529783@stu.ukzn.ac.za)

## Appendix 8: Focus group discussion guide for undergraduate students

### **Focus group discussion guide for undergraduate students**

This is a study of Collaborative Information Behavior (CIB) of undergraduate students in three Tanzanian universities. The objectives of the study are: (i) To investigate collaborative information behavioral patterns of undergraduate students (ii) To examine the challenges that undergraduates encounter during collaborative information seeking, sharing and use and (iii) To examine the applicability of Wilson (1996) model of information behaviour for studying collaborative information seeking, information sharing and use. I am kindly inviting you to participate in this focus group discussion. Your participation and contributions in this discussion would be greatly appreciated and valued.

### **Collaborative learning tasks and roles**

1. What are the objectives and outcomes that you intended to achieve from this collaborative group assignment?
2. In which aspects of collaborative learning did you find more appropriate to collaborate with your fellow students? Why?
3. What roles do each group member has in accomplishing different collaborative learning tasks?
4. In your opinions, how does the type of collaboration [collaboration in credit based learning assignments] influence the way you collaborate in seeking and using information?
5. What challenges did you face in accomplishing different collaborative learning tasks and activities?
6. How do you describe the role of faculties and librarians in supporting your collaborative assignments particularly on aspects of identification of information needs, information seeking, evaluating and using information?

### **Collaborative information behavior**

7. What type of information do you need during pre-field work phase, fieldwork phase and post fieldwork phase?
8. What information sources [including people, objects, artifacts, printed and electronic sources] have you accessed in order to get information that meet your needs? What are the reasons for your preferences?
9. What type of information is important in your group works? How do you evaluate the value of information that you have obtained from different sources?
10. What course of actions do you take when information that you have acquired does not address the need that gave rise to information seeking?
11. What kind of information do you share in within and outside your groups? What motivate you to share information?
12. How do you share information among group members or between groups? What influence you to choose a particular method of sharing information?
13. During fieldwork, have you encountered a situation where your fellow group member refused to share information with you? What do you think were the reasons for non sharing information?

*I thank you so much for your participation and contributions*

## Appendix 9: Interview guide for faculty members / field instructors

### **Interview guide for faculty members / Field supervisors**

This is a study of Collaborative Information Behavior (CIB) of undergraduate students in three Tanzanian universities. The objectives of the study are: (i) To investigate collaborative information behavioral patterns of undergraduate students (ii) To examine the challenges that undergraduates encounter during collaborative information seeking, sharing and use and (iii) To examine the applicability of Wilson (1996) model of information behaviour for studying collaborative information seeking, information sharing and use. I am kindly inviting you to participate in this focus group discussion. Your participation and contributions in this discussion would be greatly appreciated and valued.

1. What are the learning objectives and learning outcomes that you intend your students to achieve from this collaborative learning assignment?
2. What is your role as a faculty member / supervisor in the accomplishment of students' group work assignments?
3. How do your roles [supervisor/faculty members] have influenced the way group members:
  - (a) Define their information needs and understand the objective of their assignments.
  - (b) Identify information sources and seek information.
  - (c) Evaluate information found
  - (d) Share and use information to accomplish their group assignments.
4. From your experience what do you think are the common challenges that students face when working in collaborative learning assignments?
5. How would you describe the role of library in helping students to accomplish their collaborative academic assignments?
6. In your opinions what does the library need to do to support students' collaborative information behavioral activities?
7. What does the university need to do to support students' collaborative learning activities?

***Thank you so much for your time and inputs***



## Appendix 10: Interview guide for librarians

This is a study of Collaborative Information Behavior (CIB) of undergraduate students in three Tanzanian universities. The objectives of the study are: (i) To investigate collaborative information behavioral patterns of undergraduate students (ii) To examine the challenges that undergraduates encounter during collaborative information seeking, sharing and use and (iii) To examine the applicability of existing models of information behavior in collaborative information behavior context. I am kindly asking you to participate in this interview. Your participation and contributions would be greatly appreciated and valued.

### Background information

1. Name of the University: .....
2. Name of the library: .....
3. Date of interview: .....

### Academic libraries, students' collaborative work and collaborative information behavior

1. The use of library services and resources is always viewed as individual undertaking in which individual user seeks information to satisfy his or her information need. How would you describe the role of library in helping students to accomplish their collaborative academic assignments?
2. Most of the time University students work collaboratively to accomplish their learning based assignments. How are the library infrastructure, resources and services "user friendly" in supporting students' collaborative information behavioral work tasks?
3. What types of collaborative services and resources do you have in your library? To what extent are these resources and services used to support students' collaborative information behavioral activities?
4. What challenges do you face in supporting students collaborative information work tasks? What measures have you taken to overcome these challenges?
5. In your opinion what does the library need to do to support students' collaborative information tasks and activities?
6. What does the university need to do to support students' collaborative information behavioral activities?

Thank you so much for your time and inputs

## Appendix 11: Field observation guide

### **FIELD OBSERVATION CHECKLIST**

**Date:**

.....

**Time:**

.....

**Group no:**

.....

**Group activities:**

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**Case study:**

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#### **Collaborative learning task objectives and requirements**

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**Rationale:** Understand tasks requirements, task objectives and learning tasks environment and individual and group information needs

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#### **Information sharing and sharing practices**

**Rationale:** Incidences of information sharing, patterns in which information is shared within and across groups, patterns of non information sharing and motives for information sharing and non information sharing.

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**Collaborative learning and collaborative information behavioral challenges.** Observe challenges encountered by students in different stages of collaborative learning and collaborative information behavioral activities.

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#### **Group information evaluation**

Criteria used to evaluate information found. Motives for information evaluation, contextual factors influence students' collaborative information evaluation

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#### **Information seeking, Information sources preferences and Collaborative Information use**

Observe types of information sources preferred and used by students to accomplish different collaborative learning tasks. How different information sources are used across different learning tasks stages.

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#### **Other contextual factors shaping students collaborative information behavior:**

Contextual factors i.e. social and physical environmental, group composition, tasks requirements, external factors, roles of field instructors.

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