UNIVERSITY OF CAPE TOWN :: FACULTY OF COMMERCE

INFORMATION SYSTEMS

Acquired Status in Free and Open Source Software User Groups

Masters Thesis
Department of Information Systems

University of Cape Town

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In Satisfying the Requirements for the
Masters in Information Systems

To my dear wife Chipo and my beloved parents Sibongile and Brave.

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ABSTRACT

This study represents a seamless weaving of new and previously seemingly unrelated concepts on Free and Open Source Software (FOSS) participation into an integrated substantive framework. The research demonstrates how patterns of behaviour amongst FOSS participants serve as currency for the acquisition of status. Stages of the Basic Social Process (BSP) that lead to the resolution of the status concern are proposed. The core elements of the BSP are found to be Joining, Learning, Locating, Cultivating and Consolidating. These constructs represent the non-linear stages which the members of the community encountered in their FOSS journey towards acquiring status. The conditions for variation of the constructs are also addressed in this study. This was a qualitative study conducted through ten interviews with the senior members of the Cape Linux User Group. Observation of members was also done in meetings, mailing lists and the Internet Relay Chat (IRC) channel used by the members.

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ACKNOWLEDGEMENTS

I am heartily thankful to my supervisor, Professor Irwin Brown for his guidance and support from the initial to the final level which enabled me to develop not only an understanding of the subject area but also a great appreciation of the discipline.

I offer my regards and blessings to all the staff in the Information Systems department at the University of Cape Town. Lastly, I am thankful to all those who supported me in any respect during the completion of the project.

This material is based upon work supported financially by the National Research Foundation. Any opinion, findings and conclusions or recommendations expressed in this material are those of the author and therefore the NRF does not accept any liability in regard thereto.

1. INTRODUCTION

1.1. Background

Information Systems (IS) research is mired with a plurality of theory and methodologies adapted from its reference disciplines (Truex, Holmström & Keil, 2006). It has been characterised as a fragmented adhocracy (Chen & Hirschheim, 2004). Though the need for theory in the discipline has been widely agreed upon, very little has been done to address the concern as demonstrated by a paucity of theory. Information Systems researchers continue to borrow more and more theory from reference disciplines (Gregor, 2006).

York University lists up to 85 theories that are being actively used in the discipline, with eight that have been introduced in the last twelve months (York University, n.d.). Of all the theories listed only 16 originated from the Information Systems discipline. At the time of writing the eight new theories listed were the Technology-Organization-Environment Framework, Process Virtualisation theory, Lemon Market theory, Delone and McLean IS success model, Cognitive Load theory, Theory of Impression Management, Organizational Culture theory and the Yield Shift theory of satisfaction (York University, n.d.). Amongst these, only three, Process Virtualisation theory, Delone and McLean IS success model, and the Yield Shift Theory of Satisfaction are originally from the Information Systems discipline. These ratios demonstrate that though a significant proportion of new theories are being internally developed, the majority of the incoming theories are from reference disciplines. This is exacerbated by the observation that the adopted theories are borrowed from an increasingly wide array of disciplines ranging from Artificial intelligence (Argumentation Theory) to biology (Evolutionary Theory).

Borrowing theory risks: "repeating mistakes made, debated, and dealt [with] within the original disciplines' discourse; misinterpreting the underlying notions about the nature of reality and how knowledge is acquired that are implicit in the theory and the methodological implications those assumptions imply; and wasting time and effort by not adding value to the cumulative tradition in our own field" (Truex, Holmström, & Keil, 2006, p. 798). Information Systems researchers have given issues concerning epistemology and ontology greater precedence than issues pertaining to the requirement of a theoretical core in the discipline. While this has been ongoing, the Information Systems discipline continues to evolve, spawning unique social and cultural phenomenon which expose new facets of human interaction and behaviour. On-line communication has led to the

ballooning of the information age, giving birth to socio-cultural artefacts like Facebook and Free and Open Source Software (FOSS) which warrant introspective theory development from the discipline, with the latter being the subject of this study (Lyytinen & King, 2004).

1.2. Free and Open Source Software (FOSS)

In general, Free and Open Source Software (FOSS) is software which may be "freely used and its code freely read, distributed and modified" (Bruggink, 2003, p. 2). The user of FOSS can change it, package and re-distribute the software artefact without cost (Schmidt & Schnitzer, 2003). The freedom associated with FOSS is likened to "free speech and not free beer", which demonstrates that the libertarian aspect of the software is emphasised rather than its price.

1.3. Free vs Open Source

The term FOSS is often a subject of debate but can be best understood by separating the terms "Free" and "Open Source Software". Scacchi (2007), for instance, understands Free Software as a software movement and Open Source Software as a development methodology. Free Software is usually released on the General Public License (GPL) while Open Source Software (OSS) is released on the GPL, Mozilla Public License (MPL) or any other Open Source Initiative approved licence. Free and Open Source Software is often referred to as "copyleft" as the ideals are direct opposite to copyright laws.

To understand the difference it is useful to think of the Free Software community as that which is interested in the freedom that can be incorporated into software, while the Open Source community is predominantly interested in the software as technology. The former will use free software if it is worse in functionality to the proprietary version as long as it complies with the GNU Public Licence (GPL) and its versions, while Open Source advocates will only use a software if it is technically superior to the proprietary versions. To this end the primary foundations that represent the interests of these two groupings differ. The Free Software Foundation represents the interests of the Free Software pundits while the Open Source Initiative represents Open Source proponents. The interests of the two organisations intersect in many respects but where they differ, they do so sharply and irreconcilably. The interests intersect in that almost all Open Source software developed is indeed free software, however the proponents of the former focus on trying to make the software better, while the latter emphasise how to make it more ethical (Stallman, n.d.).

As highlighted previously, OSS is a methodological approach to software development, while Free

software is a movement (Scacchi, 2007). The Open Source Software Methodology of software development, is seen as an efficient and fast way to develop critical software packages. Interest has grown as to how the techniques common to the open source community can be imported into the commercial world. The areas of the methodology that are intriguing to commercial enterprise are cooperation, coordination, control and the multi-project ecosystem in the community (Scacchi, 2007). The methodology has challenged some of the longest held assumptions about project management and team work. It is thus no surprise that research in this area can illuminate some key weaknesses of traditional software development methods (Fitzgerald & Agerfalk, 2005).

1.4. Motivation

The issue of motivation for engaging in FOSS emerges as the core professional concern of researchers of the phenomenon (Lakhani & von Hippel, 2003; Bonaccorsi & Rossi, 2006; Shah, 2006). A professional concern is an issue that is hyped by the research community leading to its extensive coverage in the corresponding technical research publications (Glaser & Holton, 2004). In many instances the chief justification of inquiry in the area would be based on the fact that it is being covered by other researchers and hence making it publishable in the renowned outlets. Researchers of professional concerns often base their studies on a premise of context, stating that though the study has been done before, contextual issues have to be investigated. Though context is a contributing factor in some Information Systems discourse, it cannot be assumed to be in all cases, more-so in theory formulation.

The question of motive is widely investigated as researchers find it intriguing that individuals possessing the commercial skill of software engineering converge to produce a publicly available artefact (Lakhani & von Hippel, 2003). It has been characterised as the first question that any researcher of FOSS would want to answer (Bonaccorsi & Rossi, 2006). Despite widespread coverage of the motive issue, there is very little agreement on the true motives of FOSS programmers. Explanations range from financial (Bonaccorsi & Rossi, 2006), hobbyist (Shah, 2006) to career concerns (Lakhani & von Hippel, 2003). It is the opinion of the researcher that the core reasons why participants engage in the FOSS phenomenon will indeed continue to vary as much as context varies. However, the intrinsic character of the community in terms of ideology, is widely constant and hence the question most critical would be, not why the participants join the FOSS community, but how their differing motives serve to propagate the overall culture.

The issue of motivation is however not the only issue considered by researchers of FOSS. Allen

(2009) looks at the applicability of the open source model for business. The researcher argues that by separating contributions into a core, extensions and themes pattern, business can leverage the production of their software by receiving increased input from the FOSS community since the barrier to entry would have been minimised. Researchers, like Rose, Johnston and van Belle (2006), have investigated issues of FOSS adoption. These authors identify issues that enable and limit the adoption of FOSS within the business environment. Other researchers look at the macro-economic capabilities of FOSS and attempt to elucidate the potential benefits to developing nations as demonstrated in the proceeding section.

1.5. Free and Open Source Software in the Developing World

The espoused freedom in FOSS is appealing to Africa for the following reasons (Bruggink, 2003; Fuchs & Horak, 2008; Kshetri, 2004)

- Limited resources which do not permit heavy investment in Information Technology (IT)
- Pursuit of Millennium Development Goals where IT growth is seen as an enabler
- The promotion of technology ownership which is inherent in the FOSS doctrine
- Freedom to customise language and other settings thus preserving indigenous knowledge
- National security since the source code is accessible when handling confidential issues

Open Source Software has been widely researched as a tool for aiding in development initiatives in the third world (Fuchs & Horak, 2008). For this reason, African nations have shifted their focus to the phenomenon. South Africa is one of the few countries on the African continent to implement policies to that effect. However, the open source phenomenon is a multi faceted concept which if not well understood can fail to produce the expected economic results.

Shown in Table 1 below, are some micro and macro economic considerations to be made by governments in adopting FOSS, where the Linux operating system is a typical example. Kshetri (2004) rightly alludes to the possibility of using more resources in the appropriation of free software that would be the case with proprietary. From Table 1, the key determinants of success are local knowledge, support and the right laws in a country. Given that South Africa has implemented an Open Source Policy (South African Department of Public Service and Administration, 2006), it is thus the position of this study to assume that has been sufficiently dealt with. However the systemic nature of such grand initiatives requires a holistic consideration of the potential inhibitors and

success factors, amongst which an understanding of the community is critical.

Macro- and microinfluences on choosing Linux in developing countries

Factor	Positive effects	Negative effects
Microeconomics:		
Ownership	Slower obsolescence of basic infrastructure features help reduce total cost of ownership.	Lack of supports to deal with security vulnerabilities.
Effective use	Amenability to modification makes localized customization easier.	Ordinary users can't custom-configure the system. Costs of supporting custom changes can escalate dramatically over time.
Learning/switching	Switching costs might be lower compared to developed countries. Linux communities provide supportive environments for transition.	Undertaking to use the full complexity of Linux utilities and source code can lead to higher learning and switching costs.
Compatibility	Linux has high levels of compatibility and portability for old and used hardware.	Likely to be incompatible with business partners' technologies. Hardware-OS incompatibility if Linux device drivers are unavailable
Macroeconomics:		
Enforcement of intellectual property laws	Linux IP rules encompass both aggressive sharing of basic resources and support for business growth.	Proprietary versions of Linux depend on IP laws.
National security	Linux provides an easier basis for global sharing of security infrastructure	Microsoft's opening of codes increases Windows relative attractiveness.

Table 1: Economics of Free and Open Source Software (Kshetri, 2004)

It is because of the positive effects above, and other reasons, that FOSS has been presented as an evolutionary concept, capable of aiding in the development initiatives of many Third World countries (Kshetri, 2004 ; Camara & Fonseca, 2007 ; Fuchs & Horak, 2008). Open source software has been said to be an enabler in achieving some of the Millenium Development Goals (Bruggink, 2003). It is no wonder then that Brazil, Thailand (Camara & Fonseca, 2007) and South Africa (South African Department of Public Service and Administration, 2006), among other emerging economies, have responded positively to the trend by crafting policies that promote and support the open source initiatives.

Having crafted these policies, it is essential to focus on the development of local knowledge to support the phenomenon in a sustainable manner. This also confirms work by Camara and Fonseca (2007) who espouse that sustainability is key in the success of ICT in emerging nations.

Braa, et al., (2004) state that the first issue to consider is

" the challenge to make an information system work, in practice, over time, in a local setting. This involves shaping and adapting the systems to a given context, cultivating local learning processes, and institutionalizing routines of use that persist over

time .....We term this the problem of sustainability" p. 338

Aberdour (2007) agrees that sustainability is key to the success of open source projects. To create sustainable on-line networks requires the beneficiaries to understand, develop and maintain conditions that enable contributing to the organisation of the communities (Koh et al., 2007). This requirement can be met by the development of concepts to explain the communities and their activities. To tackle this issue and more, it is insightful to understand the context under which this study was undertaken, that is in South Africa.

1.6. Free and Open Source Software in South Africa

South Africa is home to numerous FOSS initiatives. A strong interest in FOSS is shown by the government which crafted a strategy which requires that all public departments seek out FOSS alternatives before implementing proprietary packages (South African Department of Public Service and Administration, 2006). The strategy envisions a situation where "open standards are a pre-requisite for all software development", "discrimination and prejudice are eliminated from all software procurement" and the "Open Source Software model [is] adopted for development of government systems" (South African Department of Public Service and Administration, 2006, p.3) and was approved in 2007. It is, in wording alone, a very strong statement for the acquisition and use of FOSS technologies across the nation. It is important to note that the term "Open Source" is often misunderstood and taken to incorporate "Free Software". The strategy adopted by the South African government highlights the benefits of "Open Source" as constituting the "Freedom to enhance....Freedom to redistribute" (South African Department of Public Service and Administration, 2006, p.17-18) by the "end user", tenets clearly derived from the "Free Software" movement. It is clear therefore, that in drafting the strategy, "open source" software was conflated with "free software", something not uncommon as the two usually intersect (Stallman, n.d).

The South African government has also demonstrated that it intends to take the issue of open standards seriously. Its dedication was demonstrated recently when it was the first country to appeal against the implementation of the ISO/IEC DIS 29500 Office Open XML (OOXML) standard by the international standards body ISO (International Organisation for Standards, 2008). The standard is widely viewed as being sympathetic to proprietorship and was indeed proposed by Microsoft Corporation, despite the existence of Open Document Format (ODF) that achieves the same

purpose. The government came out strongly against the OOXML standard and sought to rally support from other nations. In the end the standard was only opposed by a group of emerging economies comprising Brazil, India, South Africa and Venezuela and was eventually passed. However, the nations demonstrated how seriously the issue of proprietorship in software is now viewed in the developing world.

In practice, numerous FOSS initiatives are ongoing or at different stages of completion. Amongst these are Translate, which endeavours to translate software applications into the 11 official South African languages, AVOIR, which supports capacity building in FOSS and Scubuntu, a Linux platform for scientific computing. A layer of support has been spawned by commercial interests in the FOSS phenomenon as companies specialising in these technologies have been formed. The projects are also supported by the emergence of FOSS volunteer groups like the Cape Linux User Group (CLUG), Gauteng Linux User Group (GLUG), Ubuntu-ZA and Cape Town Python User Group (CTPUG), which offer front-line support for individuals involved in FOSS activities. The volunteer communities hence form reliable informants for the study as they interact with the interests of government, private enterprise and the FOSS artefacts in their day to day activities. The Cape Linux User Group was hence selected as a group that could produce relevant informants for this study.

1.7. Problem Statement

The Open Source phenomenon is a recent phenomenon hence it has been subject to numerous applications of unfamiliar theory. The social sciences and economics have tried to encapsulate the activities of the FOSS communities within pre-existing frameworks (Bitzer, Schrettl & Schroder, 2007; Krishnamurthy, 2006). Authors have approached the open source phenomenon as a study of technical objects and individuals, adopting approaches filled with pre-suppositions and ignoring the socio-cultural evolutionary nature of the phenomenon. The phenomenon is indeed a product and propagator of culture that is embedded in society and facilitated by technology and indeed existent in the real world, not an abstractly separated virtual world. Since it is unique, theories from reference disciplines cannot reflect the true nature of the phenomenon. Theories unique to FOSS are pertinent to open up full understanding of the field. It is because of this that an empirically grounded research methodology is best suited to study the phenomenon so as to allow for an IS centric theory to emerge. Such theories would also be beneficial from a developmental point of view. As developing nations thrive to compete, it is important to build substantive theories fully

applicable to developing countries. Further development of the substantive theories would lead to the development of more formal specifications on FOSS, which would also be beneficial to the IS discipline (Glaser & Strauss, 1967; Glaser & Holton, 2004).

As earlier alluded, Camara and Fonseca (2007) highlight the need for sustainability in the implementation of ICT in developing countries. Braa et al., (2004) suggest that this can be achieved by the cultivation of local learning to enable an information system to work in practice over time in a local setting. To enable this sustainable use of open source software, it is important therefore to build sustainable communities that develop and maintain this software (Koh et al., 2007). The chief challenge in building the sustainable networks in FOSS Communities, for stakeholders like government, is the absence of relevant theory on the phenomenon, a factor termed "theoretical tension" by Von Krogh and Spaeth (2007). The problem can however be resolved in two possible ways, (i) by adapting theory from a reference discipline or (ii) generating theory from empirical data.

In the case of open source software, the risks of adapting theory are compounded by the relative youth of the phenomenon. For a theory to fit the FOSS phenomenon, it therefore needs to be laboriously discovered from empirical data using a suitable methodology (Zmud, 1998).

2. METHODOLOGY

The research aimed to build a substantive theory on FOSS participation. Substantive theory is generated from the study of a phenomenon within an empirical area of sociological research while, to the contrary, formal theory is more abstract and is obtained from a conceptual area (Glaser & Strauss, 1967; Strauss & Corbin, 1990). Given the lamented absence of theory, in both FOSS as a subject area and Information Systems as a discipline, an exploratory and inductive approach is suitable (Von Krogh & Spaeth, 2007; Markus & Saunders, 2007). The approach chosen for this study was Grounded Theory Methodology (GTM) (Glaser & Strauss, 1967).

2.1. Grounded Theory Methodology

Grounded Theory Methodology (GTM), is a transcendental qualitative and quantitative research approach that has its roots in sociological enquiry (Glaser & Strauss, 1967). The core tenet in the methodology is that the findings of a GTM study are primarily based on the data surrounding a phenomenon, and not based on any *a priori* theoretical understanding (Glaser, 1978). According to Glaser (1992), GTM "has the purpose of generating concepts and their relationships that explain, account for and interpret the variation in a substantive area under study" (p. 19). Goulding (1998, p. 51) defines a grounded theory as that which has been "systematically obtained through social research and grounded in data". This approach ensures that the emerging theory is faithful to the persons being researched, faithful to context and can be used to discover enduring frameworks (Duchscher & Morgan, 2004).

2.2. Underlying Philosophy and Approach

GTM, in its complete form, has evolved into two main formulations (Matavire & Brown, 2008). The dominant approaches are commonly termed Glaserian and Straussian and are characterised as emergent and forcing respectively (Glaser, 1992; Duchscher & Morgan, 2004). These approaches are based on the originating authors differing perspectives on the application of the methodology's tenets.

2.3. Glaserian vs Straussian Grounded Theory

Following the initial publication on grounded theory (Glaser & Strauss, 1967), Strauss went on to publish additional insights into the methodology (Strauss & Corbin, 1990). In this new formulation,

the terms "axial coding" and "coding paradigm" were introduced. Axial coding is defined as "the process of relating categories to their sub-categories, termed "axial" because coding occurs around the axis of a category, linking categories at the level of properties and dimensions" (Strauss & Corbin, 1998, p. 123). The coding paradigm can best be described as family of codes which are meant to guide a process of generating the theoretical codes (Kelle, 2005). The generated codes are simultaneously integrated into the paradigm model which contains "conditions, context, strategies (action/interaction), and consequences" (Corbin & Strauss, 1990, p. 13).

It is this logico-deductive approach that led to Strauss and Corbin's (1990) formulation of GTM being associated with the term "forcing" by Glaser in his polemic monograph (Glaser, 1992). Similarly, the "emergence" concept is primarily associated with the Glaserian approach since Glaser (1992) believed that theory should emerge from data without the forcing of categories through Strauss and Corbin's excessive interrogation (Strauss & Corbin, 1990). The researcher believed that Glaserian GTM could generate theory that closely illuminated the key issues in the FOSS community. In order to ensure a close fit between the emergent theory and empirical data, void of *a priori* theorising, the Glaserian approach was chosen for this study.

2.4. Epistemology: Positivist, Interpretive or Neither?

It is important to note that the debates presented here, where tackled in retrospect, when the data had been gathered and analysed. This was done so as not to undermine the transcendental nature of GTM but to illuminate the intrinsic philosophical underpinnings embedded in the research process followed in this study. While GTM is sometimes associated with either positivism or interpretivism epistemologically, it has been demonstrated that the methodology itself does not fall within any particular paradigm (Matavire & Brown, 2008). Fitzgerald and Howcroft (1998) show that any epistemological stance can be assumed, based on the preferences of the researcher and more importantly the purpose of the research but *non sequitur* from the methodological choice. The arguments that follow do not therefore assume that all GTM research falls into the proposed paradigm but are merely a reflection of the approach adapted for this study.

Interpretive and positivist research forms the bulk of information systems research (Chen & Hirschheim, 2004). Information Systems researchers should not believe these are the only options but they should seek viable alternatives to address the underlying weaknesses of these paradigms. In this study, this is compounded by the grounded theory tenet that "all is data", qualitative or

quantitative, thereby placing it directly at odds with the empiricism and social constructivism characterising positivist and interpretive research respectively (Glaser, 1992; Goldkuhl, 2004; Mingers, 2004;).

GTM is a general research methodology which transcends qualitative data analysis techniques (Glaser, 1998). The criteria for a good grounded theory are that it must fit, work, be relevant and be readily modifiable (Glaser & Strauss, 1967). Both naive positivism and interpretivism would have been problematic in achieving a fitting theory (Lomborg & Kirkevold, 2003). Ideal positivism would have been problematic because it would have sought an infallible truth void of any socio-psychological consideration, while ideal interpretivism would have meant that the generated results are highly subjective (Lomborg & Kirkevold, 2003), thereby supporting irresponsible relativism.

While naturally, a constructivist approach would seem to be middle ground, as that adopted by Charmaz (2006), it is laden with highly structured preconceived questioning, which in turn goes against inductivist grounded theory. Glaser (2002) alludes to the paradigmatic fallacy of accuracy embedded within constructivism, which is borne of qualitative data analysis techniques and is not grounded theory. The researcher sought to illuminate the core concerns of the South African FOSS Community. Constructivism would have discounted "the participant's main concern, which is always relevant to ongoing resolving behaviour, in favour of the researcher's professional concern " (Glaser, 2002, p. 4). The constructivist middle ground is therefore rejected in this research. Since positivism, interpretivism and constructivism had been found unsuitable in accounting for this study, critical realism was explored (Mingers, 2004).

2.5. Critical Realism: Ontology and Epistemology

Critical Realism was developed "(i) to re-establish a realist view of being in the ontological domain whilst accepting the relativism of knowledge as socially and historically conditioned in the epistemological domain; and (ii) to argue for a critical naturalism in social science." (Mingers, 2004, p. 91). In other words, critical realism recognises that the truth exists out there but cannot be fully grasped owing to socio-psychological limitations (Guba, 1990). It is an attempt to redress the problems associated with naïve realism which, in the ontic domain, alludes to the existence of a real world that can be perfectly perceived on the epistemic level. In critical realism, the world is real and driven by natural causes whose perception is limited by human cognition (Guba, 1990). This is in line with a grounded theory where it cannot be debunked but continues to be developed as new data

emerges (Glaser & Strauss, 1967). This is acknowledging the limited cognitive ability of an individual in one setting, with limited data when attempting to discover a conclusive non-modifiable theory.

2.6. Critical Realism: Imbalances

Guba (1990) notes four imbalances in the adoption of the the critical realist paradigm. The imbalances exist between, "rigour and relevance", "precision and richness", "elegance and applicability", and finally "discovery and verification". The following sections, note these imbalances and hypothesises as to how the methodology followed addresses these.

In the case of rigour and relevance, Glaser (2004) espouses that by following the rigorous procedures a relevant theory is generated. For qualitative data analysis however, this issue would be of primary importance. If GTM is eroded by the application of Qualitative Data Analysis (QDA) standards, a trade-off would exist between rigour and relevance since the focus would be on credibility, auditability and fit of the generated theory (Guba, 1990; Chiovitti & Piran, 2003; Glaser, 1998). Following grounded theory canons, with care, answers the problem of rigour (Corbin & Strauss, 1990). The conceptual hypotheses emergent in GTM are also relevant to "any time, place and people" (Glaser, 2002a). This relevance is achieved through careful application of constant comparative analysis. Hence the issue of relevance was addressed without a trade-off to rigour.

Another imbalance noted by Guba (1990) in the adoption of the critical realist paradigm is that of "precision and richness". In an endeavour to be precise, researchers are likely to directly question data and hence embed it with preconceived ideas thereby eroding the generated theory (Glaser, 1992). GTM is an inductive methodology which does not advocate for direct questioning of the data least the emergence principle be violated. The richness of a grounded theory is generated via sorting (Glaser, 2004), which shall be elaborated on in the proceeding sections. Typically, the data mostly gathered in the process is qualitative, hence the empiricist's desire to be precise is also stifled in the application of Glaserian GTM. The "precision and richness" imbalance was therefore addressed in using Glaserian GTM for the research.

The third imbalance, "elegance and applicability", is that which occurs in the attempt to press toward generating predictive and controlling formal theories (Guba, 1990). The theories generated in this regard are found often not to meet their intended targets and be poorly representative of their

subject area due to lack of grounding (Glaser & Strauss, 1967). This would be typical of research that borrows theory from reference disciplines instead of creating its own in the belief that "data should fit theory" (Glaser & Strauss, 1967, p. 261). This contrasts the inductive position taken in this research in which theory should fit the data. Furthermore, the study did not seek formal but substantive theory. Generating theory using GTM ensured that the imbalance was addressed as the outcome is faithful to the subject area.

The fourth and final imbalance is between "discovery and verification". At this point, it is important to note that this study sought out to discover a substantive theory of participation in the FOSS Community in South Africa, not to verify it. Clearly advances in all disciplines were achieved through discovery, not verification. While naive discovery lies on the extreme end of the continuum, what is sought in grounded theory is "credibility, plausibility and trustworthiness" of the theory generated (Glaser & Strauss, 1967, p. 223; Guba, 1990). The process of generating grounded theory is systematic and rigorous. A parsimonious theory is achieved by following the tenets of the methodology. One tenet is that of memoing, which allows the researcher to "verify categories and their integration and fit, relevance and work for the theory" (Glaser & Holton, 2004). With internal verification highlighted, Glaser (1978, p. 93) states that "the goal of grounded theory is to generate a theory that accounts for a pattern of behaviour which is relevant and problematic for those involved. The goal is not voluminous description, not clever verification". Verification is a goal of qualitative data analysis techniques, and should not be laced with grounded theory, ergo the imbalance was noted and addressed.

Critical realism therefore acknowledges the origins of GTM from symbolic interactionism on the epistemological and ontological levels. Responding to a call for the use of critical realism as an alternative paradigm for Information Systems research (Mingers, 2004), it is hence adopted in this study. It has been shown above that the problems raised in using the paradigm (Guba, 1990) are adequately addressed within the canons and procedures of GTM (Glaser & Strauss, 1967; Glaser, 1978). Glaser (2002a, p. 10) also states that "theory is not reality, but our perception or organization of reality, perhaps closely resembling reality, but not reality *per se*" , thereby showing compatibility of Glaserian GTM and the critical realist paradigm and hence the paradigms adoption in this study.

2.7. Critical Realism for Interpretive Research

The core concern emergent from the use of critical realism for this study came from the exclusive use of interviews and observation for data collection. Epistemologically, participant interpreted data

was collected in interviews and further interpreted by the researcher along with the interpretation of the observed. The researcher, ontologically, acknowledged the existence of an objective reality within the FOSS community, a reality to which members join and participate. It is hence because of this that aspects of interpretivism can be observed and are indeed acknowledged. Walsham (2006, p. 320) agrees to the possiblity of such a research stance by alluding to "critical realism as one possible philosophical position underpinning interpretive research".

3. RESEARCH APPROACH

The FOSS community exhibits some unique characteristics which promote research. It is a genuinely unique emerging phenomenon which to be understood requires the collection of data from all possible sources. The primary purpose of this research was the determination of the core concern amongst FOSS community participants and discovering the activities they undertake to resolve the concern. The study was predominantly centred around an interview strategy. The "all is data" mantra espoused in GTM was followed. Although all sources that could be viewed as contributing to evidence of concepts like discussion forums and community meetings were analysed, the predominant sources of data were interviews and observation.

3.1. Qualitative versus Quantitative Research

The value of quantitative and qualitative research has been an issue of debate in Information Systems. Fitzgerald and Howcroft (1998) define quantitative research as that which uses "mathematical and statistical tools to identify facts and causal relationships" (p. 319). The quantitative methods are classified as hard and inversely, qualitative methods as soft. Qualitative research does not depend on quantification and the use of statistical processes to arrive at the findings but rather requires interviews, observation and documents to comprehend social phenomenon (Myers, 1997). Qualitative research entails a process of illuminating a study area and possibly extrapolating the findings to other areas that can be considered as similar (Hoepfl, 1997).

Trauth (2001) posits reasons for performing qualitative inquiry as those encompassing the nature of the problem, methodological choice, degree of uncertainty, the researchers skills and institutional influence. She demonstrates that the less that is known about phenomenon, such as FOSS, the more qualitative inquiry becomes appropriate. Von Krogh and Spaeth (2007) describe the "theoretical tension" in the open source phenomenon as one of the promoters of research in the field. Very little is understood about FOSS and therefore a loose qualitative approach was preferred for conducting the research. The component constituents of qualitative enquiry are the data, the procedures for analysing data and arriving at the findings, and the resulting report, all of which are systematically catered for in applying Glaserian GTM.

It is important to note that the Glaserian GTM approach adopted for this study recognised any data surrounding the phenomenon as necessary and relevant (Glaser & Strauss, 1967; Glaser, 1992), including the tacit knowledge held by the researcher. Though an exploratory and inductive stance was taken in this study, the analysed data was predominantly qualitative. This should not mislead

into the notion that this is a qualitative study as only the nature of this phenomenon led to such data. Glaser and Holton (2004) blame the qualitative/quantitative misunderstanding of GTM as a source of contention causing researchers to use strict qualitative data analysis procedures in judging grounded theory. Glaser (1992) sums up the qualitative/quantitative dichotomies argument within grounded theory methodology by stating that "all is data".

3.2. Sample

Morse (2007) espouses that grounded theory sampling typically goes through numerous stages and changes from scheme to scheme. Typically, the first sampling scheme would be convenience sampling. In this stage, which is at the onset of the research, the researcher selected the most accessible participants. The most accessible, for this particular case, were members of the Cape Linux User Group (CLUG) who held monthly meetings at the researcher's university. It is worthwhile to deal, at this juncture, with the ethical issues regarding the naming of CLUG as the research organisation.

3.2.1. Open Source Ethics

While, for proprietary organisations, the issue of naming the research organisations in academic research is often contentious (Vinson & Singer, 2001), the FOSS phenomenon is directly contradictory to copyright concerns. It is argued that it is this sharing of information and publicised critique in FOSS that has led to its success and rapid progress (Berry, 2004). As a senior member stated on the CLUG Internet Relay Chat (IRC) channel, when asked about using a pseudonym for the user group:

> *"other companies, their main focus will be making money or something, so if hiding their flaws helps them do that, they'll want to do that...open source is maybe only about bettering itself, so it'd want as much criticism as possible, to fix its flaws"*

It is because of this background that the predominant research organisation is refered to by its name, CLUG.

3.2.2. Background and Context of research Organisation

The Cape Linux User Group (CLUG) was identified as the primary source of data for the study. The group is a "A non-profit organization dedicated to the promotion of Linux and open-source software

in the Western Cape province of South Africa" (Cape Linux User Group, n.d). The membership of CLUG can be distinguished according to the mailing lists that individuals belong to as shown in Table 2, below.

Mailing List	Description	Membership
clug-announce	Used to announce CLUG meetings and general events.	487
clug-tech	Used by users to ask Open Source technical questions and share solutions.	438
clug-chat	It's meant for discussions on open-source software and Linux related topics.	293
clug-noise	A mailing list that exists purely for socialising and content that would be inappropriate for other lists	87
clug-work	For Open Source-related employment. Members may post requests for support, contracts and job adverts.	324
Total (unique)		**861**

Table 2: CLUG Membership (Cape Linux User Group, n.d)

The history of CLUG is predominantly anecdotal. What is clear however is that the community developed in the mid to late 90s with experts congregating to discuss Linux problems they may have encountered in their work places, homes or studies. A significant number of students from the Cape Town universities have been part of the community since its inception. Given the influence by students and academics from the institutes, the community has held most of its meetings to date on campus grounds. Over the years, CLUG as spawned other specialised groups like Cape Town Python Users Group (CTPUG) who have retained membership to the main body. Members from CLUG hence represent the membership of other FOSS groups in South Africa. Joining the group is entirely voluntary and free.

CLUG activities are co-ordinated by an elected committee according to the body's constitution. The committee consists of a "Chairperson, Vice-Chairperson, Treasurer, Secretary and five members elected at the Annual General Meeting" (Cape Linux User Group, n.d.). A member of CLUG is defined as an individual who subscribes to the mailing list and has attended at least one of the

group's monthly meetings. Membership is subject to an adherence to the constitution and mailing list rules and can be revoked.

3.2.3. Research Participants

It is pertinent to seek out what has been termed the "excellent informant" by Morse (2007). This, according to Morse (2007) would be an individual who has witnessed and joined the phenomenon under investigation and can be by all means be termed a professional in the area under study. No demographic criteria was used to select the participants as this would have implied preconception on the part of the researcher, which would have had a significant eroding impact on the result. This is not to state that issues of a demographic nature were ignored in the final analysis, but certainly so in the sampling stage. Strauss and Corbin (1990, p. 45) state that the "initial decisions for the theoretical collection of data are based only on a general sociological perspective and .... problem area .... not on a preconceived theoretical framework". This is not at odds with the Glaserian formulation of the methodology and was applicable in selecting the initial participants. The researcher targeted senior members of the Cape Linux User Group, who convened and led the monthly meetings. To access these members, the researcher joined the group as an official member.

The second step posited by Morse (2007) is purposeful sampling. This happens as soon as the initial categories have started to emerge from data. The first interviews showed the researcher how the phenomenon is understood by the participants. Gaining this understanding, it was easy to use these preliminary concepts to define some way forward. The participants also directed the researcher as to possible avenues to pursue in order to obtain rich data. Glaser (1978) identifies the process of theoretical sampling as another step in the research process. The emerging theory directed the researcher as to which data should be collected and where it could be found. The criteria for theoretical sampling is of "theoretical purpose and relevance, not of structural circumstance" and should not be guided by preconception (Glaser & Strauss, 1967, p. 48). In this study, the members interviewed after the initial stages of the study spoke about the interviews to other members of the community in the CLUG Internet Relay Chat (IRC) room, which the author was monitoring. Using this, the author identified other members to interview for the study based on the categories from the initial analysis. The interview questions were changed for the second round of interviews according to emerging constructs.

3.3. Data Collection

Grounded theory begins when the field is entered and data starts being collected (Glaser & Strauss, 1967). To construct a strong grounded theory, it was important for the researcher to have a strong direction in the source and sort of data to be sought. Glaser (1992) argues that the source of data whether qualitative or quantitative is irrelevant, as "all is data". Glaser and Holton (2004) place the onus on the researcher to decide what data they will use. The researcher accepts that he did not approach the research setting *tabula rasa*, which enhanced his theoretical sensitivity and hence the ability to see the participants world through their eyes (Glaser, 1978). Emanating from the relative accessibility of the research subjects, interviews were the major data collection method. FOSS participants are known to believe in the freedom to share knowledge without cost and hence were readily available for interviews. A total of ten CLUG members were interviewed in the study, three in the first round and seven in the proceeding one over a period of six months as presented in Table 3 below. Senior founder members are those who witnessed the inception of the group, senior members are those who have served on the committee before and/or during the course of the study, while members are those who actively participate in the activities organised by the committee. Participant 5 and 6 were interviewed within a single session.

Participant	Gender	Position
1	Male	Senior Founder Member
2	Male	Senior Member
3	Male	Senior Member
4	Male	Senior Member
5	Male	Senior Member
6	Female	Member
7	Male	Member
8	Male	Senior Founder Member
9	Male	Member
10	Male	Senior Member

Table 3: Research Participants

Historically, grounded theorists have been criticised for not paying much attention to data (Wimpenny & Gass, 2000). For this study, intensive interview techniques were adopted to

ensure that the data was sufficient. Field notes were the prefered record keeping method over tape recording so as to avoid over-conceptualisation in analysis in accordance with Glaserian GTM (Glaser, 1998). The interviews were predominantly semi-structured containing semi-focussed questions to allow the participants to reflect on the areas of interest. Some open ended questions were used to start the discussions and to encourage "unanticipated statements" to emerge (Charmaz, 2006, p. 26). The questions asked in the initial interviews are attached in Appendix 3, and were derived from general questions in GTM literature (Charmaz, 2006), hence no pre-conception is assumed in the questioning. While Charmaz (2006) advocates for a constructivist GTM approach, these views were not adopted in this research. Her book was however insightful in understanding the debates surrounding GTM.

The CLUG community convenes regular meetings. The researcher attended five of CLUG's monthly meetings while only two were approached with the specific intent of group observation. Particularly insightful was a meeting in which a panel discussion themed "What can/should CLUG do" was convened. Field notes from the meetings were recorded for analysis with the verbal consent of the chair and/or speaker of the day. Such opportunities provided insight into the issues faced by the community. Furthermore the meetings served as a platform from which the researcher was exposed to some potential interviewees.

Following GTM, theoretical memos were recorded during the data collection and analysis process and they constituted secondary data which was also analysed in memo sorting (Glaser & Strauss, 1967; Glaser, 1978). As analysis continued, the research questions became more defined as the core concern of the participants emerged.

3.4. Data Analysis

As alluded to earlier, data was collected and recorded in the form of field notes. This is because word for word transcribing as espoused in GTM would have resulted in over-conceptualisation had interview transcripts been used (Glaser, 1998). Hard copies of the notes were retained for future reference. Line by line analysis was conducted on the field notes of the interviews in the tradition of GTM. Digital data analysis was not considered therefore hard copies of the field notes were made for backup purposes.

In accordance with GTM canons, data analysis started when collection was initiated (Glaser & Strauss, 1967). Coding and analysis of data in grounded theory forms a central process in theory

building (Strauss & Corbin, 1990). Glaserian GTM analysis is constituted of open coding, selective coding and theoretical coding. Straussian grounded theory has axial coding in place of theoretical coding. Glaserian GTM espouses that the use of theoretical codes precludes axial coding (Glaser, 1992). Given the researchers choice in using the Glaserian approach, no axial coding was used in this study.

3.5. Open Coding

Open coding is the process by which field notes are to be analysed line by line to identify concepts (Glaser & Holton, 2004). During this process the researcher tried to answer a set of questions. The general questions are , "what is this data a study of?", "what category does this incident indicate?", "what is actually happening in the data?", "what is the main concern being faced by the participants?" and finally "what accounts for the continual resolving of this concern?" (Glaser, 1978; Charmaz, 2006). These questions were used to enhance the researchers theoretical sensitivity. It is called open coding, as the data was "run open", with all possible categories being explored (Glaser, 2004). To avoid researchers leaping to concepts, it his highly recommended that the codes that emerge be as closely tied to the text, and where possible be *in vivo*. The researcher therefore generated as many *in vivo* codes as possible and where necessary, conceptual codes were used. The result of this process were dense codes which, to the extent possible, were not loaded with the researchers preconceived ideas. Memos were also recorded as ideas about the data entered the researchers mind. Once the data was coded according to the tenets of open coding, the researcher knew where to collect data next using theoretical sampling, and more specifically, what questions to ask (Glaser, 1978). In this study the sample was primarily derived from CLUG, and the issue of theoretical sampling, though not pursued in the sense of seeking out informants from other groups, was pursued in identifying the senior members who were able to confidently answer questions derived from the emergent constructs.

3.6. Selective Coding

When the researcher ceased open coding, selective coding ensued (Duchscher & Morgan, 2004). It was important for the researcher to patiently follow the tenets enunciated for grounded theory since premature closure of the process would have yielded poor results, unreflective of the phenomenon under study (Skodol-Wilson & Ambler-Hutchinson, 1996). Selective coding is a process of "delimiting the coding to only those variables that relate to the core variable in sufficiently significant ways to be used in a parsimonious theory " (Glaser, 1978, p. 61). The developed categories and core variable pointed the direction for further theoretical sampling. During this

process the researcher continued to write memos as the ideas became clearer. It is important at this stage to urge the reader not to assume the linear progression of the steps as assumed in the write up. The stages where followed in a highly iterative way, with selective coding only being concluded during writing.

3.7. Theoretical Coding

Theoretical coding is a more complex process involving the conceptualising of codes from the previous step and exploring how they can possibly be integrated into sound theory using constant comparative analysis (Glaser & Holton, 2004). The arising substantive codes formed the basis for theoretical codes. Glaser (1978) discovered 18 theoretical code families into which the emerging concepts could fit. The theoretical codes, however are not absolute and the researcher, where necessary, generates his own code families as encouraged by Glaser (1992) thus avoiding a forced preconception of ideas. While a review of the coding families espoused by Glaser (1978) was performed at this stage, what clearly emerged is that most coding families had elements which could be assumed representative of this work. The relationships between codes was thought out at this stage. The codes gave "integrative scope, broad pictures and a new perspective" (Glaser, 1978, p. 72) to the researcher. To avoid falling to pet themes and preconception, the researcher endeavoured to get direction from the data and the literature that was reviewed.

3.8. Literature Reviewing

A critical, often contentious, feature of GTM is the simultaneous literature review that proceeds with the data collection and analysis (Glaser, 1992). As concepts and categories emerge during theoretical coding, the analytical prowess of the researcher will be sharpened through the reviewing of literature that is aligned to the emerging concepts (Glaser & Strauss, 1967; Glaser, 1978; Glaser, 1992). Since it was the intention of this research to stay within the bounds of the Glaserian GTM approach, it was important to keep within its tenets. This analysis of literature during data analysis helped shape the emerging theory and formulate the theoretical framework to report the emergent ideas. It is also important at this stage to urge the reader not to assume the linear progression of the write-up to be demonstrative of the processes followed.

3.9. Theoretical Memoing

In all processes and activities in the research, the researcher recorded theoretical memos. According to Glaser (1978), without this stage there is no grounded theory. The memos accumulated into a memo fund and were used to generate a parsimonious theory in theoretical coding and sorting. They were used in assimilating this write up of the thesis as they represented the theoretical growth of the

grounded theory.

3.10. Theoretical Saturation

To avoid the premature closure highlighted by Skodol-Wilson and Ambler-Hutchinson (1996), the analysis as highlighted above continued until a point of theoretical saturation was reached (Eisenhardt, 1989). Theoretical saturation is a point in the research where "1) no new or relevant data are emerging regarding a category, (2) development of the category's properties and dimensions can withstand variations in the context of the phenomenon, (3) the relationships amongst categories are well established" (Duchscher & Morgan, 2004, p. 610). Collecting data beyond this point would not have added to the categories and therefore data collection will ceased.

3.11. Theoretical Sorting

Through the constant comparative analysis, the researcher wrote memos on ideas conceptualised in open coding, selective coding and theoretical coding. The sorting of these memos in the pursuit of theory formulation constituted the final stage of analysis. The researcher sorted, not the data but concepts thereby creating a theoretical outline of his work (Glaser, 1978; Glaser & Holton, 2004). During this process connections between theoretical codes were seen and documented. It is also at this stage that ideas from the data analysis formed into a continuous thread that constitutes the theory. Before this stage, the codes were fragmented and difficult to integrate into a parsimonious theory. The stage also served to elucidate the guiding theme through the findings and aided in structuring this write up. In fact, during sorting the researcher sought out a core theme from the memos, which could account for the majority of concepts generated during memo ideation. Without this stage there would have been no write-up. Memo sorting is an extremely subjective stage of GTM where the researcher saw numerous opportunities to dwell on the professional concern. However, this was noted and avoided accordingly.

3.12. Access, Privacy, Confidentiality and Ethics

Upholding ethical concerns is a basic concern in professional practice, and especially in issues to do with the collection of personal data like research. The Department of Information Systems overseeing this research is especially concerned with this issue. The student researcher took every precaution necessary to stay within the bounds of this requirement. The data collected was, and will be, strictly, not shared with third parties. Following regulations set out by the University of Cape Town, an ethics form was submitted to the "Ethics in Research Committee" at the institute. An interview consent form was presented to the participants to ensure that they understood the ethical issues surrounding the research before they partook. The document is attached as Appendix 4, for

clarification and to give assurance that these ethical aspects were of prime importance in this work. The final presentation is not confidential. Participants will be maintained as anonymous. Confidential information shall be treated as such without exception. No individual was forced to divulge any information as participation was voluntary. In cases where group sessions were used to solicit for opinions, anonymity of the individual participants was also assured.

4. LITERATURE REVIEW ON "GROUNDED THEORY" IN IS RESEARCH

Basing on the inductivist nature of the grounded theory methodology, the author did not initially immerse himself in the technical literature of the substantive area under study, that is the FOSS phenomenon (Glaser & Strauss, 1967). However, because the literature reviewing process represents a deliverable in the Information Systems Masters course, a meta-analysis of the use of Grounded Theory Methodology in IS research was undertaken. The top 50 IS journals were used to search for any studies using the methodology (Lewis, Templeton, & Luo, 2007). The results of the analysis led to the development of the paper in Appendix A, which was presented at the South African Institute of Computer Scientists and Information Technologists annual conference, 2008. The papers assesed by the researcher in the meta-analysis of Information Systems GTM studies are listed in Appendix 2. A review of the literature within the substantive research area was only undertaken during memo sorting. At this point key issues that had emergent fit, from literature, were incorporated into the study. However, the literature review of GTM in Information Systems research is discussed.

4.1. Background

To analyse the relevant material, a criteria had to be established on the selection of publication sources. This is particularly relevant given that the IS discipline is known to have more than 600 active journal publications (Lamp, 2005). The study sought to reveal practices in the IS discipline hence any of these sources would have been relevant. However, researchers typically target the most prestigious outlets for their research. Lewis, Templeton and Luo (2007) conducted a scientometric study to establish validity of metrics used to ascertain journal quality in information systems research. In Lewis et al., (2007), a list of the top 50 Information Systems journals was espoused and this was used as the source for the GTM publications analysed in this review. (See Appendix 5).

An on-line academic article search was conducted for articles in the journals specified in Appendix 5. The papers used for the literature review were identified using "grounded theory" as the search keywords. To search within the body of the document, the "TX" keyword was used for the EBSCOHost database. A typical search query would look as follows , (JN "International Journal of Electronic Commerce" and TX "grounded theory"). For publications not appearing in the *EBSCOHost database the search was supplemented using Google© Scholar Advanced Search,* ScienceDirect, Emerald Fulltext and JSTOR with the same search keywords. In some cases, the

interlibrary loan system was used to obtain hard copies of articles where they could not be obtained through the electronic journal lists. The findings of the search exercise are shown in Table 4, below.

Journal Ranking	Journal Title	Articles using GTM
1	MIS Quarterly	10
2	Journal of Management Information Systems	14
2	Information Systems Research	2
4	Communications of the ACM	7
5	Information & Management	4
6	Decision Support Systems	2
7	European Journal of Information Systems	9
8	Journal of Strategic Information Systems	2
10	Information Systems Journal	11
10	Journal of the Association of Information Systems	1
12	Information and Organisation	1
15	International Journal of Human & Computer Studies	2
15	ACM Transactions on Information Systems	1
15	Journal of Organisational Computing and Electronic Commerce	2
15	Information Society	5
20	Information Technology & People	16
25	Journal of Computer Information Systems	1
25	International Journal of Information Management	1
25	Information Systems Management	2
32	Electronic Markets	3
34	Journal of Information Systems Education	1
34	Scandanavian Journal of Information Systems	7
34	Australian Journal of Information Systems	1
34	Information Processing and Management	1
34	Journal of Global Information Management	1
41	Journal of Information Technology Education	2
45	Computer Supported Cooperative Work	3
45	E-Service Journal	1
47	Informing Science	1
47	Information Research	12
Total Result		**126**

Table 4: Journals with GTM Articles

The articles retrieved were published from 1985 to 2007. 1985 was inductively chosen as it signifies the first relevant IS article using GTM. The search yielded a total of 272 articles out of which 146 where eliminated. They were eliminated as they did not use GTM or any of its canons to conduct research. Other articles where eliminated as they were published in 2008 and above, cases which would give inconclusive findings due to to page indexing algorithms and the fact that 2009 has not ended. A total of 4 articles from Wirtschaftsinformatik could not be included in the study as they did not use English as their language of presenting their research. Two more articles were also eliminated from the study given that they did not specify enough to be included in the research based on the categories determined for the analysis as explained below. The remaining relevant

articles for this study were 126. In the top 50 IS journals the relevant articles were located in only 30 journals as shown in Table 4, above.

The text of each of the 126 articles was analysed for classification. The classification scheme was based on the year of publication, GTM approach, epistemology, a priori theory and publication outlet. A primary understanding of the principles of interpretive research espoused by Klein and Myers (1999) was necessary to determine whether a study could be classified as interpretive or positivist. These are the principles of the Hermeneutic Circle, Contextualisation, Interaction, Abstraction and Generalisation, Dialogical Reasoning, Multiple Interpretation, and Suspicion. It was also important to develop criteria to distinguish as to which GTM approach was used in each study. The table below shows the framework adopted.

	Constant Comparative Analysis	**Principles of GTM**	**Coding Techniques**	**Adherence to paradigm model**	**A priori technical literature review**
Glaserian	Required	Required	Open and Selective Coding	Families of codes can emerge into the model not the deductive opposite.	Not permissable.
Straussian	Required	Required. However Glaser (1992) highlights a difference in the directive questioning of Straussian GTM inhibiting the principle of emergence.	Open, Axial and Selective Coding	Stated by Strauss and Corbin (1990) as a requirement	Not permissable. However limited exposure is tolerated.
Analysis Techniques	Optional	Not Required	Open, Axial or Selective coding in any desired combination	No	Not specific
Mixed Method	Optional	Optional	Open, Axial or Selective in any desired combination	No	Not specific

Table 5: Criteria for Classifying GTM Approaches

As grounded theory is meant to develop theory, it was interesting to discover whether researchers used GTM with prior theoretical understanding hence the presence of *a priori* theory in the classification scheme.

4.2. Literature Review Findings

Using the classification scheme stated above, each individual paper using GTM or its tenets was analysed. The findings are presented below, under the relevant classification headings.

4.2.1. By Year of Publication

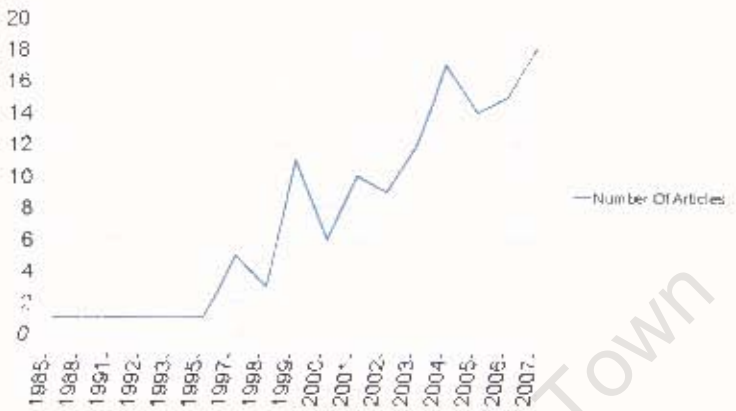

Figure 1: GTM Articles per year

The distribution of articles for the years from 1985 to 2007 are shown in Figure 1 above. For analysis purpose, the publications can be grouped into three time periods based on the relative increase of publications in the period. The first period of relatively slow publication of GTM studies is from 1985 to 1994, inclusive, where there was one article per year utilising GTM or its tenets. The second period in which a steady increase is observed is from the year 1995 to 2000. The third and last period which shows sharper increase is from 2001 to 2007. The periods specified are inclusive of their lower and upper limits.

In the first decade, from 1985 to 1994 there was a constant minimum of studies employing GTM. In this period, 40% of articles used the Glaserian approach while 40 % used the analysis techniques and the remainder using the Straussian GTM. No studies in this period utilised the mixed approach since the GTM approaches encouraging methodological pluralism appeared latter (Eisenhardt 1989; Baskerville & Pries-Heje 1999). One study in this period presented a paper that has been widely cited. The article presented a study using Straussian GTM by Orlikowski (1993) in MIS Quarterly. It investigated experiences in the adoption of CASE tools in organisations and serves as a testimony of the possibilities when utilising GTM. A significant 60% of GTM studies in the first decade were positivist while 40% adopted an interpretive stance. Note that the complete reference list of studies

used in this analysis appears in Appendix 2.

In the next six years, from 1995 to 2000, there is a constant increase in the use of GTM methodology in IS publications. There are 45% fewer GTM publications in 2000 as compared to 1999, which to date constitutes the largest drop. The Journal of MIS and fittingly Information Technology and People published 16 articles altogether in the specified 1999 to 2000 period, evenly distributed between them. In total, 26 articles were published during this period. That means in just over half the period, comparing with the period 1985 to 1999, which is fifteen years inclusive, the journal articles utilising GTM or its tenets had more than quadrupled. This leap could be credited to the increase in awareness of the possibility of using GTM as a qualitative method, spawned by the work of Strauss and Corbin (1990). Data shows that 46% of articles in this period were using the GTM analysis techniques, that is open, axial and selective coding, without aligning themselves to any particular methodological approach. A further 23% of authors were using the Straussian GTM approach as compared to only 12% for Glaserian. The remaining 19% adopted the mixed methodological approach, particularly Eisenhardt's (1989) grounded case study approach. Epistemologically, the studies in this half decade had shifted from positivist to predominantly interpretive. Only 31% were positivist while more than double, 69%, were interpretive.

From the year 2001 to 2007, a sharper increase in the use of GTM methodology is observed in IS research. A total of 18 articles were published in 2007 alone, almost reaching the 26 published in the second period, between 1995 and 2000. In the analysis, this was highest number of articles published in one year. The total number published between the years 2001 and 2007 is 95. Of the 95 articles, only 5% used the Glaserian GTM approach. A further 67% used the analysis techniques espoused by Strauss & Corbin (1990) while 13% used GTM within a multi-method approach. The remaining 15% used Straussian GTM. Furthermore, 62% of articles in this period were interpretive, a 7% drop from the second period.

4.2.2. By GTM approach

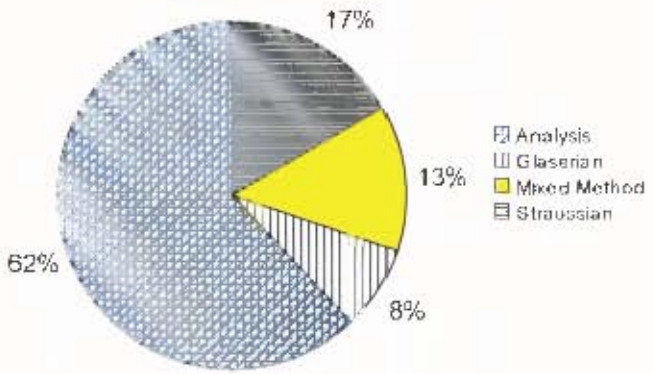

Figure 2: GTM Approaches Used in IS

The results for GTM approach for articles in the period from 1985 to 2007 are shown in Figure 2 above. Overall, 62% of publications used the analysis techniques of GTM without adopting the full methodological approach. Glaserian GTM was not widely used as reflected in the figure above. It was the least approach falling behind both the Mixed Approach constituting 13% and Straussian GTM with 17% of the published research. A more detailed view of the changes over the years in the individual approaches can be viewed in Figure 3 below.

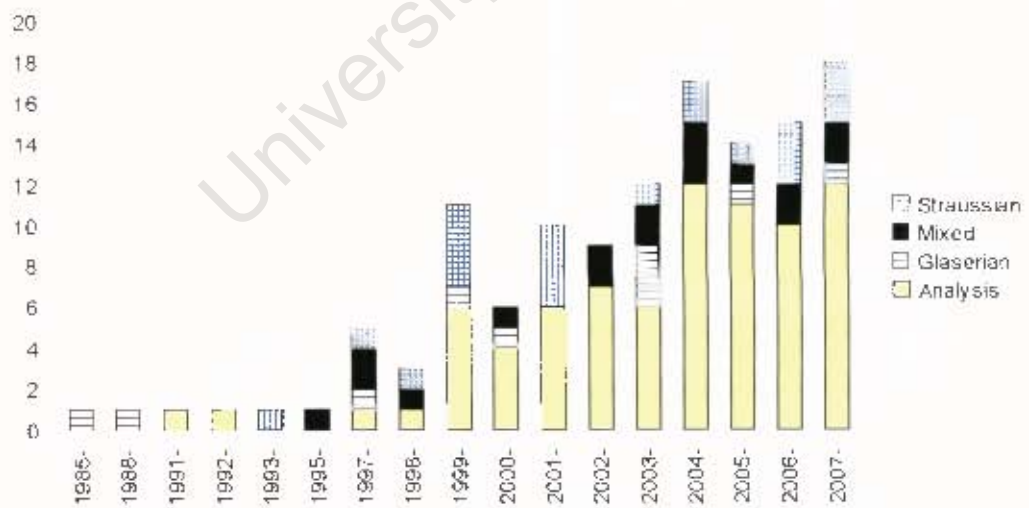

Figure 3: GTM Approach Distribution

The above figure shows that the use of GTM purely for its data analysis techniques has been on an

upward trend.

4.2.3. By Publication

Table 4 showed the 30 journals from the to 50 IS journals that contain studies on grounded theory. A third of the journals contain more than 75% of all GTM research. The highest incidence of the research is found in the Information Technology and People Journal. This journal contains more than 12% of all the GTM research. The second highest incidence was in the Journal of Management Information Systems. The Information Technology and People journal credits itself as a pioneer in "new methods and theories for perceiving and understand[ing] [the] relationship" between IT and organisation (Information Technology and People, 2008). It is hence no surprise to see that it is the leader in publishing GTM research, a method that discovers new theory. MIS Quarterly, which according to the survey by Lewis (2007), is the best IS journal is among the top 5 publishers of GTM studies. Other journals which contain a significant number of articles on GTM are Information Research and the Information Systems Journal.

Information Technology and People was found to contain the highest number of articles adopting the Straussian GTM to conduct research, that is four. This journal also contains the highest number of articles preferring to use the analysis techniques, 11, but has no work adopting the Glaserian approach. The highest incidence of Glaserian GTM is in the Journal of MIS with only two articles. The Mixed GTM approach has been more favoured in the Journal of Management Information Systems, which published five articles.

4.2.4. By Epistemology

Glaserian grounded theory is often alleged to be positivist while Straussian is often linked with interpretivism. It is thus important to asses how GTM is used in practice. Figure 4 below illustrates the distribution of approaches against paradigm.

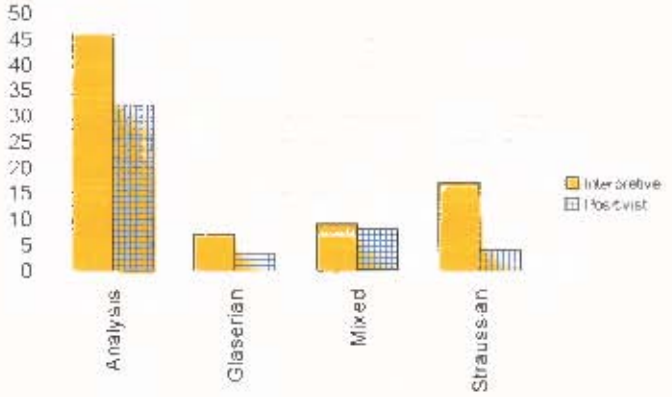

Figure 4: GTM Epistemology in practice

For Mixed Method GTM 53% were interpretive while 47% were positivist studies. In studies adopting the Glaserian approach, 30% percent adopted a positivist epistemology while the remainder were interpretive. Positivist studies in GTM analysis approach were 41% compared to 59% for interpretive. Finally positivist Straussian GTM constituted 19% with the rest being interpretive studies. The paradigms over the years of GTM use were distributed as follows in Figure 5.

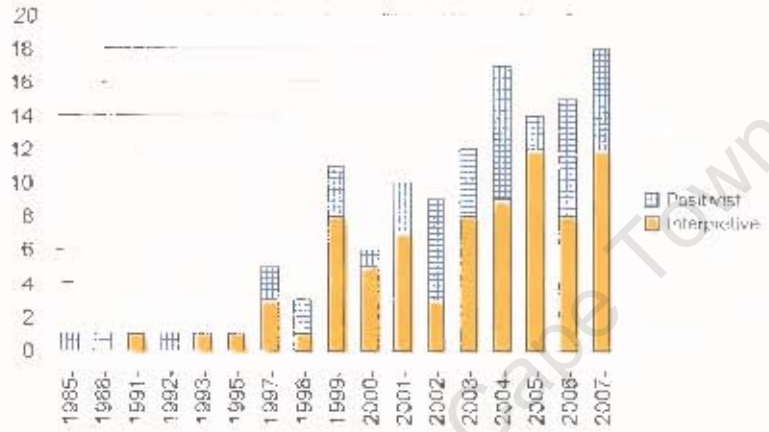

Figure 5: Positivism vs Interpretivism in GTM Studies

Figure 5 shows the relative increase in grounded theory studies published which follow an interpretivist epistemology. Positivist GTM went through a decline in the early 2000's but started to increase after that. It maintained a sizable presence, though no significant growth as compared to interpretivist GTM.

4.2.5. By A Priori Theory

Grounded theory construction requires that no prior theory be used lest it become a deductive study. This section is does no tackle this issue but merely illuminate GTM methodology as it is used in practice. Figure 6 shows the extent of use of *a prior* theorising for the different approaches of GTM.

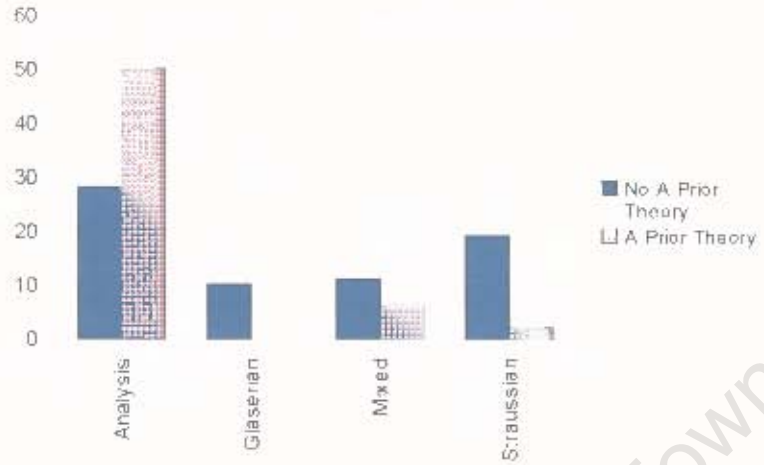

Figure 6: GTM vs A Priori theory

The above figure demonstrates that for the Glaserian GTM approach, no prior theorising would occur in the published studies. In studies utilising GTM analysis techniques, 36% approached the research without an a priori theory. For Straussian GTM, 11% of published researchers entered the research with a priori theory. The Mixed GTM approach was almost evenly matched with 55% approaching the research with a priori theory.

4.3. Discussion of GTM Use

The literature review was strategically performed so as to avoid technical literature in the area of concern, that is the FOSS phenomenon. It served this purpose sufficiently well, while also illuminating gaps in discourse that utilises GTM. This was particularly so with regards to the Glaserian GTM approach. It has been shown above that the specific research avenue is seldom pursued in Information Systems research, an issue which further affirmed the researchers desire to utilise it for this study. It was also demonstrated in this meta-analysis that interpretivism and positivism are the dominant paradigms of inquiry within the discipline. This further presents an opportunity for research where other paradigms are considered.

Finally, the literature review served to sensitise the researcher on the issues to consider while conducting this study. The methodology utilised is multi-faceted and its complete understanding

was achieved by analysing the originating authors works and comparing these to its practical application in the Information Systems discipline. Without this, the researcher would have fallen into numerous pitfalls, which would have made it difficult to classify as Glaserian, Mixed, Straussian or simply analytical. The results are further elucidated in the paper presented at the annual South African Institute of Computer Scientists and Information Technologists conference, attached in Appendix 1. What follows henceforth are the findings obtained in the FOSS GTM study.

5. FINDINGS

As GTM was utilised for the study, this section presents an interweaving of reviewed literature in the technical area of concern and the emergent concepts from the research participants. The other literature reviewed was from the sociological area of inquiry representing the core concern and was useful in presenting the evidence as will be demonstrated in the proceeding sections. While others would argue for a graphic representation of the results, the researcher argues that doing so would not aid in the presentation and could possibly erode the findings, despite its going against the Glaserian tenets (Glaser, 1998).

5.1. Introduction

Many researchers of FOSS have focussed their studies on trying to determine the reasons for participation by members of the community (Hertel, Niedner, & Herrmann, 2003; Krishnamurthy, 2006; Shah, 2006; Bitzer, Schrettl, & Schröder, 2007). Others have lauded the potential macro-economic benefits of FOSS to emerging economies (Braa, Monteiro, & Sahay, 2004; Fuchs & Horak, 2008). While these are important directions of inquiry, it emerged in this research that the FOSS community represents a real social structure, transcendental to its membership that is produced and altered by interactions within it. This reaffirms the exposition that online communities are not seperate from the world, but are indeed embedded within it (Wilson & Peterson, 2002).

Krishnamurthy (2006), while acknowledging the importance of identifying the components that comprise the phenomenon, decries the absence of an integrative theory. The researcher sought, therefore, by nature of the adopted methodology, to address the theoretical core of the phenomenon. As the study progressed, it became clear to the researcher that the key issue of concern was the basic social processes that allowed membership, acceptance and growth of participants. Addressing the key question in GTM analysis, "What is this a study of?", it emerged that this was a study of individual actions by members of a community and about how their actions had a holistic auto-poetic appeal that served in the sustenance of the community. Individuals join and leave the community in as much the same way as they do any enterprise, be it commercial or voluntary, reproducing the social structures through concious decision making and actions.

The key character of any community is that it should continue to exist driven by the intrinsic desire of the participants to continue to benefit from its existence (Hoffman, 1981). While this does tempt the researcher to feed his professional concern by continuing the dominant FOSS motivation discourse, the key issues had to come from the participants, notwithstanding any *a priori* tacit

knowledge. The data exposed interesting directions for further inquiry and verification, but basing on the theoretical ends sought in the study, it was more important to expose the complex interrelationships between the emergent concepts. It is worthwhile to reiterate that verification is not the purpose of this study, but rather theory development.

Following Glaser (1978), the basic social psychological concern that emerged from the data was the continuous individual development of the participants. The FOSS community was observed to be a meritocratic society where recognition is related to intellect and the degree to which it is used for the sustenance of the community. The category was fittingly named "Acquired Status" as this holistically captures the key basic social process in the FOSS community (Glaser, 1978). The proceeding sections elucidate the processes that the FOSS community members engage in to resolve their core concern of acquired status. The researcher shall demonstrate how the pursuit of a seemingly ignoble value as status leads to the production of the socially noble outcome of a public FOSS artefact and a continual reproduction of the underlying ethos.

5.2. Acquired Status

There is a paucity in the number of studies in Information Systems research that attribute some of the behaviour observable in the FOSS community to status. While there are some that do indeed attribute some actions to status, the author could not locate any that dedicated more than a passing reference to the issue (Shah, 2006; Bitzer, Schrettl, & Schröder, 2007; Von Krogh & Spaeth; 2007). Lakhani and Wolf (2002) rate the issue of community status (based on reputation) as one of the least important concerns for FOSS participants, while issues of problem solving, technological skill, ideology, obligation and team dynamics are ranked as the more important. This study however, will demonstrate not the quantitative ranking of these constructs, but the complex interrelationship between them, guided by an otherwise implicit, and sometimes explicit desire to acquire status.

Status identifies "one's standing in a social hierarchy as determined by respect, deference, [and]/or social influence" (Thye, 2000, p. 408). Though in some instances the definitions of status presuppose power, this is contrary to its use in the current context. Power is related to influencing the behaviour of an individual or group in order to meet its own ends (Goldhamer & Shils, 1939). In the FOSS phenomenon, such a definition would not suffice as it is a voluntary community basing its foundation on a set of mutually held views on software freedom. This supposition is supported by statements made by the members of the community with Participant 6 stating that:

"No one holds particular power"

Anderson et al., (2001, p. 116) identifies status as "one of the most important goals and outcomes of social life". Acquiring status in a community is both a natural sociological action and a necessity for the continued existence of a group. The need to acquire status is borne out of the existential reality that similar contributions are subjectively assessed based on perceived status of the individuals proposing them (Gould, 2002). In order to acquire status an individual needs to invest their time, personal and social resources into the social activity from which they wish to attain the status (Lin, 1999). Refering to new members, Participant 3, stated that one:

"should be prepared to work for their acceptance".

Lin (1999) defines personal resources as those resources that an individual possesses and can distribute or withhold without concern, while social resources are those that one can access because of their networks.

It is important to understand how beliefs of status are propagated within a group given that the members of the FOSS community exhibit similar characteristics and engage in abstractly similar processes in their pursuit of status. In acquiring status in a group, members are guided by the particular status beliefs within the community of interest. Status beliefs are the characteristics by which participants within some social context identify and measure status. Ridgewell and Balkwell (1997, p. 14) claim that social interaction and group processes "accelerate the creation and spread of status beliefs". This would mean that groups with established status beliefs can spread these through diffusion via interaction (Ridgewell & Balkwell, 1997).

The FOSS community is a group of individuals who are concerned with the development, modification and distribution of the software artefact. This artefact is indeed their object of concern. Evidence suggests that few core members exists around the software artefacts with an increase in the number of participants as we move to the outer layers, and an eventual termination at the end-users (Mockus, Fielding, & Herbsleb, 2002). In this structure, the value of a contribution to a software artefact is measured according to the perceived status of the individual making it, and so is the possibility of it being incorporated into the end product. This is in agreement with existent theory on status which espouses that "social status can affect the value of objects with which people are associated" (Thye, 2000, p. 407), with contributions from the core membership being perceived

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as more valuable.

The FOSS community represents the "market framework" in differentiating the status of its members (Gould, 2002). In this scenario, issues pertaining to time devoted toward achieving the overall goals of the community, contributions made to individual projects and other individual traits in personality, like vociferousness, form the core of the status beliefs (Gould, 2002). These issues were predominant in the interviews that were conducted by the researcher. Participant 3 alluded to the existence of a

> *"geek meritocracy"*

Participant 6:

> *"how active and skilled [you are] decides how your views are seen"*

Participant 10:

> *"the Free and Open Source Software world is about reputation .....there is a lot of reputation based stuff in the community"*

There exists a degree of variation of the status concern among members of the community. While others are significantly encultured into the phenomenon and ideologies, others make compromises to the extent that they adopt the status beliefs of the community. This is usually based on the motivation of the participants. It is important to underline that motivation itself is not a fixed construct in time and hence even this could vary during the course of a participants membership to the FOSS community.

5.2.1. Altruism

The degree to which acquired status in FOSS communities is perceived to be a core concern varies according to numerous parameters. Participants differed on the issue of status in the community, with some from a seemingly idealistic perspective who viewed the FOSS phenomenon as a means to cater for a spiritual mission to provide the software artefact to humanity. This behaviour can be classified as altruistic. Altruism is the selfless concern for others. The relationship between altruistic tendencies and status has been evasive in FOSS discourse as the two seem dichotomous. Dessalles

(1998) likens the situation to one of picking four leaf clovers to ward off an immediate danger, deeming one activity irrelevant in the pursuit of the other. Hence relevant behaviour in pursuing status would by most be conceived to be comprised of direct politicking in some form and could not be logically linked with altruistic behaviour.

This study reveals altruism as currency which is used to buy status in the FOSS community. Altruistic tendencies are the mainstay of the community. It is demonstrated in varying degrees by *the participants. For instance, Participant 1, denied the existence of any structural hierarchy in the* community by stating that:

"There is no structure or hierarchy....I am just a part of the community"

The participant further stated that the FOSS movement is:

"something that is spiritually and deeply meaningful"

However, even though this view is not shared or propagated by all the members, it is very highly tolerated by the community and perhaps even essential. Though altruistic participants admonish the pursuit of status, the holders of such views are held in high esteem by other members of the community, hence the currency view emergent in the study. This is indeed emulated by the renowned fathers of the phenomenon Eric Raymond and Richard Stallman, who represent open source and free software ideologies respectively. These two holders of altruistic views serve as status symbols within the community and hence contribute to the desire by the other participants to emulate their influence. As Hoffman (1981) espouses, "this helping behavior is an instrumental response reflecting an underlying egoistic motive". There is indeed a link between altruism and status as without status, a participant would lack relevance, and their views would not be considered in the community (Dessalles ,1998).

5.2.2. Barricading Interests

Another variation to Acquiring Status in the FOSS community occurs when members undertake to "Barricade" their activities due to commercial possibilities. It can be considered by all intents and purposes to somewhat the opposite of altruism as it represents a degree of self awareness and preservation, although not necessarily to the detriment of others. Barricading, in this case, refers to

the cases when members of the FOSS community realise the potential proprietary benefit of their innovation and hence decide not to release it into the communities software artefact repository. The artefact might have been originally meant for the community, or indeed based on work by the community. Barricading interests allowed the researcher to distinguish between external economic versus internal social status in the FOSS community. The barricading occurs in the Basic Social Process (BSP) of acquiring status during or after the "locating" stage which is explained in section 5.3. In this case, acquiring internal social status is sacrificed in favour of acquiring socio-economic status in the broader community. This is a point of friction between the broadly held societal views on status and the FOSS community's beliefs and represents a point of departure from the more altruistic FOSS tendencies. This is also demonstrative of the continuum between having ones behaviour being determined by ones network and manipulating a network to achieve ones personal goals (Granovetter, 1973). To support this notion, Participant 2 stated:

> *" Where code affects competitive advantage, keep that private, where it doesn't, make it open source and create shared responsibility"*

Participant 10 also supported this by stating that commercial and community pursuits

> *"Don't overlap in aims"*

There exists a degree of variation amongst the participants in the extent to which barricading occurs. This is predominantly based on the differing motives and beliefs about FOSS amongst the members. An idealistic participant would want to give away all rights on a software artefact for no financial reward whilst other members would judge the potential financial outcome of their contribution before releasing it. This is a particularly significant finding as some researchers of the FOSS phenomenon espouse that commercial gain is the primary motive for participation by members (Bonaccorsi & Rossi, 2006). It can be seen here, that even though commercial interests do exist in the community, they are mentally separated from the non-commercial, and the extent to which either is pursued is determined by the extent to which barricading is exercised, which in turn is determined by the motivation of the participant. In essence, the extent to which barricading occurs determines the Acquired Status within the community. Severely barricading has a negative impact on acquired status and vice-versa.

5.3. Basic Social Process

A Basic Social Process (BSP) is a specific type of category derived from Glaser's (1978) coding families. It elucidates the phases through which a participant would go through while resolving their core concern. For a category to be termed a BSP, it needs to be constituent of at least two phases/stages. It is merely one of 18 coding families proposed by Glaser (1978). The coding families proposed by Glaser (1978) are by no means conclusive and he indeed does encourage scholars to add new ones. For this study however, the BSP family was found sufficient to explain the ongoing psychological and structural processes encountered by the participants in resolving the concern of acquiring status in the FOSS community. By adopting the family, the researcher was able to group the sequential phases through which a participant entered in addressing their concerns (Glaser, 1978). The "Acquiring Status" BSP did not arise from deduction but rather emerged from the data.

This study does not demonstrate how status can be attained in the FOSS community but merely theorises on how the BSP is processed by the participants. Having identified the core concern as acquiring status, it became important to determine how it was continually resolved. The process of acquiring status emerged to be comprised of the stages of Joining, Learning, Locating, Cultivating and Consolidating. The stages however do not represent a linear progression of events but instead illuminate activities that the participants iteratively engage in and how these have a bearing on the status they acquire in the community. These constructs are elucidated upon in the following sections.

5.3.1. Joining

Acquiring status was found to be constituted of initial entry into the community, a construct classified as "Joining". It is usually an experimental stage which is triggered by a mentor who has acquired some measure of status in the community. Various concerns emerge to the participant at this stage, with an awareness of the existent knowledge gap being core. Joining was observed to be mainly constituted of an external awareness of the phenomenon, which causes flocking around it and an internal awareness which eventually leads to belonging to the community.

Flocking

The issues concerning acquiring status start when interest is garnered and the participant attempts to enter the community, a period which the researcher has called "flocking". It is termed "flocking" as

it resembles the coming together of living creatures based on a broad range of similar interests. Participant 8, in refering to flocking stated:

> *"Most [friends] I have met in other contexts and shared Linux characteristics"*

In this case the mutual interest that facilitates flocking is the mutual fascination and/or need of the FOSS artefact and in some cases, the ideology. It is at this stage that a participant is exposed to other ideological aspects of the community into which they are entering. Through diffusion, the status beliefs of the community are passed to the new members.

Lower level flocking continues within the community itself, with more specialised interests causing the formation of smaller groups to form in the community. For instance, interests in the Linux Operating System would cause individuals to flock around it, while interests in the Python programming language, feature rich text editors, software licensing, Graphical User Interfaces (GUI), copyright and other such issues would cause lower level groups to form. The participant would maintain their membership in the higher level community. In some cases these specialised interests are the point at which initial flocking would occur, for instance a participant can join a Python user group because of, in most cases, a technical need, without necessarily joining the higher level group. In other cases the participants are redirected to communities that would better serve their interests or their level of expertise. And indeed, it is at this stage that participants gain an awareness of the status beliefs of the community.

While heterogeneity is essential for the sustenance of the community, extreme forms of deviation from the norms causes expulsion from the community. New members gain an awareness of acceptable boundaries in deviation of ideology at this stage of flocking and decide whether to pursue the interest. The flocking stage can be thought of as a stage of inculturation to the FOSS community. Von Krogh, Spaeth and Lakhani (2003, p. 1229) rightly propose that "participants behaving according to a joining script (level and type of activity) are more likely to be granted access to the developer community than those participants that do not follow the project's joining script". The joining script constitutes the activities that a participant has to undertake for him/her to become a recognised member. Participants who deviate beyond the accepted boundaries are quickly noticed and, in some circumstances, expelled from the group. One of the core emergent issues is an awareness by the participant of the knowledge gap that exists between the senior members of the

community and the new entrants, which is indeed a barrier to involvement.

Knowledge Gap

A knowledge gap exists between new and older members of the FOSS community. This knowledge gap is compounded by the realisation of the existence of a status hierarchy within the community, with the lower structures being shunned by the more senior participants. Participant 6, stated that new members ask

> *"stupid questions"*

Participant 1, stated:

> *"There is a disparity between old and new users. There is a communication gap between them"*

Participant 2, stated:

> *"It's hard to make the community for everyone, and not for us [old members]"*

The exclusivity evident in the older members culminates in condescending responses to questions asked by the newer members. Participant 6 stated that the community:

> *"is not geared for newbies...[and] they get [frustrated] as user groups respond negatively"*

Von Krogh, Spaeth and Lakhani (2003) broadly categorise entry barriers as pertaining to ease of modifying, programming language choice and level of familiarity, architectural concerns and application knowledge. The barriers are further compounded by the limited help that the joining participants receive from the senior members. Some newbies are turned away from the community at this stage, because of this perceived arrogance amongst the older members. Their questions are sometimes met with responses such as:

Participant 2:

"just google it."

To resolve this conflict, determined new members hence have to adopt strategies of coping with the knowledge gap. One such strategy is staying in the background prefering not to ask questions and staying invisible to the on-line community, refered to as lurking, while accumulating knowledge slowly by observation. These lurking participants hardly, if ever, engage the community face-to-face and prefer this on-line presence. Once confidence builds, if it does, these participants then engage the community directly. Others join newer projects where the knowledge gap is minimal for members as the initiative or community is in its infancy. The longer the group has existed prior to a new members interest, the larger the knowledge gap at entry, which in some instances can be characterised as a knowledge barrier, and the harder it is to acquire status. The rate at which the knowledge gap is minimised determines the rate at which status can be acquired in the community. Personal determination, based on motive, determines how a new member is perceived by the community. Some new members, because they are introduced to the community by the more senior members, find their mentors as a source of information to minimise the knowledge gap.

Others, try to adopt the basic rules of "netiquette" guiding the forums. Netiquette are the rules of interaction in internet facilitated social networks, the word is derived from "internet" and "etiquette". In understanding and observing the rules, new members increase their chances of being integrated into the community and in the process, acquiring status. Having observed the rules, older members become more responsive to questions and requests by new members. While those who are considered *"noisy"* will be victimised by the older members and in some cases, banned from the forums.

An awareness of variation in the knowledge is also evident in the more senior members, with these not assisting new members as they fear correction from the more knowledgeable members. Participant 8, highlighted this by stating:

"Some are reluctant to post useful answers because they think they are not perfect"

5.3.2. Learning

Learning is a crucial aspect within the BSP of acquiring status in the open source community. While this can be one of the initial motives for joining the community, the diffusion of the status

beliefs of the community alters initial perceptions held before entry. Learning occurs when a participant passes the initial stage of joining, having adopted a suitable strategy in resolving the conflicts presented during entry. An approach that can be adopted in addressing the concern of the participant at this stage is becoming a protégé to an established member, who in many instances would be the one who introduced the participant to the community. The participants interviewed in this study predominantly adopted this strategy, with mentors as their first point of support. The mentors act to significantly minimise the knowledge barrier at entry as they shield the participants from the potential abuse enacted upon them by the older members. As Participant 1 noted about joining:

> *"My advice would be have a friend who is already in there who can help"*

There exists a degree of minus mentoring within the community. Whether the new participant has a mentor or not, it is generally expected in the FOSS community that those interested in the phenomenon teach themselves. For instance Participant 3, stated that:

> *"if you say problem, they say fix it"*

The degree that minus mentoring is required varies depending on whether the participants have a mentor or not. Those with mentors can, to some extent, ask them questions which might be perceived as *"stupid"* by the greater community in which they want to be part of. The types of learning identified in this study constitute two types of knowledge, technical and ideological. There is a complex and changing priority of either as the BSP of acquiring status processes itself. Participant 8 stated:

> *"[my] overall perception has changed, because my position has changed. I don't think I could usefully ask questions. I view it as a way of giving back"*

Technical Knowledge

Status can be attained in the community by amassing technical knowledge. The acquisition of such knowledge is a gradual process which plateaus as the participant reaches expert status. The rate at

which a member attains technical knowledge is positively related to the individual drive of the participant. Most people stay in the peripheries, never quite reaching expert status nor needing to, depending on altruistic or barricading tendencies mentioned earlier. This characteristic is seen most in members who join the community as a professional concern. To these participants the community is a source of technical information should they encounter technology related concerns in their places of work. This usually occurs when the use of FOSS artefacts is institutionally inescapable in their places of work.

These participants are typically ideologically different in terms of the fundamental ethos in the FOSS community. To these members the FOSS community serves as a means to limit the frustrations encountered in their jobs. While these participants did not emerge as the core subjects of this research, their variation in attitude toward acquiring technical knowledge from the FOSS community is important in elucidating the degree to which technical knowledge is sought in the community, and to what ends it is used. This observation shows that the degree to which status is sought in the community can also be related, in degree, to the level at which a professional concern is sought in comparison to the communal concern. To demonstrate this, participant 8 stated:

> *"My role in the FOSS community will not change, unless my career changes"*

It is important to also understand that the motive itself is in a state of flux. Those with a professional concern at the entry stage can soon change their motives to those of the greater community as demonstrated by participant 3 and 10. When stating the manner in which they have personally evolved due to participation, Participant 3 stated:

> *"I have learnt about how important community can be"*

Participant 10:

> *"I have spent time thinking about communities and realised they are about people more than they are about topics"*

The aforementioned participants entered the FOSS community to cater for the challenges they experienced while implementing FOSS. While it was initially a technical concern they gradually accepted the beliefs of the community. It was thus apparent that the technical concern can be

overtaken in importance by an ideological concern.

Ideological Knowledge

Exposure to the community not only develops a participants technical knowledge. It was evident that when the participants joined the community, experimentally or otherwise, they had not entered on a similar ideological platform as they were during the research interviews. The participants held a varying number of beliefs on software freedom, which were acquired during their membership in the community. Cultivation is essential from older participants to ensure continuity of the community. Participant 1, referring to his change in ideological beliefs also stated:

> *"[back then] I was still learning about the [community]. I was an open source guy before I became a free software guy"*

The ideological position adopted by the participant can be highly influenced by a mentor. Participant 2, when talking about a senior member of the community, who to maintain anonymity shall be refered to as "Peter", stated :

> *" At a small level, I found [Peter's] example inspiring. How one person could benefit many people, make a difference"*

Status beliefs of the community are also reinforced in the participants as they become socialised into FOSS through on-line and off-line community activities. There is a co-construction of beliefs between the community and the participant. This socio-ideological aspect of the community soon surpasses the socio-technical aspect, with limitations based on the participants eventual adopted role in the community. The growing conciousness to issues surrounding FOSS software, which comes with knowledge, triggers the resolving of an internal conflict which the researcher termed "Locating", which is part of the BSP of acquiring status in the community.

5.3.3. Locating

FOSS participants have to locate their interests in the community. The concept of "Locating" is used to define a self awareness by members in the community of their motives, their areas of benefit and ultimate intention and comparing these to the general objectives of the community. It is at this stage that a participant can say they are part of the community. The concept of locating represents the acquisition of a social identity within the community. This acquisition of identity through

locating of ones interests "*is manifested through mechanisms of categorization, whereby the user formulates a self-awareness of membership in the LUG [Linux User Group] that emphasises one's perceived similarities with other LUG members*" (Bagozzi & Dholakia, 2006, p. 1104). To acquire this identity, a participant has to align their interests with the general interests of the broader community and the specific preferences characterising more focussed groups within it, this being what is termed as "Locating" by the researcher. Hars and Ou (2002, p. 28) refer to this process as "community identification".

The FOSS community is heterogeneous, with individuals holding contrasting beliefs about the software artefact, licensing and freedom. The awareness that prompts locating is derived from different sources ranging from academia, community, and media. A participant hence becomes sensitive to the debates within the software community, and in cases involving FOSS participants. Some become estranged at a perceived injustice propagated through proprietary software packages. By locating themselves into a specific ideological belief in the community participants develop a feeling of belonging which leads to them effectively contribute towards the general goals of the group (Bagozzi & Dholakia, 2006).

Locating is an essential part of the BSP of acquiring status in the community. It is essentially a measure of a participants maturity in the community. It is related to a position held in the community, formal or non-formal. A participant can define what it is they bring to the community, on which side of the fence they stand in the numerous debates that characterise the community. It is important for participants to understand how the community functions in order to locate themselves. Participant 10, highlighting this stated:

> *"I am more likely to stay in background unless topic comes up [and] more likely to talk about Debian than Ubuntu"*

Participant 2 stated:

> *"[One] should figure out what they are interested in and subscribe"*

Once a participant has located his interests in contrast to those of the community, by continually being exposed to the community activities, the areas in which their contribution is important emerge. The FOSS phenomenon is multi-faceted, with numerous arguments and counter-arguments characterising its existence. It is important to highlight these arguments as a way of understanding how the conflict is resolved as it came out strongly in the study.

Differences

Differences in opinion are experienced both in the technical and ideological domains of the FOSS community. While the community accepts that alternative views will inevitably exist in the community, and are indeed necessary, there is a limit to this freedom. Participant 8, highlighted this by stating:

> *"Homogeneous communities are not healthy...[but] there are limits under which we all operate"*

The general range of tolerated ideological and technological opinions is from the altruistic to pragmatic. Of the participants interviewed in this study, two had fallen out with the community based on the ideological stances they had attempted to diffuse into the community. While pragmatism is a subjective construct in the community, views that are more "right" oriented in comparison to altruism (left) are neither tolerated nor accepted in the community. The members who hold them and attempt to impose them on the community find themselves being sanctioned or banned completely from the community. A case in point to illustrate this is the wide ranging views held with regards to proprietary software. While others do not use proprietary software under any circumstances, others do. However, promoting proprietary software is viewed as a breach of the accepted behaviour. Openly seeking commercial benefit and advocating against FOSS software is not tolerated. Hence, while differences are tolerated, they are accepted within boundaries that reduce conflict in the community.

In "locating" ones interests in the community it is important to consider the rules that govern the tolerated differences. Hence to acquire status in the community, the views held can differ from those of the community to a limited level. If a participant's views differ sharply from the community, and they cannot locate their interests within the group, they leave on their own or are forced to by the

community. Participant 8 stated:

> *"I would leave the community if my views contrasted sharply"*

A strategy that participants adopt to resolve the conflict of differences is "barricading interests" which is a concept explained in section 5.2.2, which in essence compromises the acquired status.

5.3.4. Cultivating

The concept of cultivating is a basic necessity for the survival of any community. While older members leave the community, others are always sought to replenish it. The concept of cultivating is hence an important stage in the BSP of acquiring status in the community. Hoffman (1981, p. 122) states that "individuals will often act in ways that do not advance their own interests but contribute to the survival of the group". Hoffman (1981) also demonstrates that this altruism is indeed part of human nature and can serve in the attainment of egoistic desires. The egoistic desire in this study is the pursuit of status. Dessalles (1998, p. 141) espouses that "high status is correlated with a higher reproductive success". By cultivating, participants enhance their status in the community as they create a base to reinforce their opinions in the community, within accepted bounds. By cultivating, participants increase their visibility in the community. Visibility in the community leads to recognition of a participant which leads to higher status. Individuals who cultivate other participants into the community are seen to have the interests of the community at heart.

The members who were interviewed by the researcher widely expressed the view that they were indeed introduced to the community by other members. Participant 1 stated:

> *"In early high school a friend gave me Slackware, I thought it was cool and 20 years later I am still doing it"*

Participant 2:

> *"I was talking to someone who came to my office with Floppy [disks] to install*

Linux"

Participant 3:

"someone gave me a copy [of Linux] in 1998/99"

The community which the researcher was investigating saw the importance of cultivating, and had undertaken to actively endeavour to cultivate new members. While on a personalised level cultivating is a continually ongoing process, the community as a subjective entity can periodically seek to actively recruit new members through outreach projects. It is important therefore to clarify the importance of cultivating to the individual and the community in the process of acquiring status. Indeed the community itself can acquire status in the broader society through diffusing its ideals and creating an awareness of its activities (Granovetter, 1973; Ridgeway & Balkwell, 1997).

Individual Need

As noted previously, the issue of visibility is a determinant to the social recognition of a member in the community and therefore, their acquired status. Participant 6, while noting that inviting too many colleagues to join the community can bring undesired attention to her stated:

"I try to persuade friends, I don't try too hard because it will put me into the limelight"

This statement demonstrates the visibility and status that one can achieve in the community by cultivating. However, the participant also shows that over-cultivating can be distracting and hence has to be managed so as to not affect other non-community activities that they are engaged in.

While cultivating does improve a member's status in the community, it is also borne out of a gratefulness by members of the community to their acquired skill level during their membership. While these members would feel that in terms of acquiring skills from the community, they would have reached a limit, they contribute to the community by cultivating. Participant 2 stated:

"I realise I am grateful to the community"

Cultivation has been shown to be beneficial in attaining status in the FOSS community. It aids in acquiring status by increasing reputation and visibility in the community. As noted above, visibility is improved as the protege's bestow status on the community member who introduced or directed them to the ways and norms of the community. While directing the beliefs acquired by the new member, the mentor, during cultivation, also assists the new members in cases of technical difficulty. Reputation is attained on two fronts, the community front and the protege front. The community recognises the effort of the mentor as selfless and that they are cultivating for the greater good of the community. This enhances the reputation and status of the giver. The reputation of the mentor is also propagated by the individual protege, in recognising the time and effort invested in cultivating. As remarked by Participant 1:

> *"software is free, time is not"*

The price of the time invested in mentorship is status, and indeed a feeling of self worth. This was demonstrated by participant 6, who noted:

> *"when I help I feel better"*

Help does have value, this value is status, without status there is no contribution as one would feel unappreciated. Participant 2 stated:

> *"there is disillusionment in the community. You are contributing for free all the time. Maybe its not appreciated but you work through that too"*

To this researcher, the working through it represents a continual resolving of the acquired status in the community.

Community Need

While status can indeed be acquired and/or consolidated through cultivating, the concept of cultivating is limited by a desire to make the community groups exclusive. The desire for exclusivity in association is not peculiar to the open source community and indeed can be attributed as a cause for many social ills. When overpopulation threatens the continued existence and

sustenance of a community, "it will restrict its own breeding" (Hoffman, M. L., 1981, p. 122). Cultivating is indeed hampered by this constraint. Participant 8 stated:

> *"I don't see any need for change. If more people come, I am not sure how it will scale"*

Recognising this, a senior member, Participant 1, stated:

> *"It is hard to make sure the community is for everyone, not only for [the senior members]"*

While there is apparent exclusivity sought after by some members of the community, new members are a necessity for the its continued existence. The community is in essence an autopoietic entity, which will try to recreate itself and redefine itself to continue to exist, responding to both internal and external factors. It is a system constituted of living human actors and is in itself a living system, with some structural boundaries such as the software artefact guiding its processes. While undertaking this study the researcher was fortunate to see the regenerative nature of the community, through cultivating. The community under study had realised the dwindling of participants and, hypothetically, community status amongst members of the society in which it is embedded. In essence no new members were coming in, and those who did were leaving. The senior members decided to meet to try and resolve the lack of cultivation that was causing this. A panel discussion was hence scheduled themed "What can/should CLUG do for you?". The researcher was fortunate enough to attend this discussion as a data source for the research.

During this introspection by the community, issues regarding proprietorship, networking with organisations and FOSS were discussed. The development of the community from inception to what it currently is was discussed. The relevance of the community in the social context within which it is embedded was also discussed. The core issue that emerged and was critical to all the participants was that of cultivating. As one participant noted:

> *"The community used to have many younger students but now [doesnt]"*

Members remarked that the community:

"should be more outreaching"

The community has since then actively endeavoured to cultivate new members. To do this various activities targeting the novices have been scheduled. Among them are discussions centering on topics most affecting novices like "Beginers topic: VirtualBox" and "Experiences as a novice Linux user". Activities targeting the novice users like "Software freedom" parties have also been added to the calender. While such activities cannot be wholly attributed to seeking and acquiring status, as much as they cannot be wholly attributed to any other construct, their role in consolidating and cementing the status of the senior members is noted. Furthermore, the new members are indeed enlisted into this status community, acculturated into it to serve to further propagate it, a concern, not only for individual users but also serving the community as an autopoietic living entity. This demonstrates the role of cultivation in both acquiring status and in the continued sustenance and propagation of the status community.

5.3.5. Status Consolidation

Having experienced the previous stages, and indeed, during them, the issue of consolidating and maintaining status becomes a core concern for the participant. This is ensured, not only by visibility to the community, but by continual participation in the activities sanctioned by the FOSS community. While the benefits attained from being a member of the FOSS community are initially centred around the technical benefits, the technical need is, during status acquisition, minimised as a more social need takes centre stage. Among the more senior members, who were a subject of the study, maintenance of membership to the FOSS group was mainly because of a perceived social benefit. The shift in interest in the FOSS community can be seen in Participant 8, who stated that they joined the community because:

"The source code learning was intriguing"

However having acquired the initial need of technical knowledge, Participant 3, states:

"I need the community less as I know more"

Despite needing the community less on a technical level, the social aspect of the community is still sought by the participants. Participant 6 stated they were part of the community mainly for:

> *"the social aspect"*

Participant 4:

> *"groups are predominantly for the new users, when you become experienced enough, you don't need [them] anymore. Most experienced users mostly stick [around] for technical discussions and the social aspects"*

Having identified status acquisition as a core concern for participants in the FOSS community, and in the particular group of the inquisition, interaction emerged as one of the sub-concerns of the participants. The social aspect of the community was strongly reiterated across interviews. The role of this aspect in attaining status was a consideration the researcher made which required logico-deductive interpretation. Two types of interaction patterns were observed in the community, on-line and face-to face.

On-line Interaction

The FOSS community interacts predominantly on-line. While events are continually organised to cater for face-to-face interaction, the on-line mode is the main point of entry into the community. As participant 2, duly noted

> *"everything starts and ends with the mailing list"*

Through on-line interaction the stages of the BSP of acquiring status are facilitated and enacted. It is hence a crucial element in the processes, for cultural negotiations and the acquisition of technical knowledge. To this end, numerous on-line fora have been established to cater for this, depending on one's particular FOSS interests. These range from common interests groups, as one interviewed in this study, referred to as Linux User Groups (LUGs), to special interest groups, those flocking

around more focussed interests like version control systems and programming languages amongst others.

By answering questions on the mailing list, members demonstrate their level of knowledge and hence acquire and consolidate status. While a significant proportion of members embark on face-to-face communication with other members, others choose to maintain a purely on-line presence. At this point it is possible to see the role interaction has on acquiring status. Members who choose to maintain an on-line presence limit the status they acquire in the community. In some cases such a choice is made consciously as a rebuttal of the status meritocracy existent in the community or as part of barricading interests. Participant 7, stated:

> *"I don't mix with geeks"*

These participants limit the extent to which they acquire status by maintaining an pseudo-anonymous on-line presence. While these members embrace the FOSS ethos, they reject the basic elements that make up the culture. In some cases this can be caused by personal grudges, as emerged from two participants. Those who feel intimidated or victimised by the community maintain an anonymous on-line presence and pull away from the social face-to-face activities. Despite this, on-line interaction can be thought of as the glue that holds the community together. It presents a framework that allows new entrants to embark on a journey through the phenomenon which is highly accessible. It helps as a medium to propagate the status beliefs without the time and space constraints normally associated with face-to-face communication. However, while social interaction does play a significant role in facilitating the acquisition of status in the community, purely on-line communication poses a limit to the level of acquired status in the community.

Face-to-Face Interaction

Face-to-face interaction occurs when the FOSS community or group organises events which facilitate the physical meeting of participants. These events can be hack festivals, Freedom Day festivals, fairs, periodic meetings, presentations, conferences or any other activities at which the FOSS artefact is the primary object of concern. The frequency of these meetings is determined by the geographic distance between the participants in any particular group. For this research, the meetings occur monthly as the community that was under investigation was formed around its location hence the name, Cape Town Linux User Group (CLUG).

It is important to note that the status beliefs of FOSS participants could also be affected by the distance between them. Hence frequency of meeting indeed does determine the extent to which status can or should be acquirable on-line. However, all FOSS projects which the researcher encountered during his research, like the Python User Group and Java Rosa, including projects that he is a part of, like the Open Source ERP, Adempiere and the JADE project, do have a high regard for participants who engage in the face-to-face events. Participant 10 stated:

"There is a distance when you work with long distance community"

This study revealed the social need to meet by participants in the community. Participants expressed that they met face-to-face with members of the community in order to fill a void that exists in on-line communities. This is an important finding not only to the study of the open source communities, but also to proponents of pure on-line interaction, be it in education, health, governance or otherwise. It shows that some social needs, like status in this case, might not be sufficiently catered for through on-line communication alone.

To understand the value of face-to-face interaction interaction in acquiring status in a community, it is important to assess the social attributes that communities share, which are not present in on-line interaction and can be associated to status. In face-to-face communication, salient issues such as race and gender are visible and indeed these have been known to affect status (Anderson, John, Keltner, & Kring, 2001). Though this has numerous negative connotations, the depth of these issues was not addressed in this study. It is reasonable to hypothesize that the more geographically distributed the group or community is the less the value of these physical traits to acquiring status. A comparative group would have yielded the required comparison to further substantiate this exposition. Bagozzi and Dholakia (2006, p. 1100) question "why ... user group participants provide field support to new users when such tasks are time consuming, mundane, and unlikely to garner prestige within the OSS community?". Their statement is based on the premise that such "trivial" actions will not benefit participants in attaining status in the community. This research demonstrates that this exposition is untrue, as they are aspects of face-to-face interaction that indeed contribute to the acquisition of status (Anderson, John, Keltner, & Kring, 2001). It is also important to note that face-to-face interaction leads to the manifestation of more formal structures. It is during these meetings that chairs are elected and the more senior members are elected into formal positions. However, this cannot be assumed as a concept relevant to the study as it was evident that

such positions were not taken seriously. As participant 3 stated:

"I remained chairman for this year as last year people forgot to vote"

While a community, such as the one in this study, was within a context where issues of race are still highly debated in alternative fora, it cannot be inductively stated that the data pointed to this issue as significant in acquiring status. However, given the relatively high status of the participants who engaged in face-to-face activities, it was hence a reasonable supposition by the researcher that this interaction was tightly coupled with status in the community. This was established from the community sanctioned meetings that the participants attended, which were observed by the researcher. The benefit from attending the activities organised was clearly not a technical one as noted by the participants. Participant 6, stated:

"I don't expect much from CLUG, [my attendance is] mostly social"

The above statement was indeed echoed across most interviews and represents an important construct. While subsequent studies can surface numerous other properties of face-to-face interaction, despite its status value discussed here, it is is still in keeping with GTM tenets as applied in this study for this research not to attempt to verify this fact with further data collection. This study is indeed a platform for the development of more formal theory on the FOSS phenomenon.

6. DISCUSSION OF FINDINGS

In this chapter, the researcher sought to analyse the contribution made in the study. While the FOSS phenomenon has indeed been researched within Information Systems, Economics and other sociological disciplines, it is important to review the contribution in this study in the light of other research. Furthermore, GTM and basic theory building tenets do require that the credibility of the outcome be evaluated.

6.1. Research Contribution

While a priori review of literature in FOSS would have relegated the issue of acquired status as one of the outer concerns of the community, and promoted the "motivation issue" in the FOSS phenomenon to the fore, this inductive study proved revelatory. One of the key figures in the FOSS community, Raymond (1999), alludes to the existence of an internal reputation market. He also credits continued involvement within the community to need, "scratching a developers personal itch" and to a hobbyist tendencies. However, Raymond (1999), besides ignoring the variation of these concerns over time of involvement, does not explain the inherent dynamics and currency used in the attainment of the concept of reputation, an aspect clearly emergent in this study. This thesis demonstrates the coherence in the behaviour of FOSS participants in a processual manner and shows the utility of volunteer activities in the acquisition of status.

Studies like that by Lakhani and Wolf (2002) have been widely regarded as providing the seed categories and hypothesis for FOSS community research. Among those following this precedent are Bagozzi and Dholakia (2006) who continue to insist that issues pertaining to reputation do little to explain the continued involvement by participants in the FOSS community. This adopted deductive and , arguably, positivist approach can only make few discoveries, in an area demanding inductive interpretation because of the relative youthfulness of the phenomenon. Instead of emerging with a set of ranked concepts as Lakhani and Wolf (2002) do, this study has gone further to elucidate the complex relationships among the seed categories and their variation in space and time.

Von Krogh, Spaeth and Lakhani (2003) also posit numerous hypotheses while attempting to construct a FOSS theory, which while generating important constructs, was focussed on the initial stage of "Joining". This is a continuation in that stream of thinking, which while recognising the importance of "Joining" in explaining FOSS community behaviour, builds on this by revealing more theoretical constructs to explain the behaviour of FOSS participants. The research goes even

further to explain this behaviour in terms of the core concern of status.

The study also shows the missing link between seemingly mundane activities in the process of acquiring status, which researchers like Lakhani and von Hippel (2003), and Bagozzi and Dholakia (2006), perceived to be of no value in the attainment of status by elaborating on the value of face-to-face interaction in status acquisition. Bagozzi and Dholakia (2006) also hypothesize that initial entry into the community is task oriented. They also show that with more experience an attachment between community and participant grows. This is thought to explain why participants continue to interact with the community, even though they have diminished technical need for participation. This study reaffirms this finding, demonstrating that as the technical need diminishes, the social need increases while also demonstrating the relationship between on-line and off-line interaction in achieving and consolidating the status goal.

The researcher demonstrates here, how on-line interaction does not replace face-to-face communication in achieving the socially inscribed elements of human behaviour. This study also reveals that on-line and off-line interactions are not necessarily dichotomous in view but represent a fluid system that, by nature, would employ any alternative media to achieve its goals (Wilson & Peterson, 2002). It continues to deconstruct the view that the two are opposites, while simultaneously opening up numerous avenues for further academic inquiry. The issue of identity making, for instance, is one possible area hypothesised in this study and serves as fertile ground for further research. On-line interaction has in cases been conflated with the creation of multiple identities in participants (Wilson & Peterson, 2002). More data could therefore demonstrate how the construction of identity is further processed by individuals engaging in such multi-media communities such as the CLUG community, where face-to-face interaction plays as important a role as on-line communication.

To some sociological researchers the issue of status is a general concern in human behaviour. Lin (1999, p. 467) states that status is acquired when "individuals mobilise and invest resources for returns in socio-economic standings". The FOSS community cannot be represented by such a definition of status as its pursuit in such groups is restricted to the internal network of participants in the phenomenon. There is very little to suggest general socio-economic compensation for the invested time and resources amongst the participants as they provide the final artefact to the public for free. The acquired status is internal since when the final product is provided to the end user, there is little or no claim of ownership. Hence traditional assumptions about status are indeed challenged by the findings in this study. It would be revelatory to investigate the 'status of

communities' in society as related to their internal status mechanisms. On-line communities are so often seen as disparate systems, separated from reality hence the proliferation of terms like virtual "world". Could such communities beliefs have an impact on the broader society in which they are embedded, or vice versa? Such inquiry would be part of general sociological inquiry, which despite its application to Information Systems, would be significant as it represents the discipline's reverse contribution to its reference disciplines. After all, Granovetter (1973, p. 1360) argues "that the analysis of processes in interpersonal networks provides the most fruitful micro-macro bridge". This type of theory can be produced by following Grounded Theory Methodology and is refered to as Formal Grounded Theory (FGT) (Glaser, 1978).

This study not only contributes to theory in the FOSS community, but to the methodological discourse in Information Systems research. As demonstrated in Appendix 1, Glaserian GTM has not been widely pursued for Information Systems research. The issue of *a priori* literature reviewing has been widely viewed with suspicion as it is assumed to compromise the basic tenets of sociological inquiry (Allan, 2003). Numerous authors have hence adopted Strauss and Corbin's (1990) formulation of the methodology, because of its relative leniency to researchers of the *a priori* literature review perspective, in an attempt to align their findings with those of the discipline's research community. While the current research, nor the paper in the appendix, does not argue on the validity and merits of either approach over the other, it merely demonstrates the utility of Glaserian GTM in cases where there is scarcity of theory. Indeed the Information Systems discipline is one that suffers from such scarcity, hence the applicability of Glaserian GTM. Particularly interesting was the utilisation of the critical realist paradigm in conducting GTM research. This also demonstrates that the methodology can serve the needs of different paradigms, according to the needs of the research and philosophical underpinnings of the researcher. This is indeed a significant contribution to methodological discourse.

6.2. Evaluation of Contribution

In essence the credibility of the findings of this study are premised on the rigorous and close following of the tenets espoused for Glaserian GTM inquiry (Glaser & Strauss, 1967; Glaser, 1978). It is therefore important that the findings be not judged according to the tenets of of Qualitative Data Analysis (QDA) but be assessed through the GTM lens. The findings generated in this study have been clearly demonstrated to emerge from the data. The researcher took the pains of suppressing any preconceptions and avoided their staining of the final findings. The systematic

interplay between outcome and method is a cornerstone of GTM research, and this was never taken for granted at any stage in the study. The researcher further avoided summarising data diagrammaticality to mantain the richness of the results (Glaser & Strauss, 1967).

The concepts presented in this analysis, Joining, Learning, Locating, Cultivating and Consolidating, were presented in an integrative manner, demonstrating how each is related to the others and to the higher order category of Acquired Status. Although these were not the only concepts generated in the study, their seamless interweaving made them emergent candidates for presentation. The researcher also used direct interview quotations to demonstrate how the real world data relates to the concepts (Glaser & Strauss, 1967).

While a comparative study group would have aided in the richness of the presented theory, it is important to note that the individuals in the research represented alternative view points which facilitated the emergence of property dimensions like face-to-face versus on-line interaction within the Consolidating concept. This is indeed in itself not a substitute of the value of comparison, hence the modifiability of the generated theory. As alluded to earlier a good grounded theory is modifiable (Glaser & Strauss, 1967). The concepts presented in this research can be modified with further data collection and it is indeed encouraged.

It is important to note the emergent constructs which were similar to those already existent in FOSS literature. The issue of status was seen to be briefly mentioned in other studies prior to this one as demonstrated in the findings chapter. This demonstrates the credibility of the the findings through validation of existing literature. What is more important about a grounded theory as this one, is not what was previously known, but what was not. The study has described the process of attaining status in the community, through older constructs like joining and identity formation (locating) and newer one like cultivating and consolidating. As mentioned above, more properties and dimensions of these constructs can still be discovered and should indeed henceforth. It is the exposition of this researcher that the concepts presented above are understandable and can be used when attempting to understand FOSS community groups.

7. CONCLUSION

Acquiring status was discovered to be the core concern amongst FOSS community members. The researcher obtained information from the perspective of senior FOSS members about the processes they encountered in attaining status. Using data from interviews and participant observation of the Cape Linux User Group patterns were discovered in the activities they undertook in attaining and maintaining status in the community. Theory inductively emerged on the stages of participation and the conflicts faced at each stage. The activities that participants undertook to resolve the emergent conflicts also emerged from the data.

7.1. Summary of Findings

The first point of entry into a community was found to be adequately explained by the "Joining" concept. At this stage participants battle with the negative responses that they are met with as they attempt to engage the community. Despite this, the members also battle with the knowledge barrier that exists between themselves and the older members. Among the strategies they adopt to resolve his concern are getting a mentor and lurking, the former producing a sharper learning curve than the latter. Another concept of "Learning" was developed to characterise a proceeding stage in participant evolution, involvement and engagement with the community. This occurs once an individual is characterised as an active member with limited influence in the community. The knowledge attained at this stage is both ideological and technical. This enables the participant to have particular perspectives on the debates that exist within the community. Once such knowledge is attained, the participant engages in what the researcher defined as "Locating".

"Locating" is a concept that represents the stage whereby a participant gains an identity in the FOSS community. It is essential to locate oneself within the broader community. It is through this stage that an individual would feel part of the community. They are sensitised to the philosophical debates in the community at this stage and can contribute towards its broader goals. Once one is a member of the community, they engage in the reproductive element of the community through cultivating. The "Cultivating" concept defines, both introducing new members to the community and mentoring them. It is indeed a necessity for individual growth and community propagation. Once a participant has experienced all these stages of the BSP, and become an expert member of the community, they enter into a stage defined as "status consolidation". It is during this stage that a participant routinises his role in the community, by attending organised activities and continues to be visible in mailing lists. They do not need the group for technical benefit, but they engage in the social aspects

of the community.

7.2. Limitations and Future Research Areas

The above mentioned stages occur in a dynamic and fluid manner, with all related and affecting the other. Indeed it is not a step by step guide on how to attain status in the community, but a mere conceptualisation of the events that occur in the community in order to sustain it. As with all studies, the work rests on the crutches of limitations which are indeed opportunities for further inquiry. Firstly, the research participants were predominantly drawn from a single group in the Western Cape, the Cape Linux User Group (CLUG). The results are not to be thought of as highly contextualised, but lacking in an added richness which could be attained should two groups in different circumstances have been compared. For instance, comparison with a community embedded within another context could have caused the emergence of constructs related to culture, group size, speciality, and other such variables. Issues of the interrelationship between group size and the impact of its variation on status beliefs was not considered in this study, and could be an area of further inquiry. However it is the researcher's belief that the information obtained in this process can be used to understand the FOSS communities in other regions. Glaser & Strauss (1967) support this notion, espousing that a grounded theory cannot be debunked but can only be modified.

Furthermore, this study does not research the conditions under which the strategies of status seeking are successful or unsuccessful. Though cases in which alienation of certain members were highlighted, it would be insightful to draw upon data from the members in the periphery of the phenomenon. It would also be important to research the altruistic participants from the Free Software community to attain more information about status, their intentions and the BSPs they undertake to attain them. In the longer term the results of such studies will lead to a formal theory on voluntary communities. The external status of members was not considered in this study. It could be intuitive to understand the relationship between external and internal status of FOSS participants. For instance, does it matter if a participant is a manager in a huge organisation, student or technician, and at the same time be a participant in the community? Do these issues have any bearing on their view on status, on on the views of the other members of the community?

While it is challenging to define the import of such inquiry into the Information Systems discipline, it is important to consider that this was neither a verificational nor hypothesis testing endeavour. The most significant contribution made by this research is the emergence of questions surrounding

the FOSS phenomenon. Questions that with more refined, quantitative or qualitative inquiry can be proved and disproved, contributing to formalisation of the emergent theory.

The concepts relating to "status" and its resolution cannot be regarded as precise, nor can they be generalised without some consideration of the context in which they are to be applied. However, they serve as powerful indicators of possible areas of future research when considering the FOSS phenomenon. They provide a suitable framework under which further questioning of the phenomenon can occur, while also refining or changing the concepts to suit the new data. Hence, it is in this light that this study is insightful and critical. To the community studied, and any other such communities, be it FOSS or other voluntary endeavour, this study could not have been more beneficial. It serves to illuminate the activities, concerns and intentions of the members in their own view. Hence unlike deductive studies, this study listens to the participants and attempts to give their voices back to them. It highlights possible areas which can be improved in the pursuit of community goals. This study is not a critique of the activities within the community, but a mere abstraction from the group to reveal its underlying processes and to what end they are undertaken.

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APPENDIX 1. METHODOLOGY LITERATURE REVIEW

Table of Contents

Investigating the Use of "Grounded Theory" in Information Systems Research

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ABSTRACT

"Grounded Theory" has been employed quite widely in studies of information systems (IS) phenomena. A survey of IS literature reveals conflict in the understanding and use of "grounded theory". The term "grounded theory" is often used as a catch phrase to denote usage of a grounded theory approach to conducting research. A variety of grounded theory approaches have been employed in IS research. The purpose of this investigation was to establish the alternative approaches employed, and the extent to which each was used. To achieve this purpose, a comprehensive review of IS studies that employed "grounded theory" was carried out. Articles from the commonly ranked top 50 IS-centric journals were used as the frame of reference. These journals most closely represent the status quo in IS research. Articles for the period 1985 to 2007 were examined. The analysis revealed four main grounded theory approaches in IS research. These can be classified as the "Glaserian" grounded theory approach, the "Straussian" grounded theory approach, the use of "grounded theory" as part of a mixed methodology, and the simple application of grounded theory techniques, typically for data analysis purposes. The latter has been the most common application of "grounded theory" in IS research. The "Glaserian" approach was the least often employed, with many studies opting for the "Straussian" approach. These and other findings are discussed and implications drawn.

Categories and Subject Descriptors
H.1.1 [**Systems and Information Theory**]

General Terms
Management, Human Factors, Theory

Keywords
Grounded Theory Methodology, Research Methodology

INTRODUCTION

A grounded theory is defined as theory which has been "systematically obtained through social research and is grounded in data" [1]. Grounded theory methodology is comprised of systematic techniques for the collection and analysis of data, exploring ideas and concepts that emerge through analytical writing [31]. Grounded theorist develop concepts directly from data through its simultaneous collection and analysis. Bryant [2] draws a clear distinction between grounded theory - the outcome of research, and grounded theory method, methodology, or approach - the process by which a grounded theory is produced through research. Many authors refer to having used "grounded theory" in their studies, when in fact what they mean is that they have employed a grounded theory approach [2]. A variety of grounded theory approaches have been employed in IS studies, but these are not always clearly differentiated by researchers.

The aim of this study is to bring clarity to the research process by identifying four alternative grounded theory approaches. The presence of these four approaches in IS research is then examined in order to assess trends and directions.

In the next section, the key principles and procedures of grounded theory methodology are outlined. The four common grounded theory approaches are then delineated. Following that, some pertinent issues and misconceptions around "grounded theory" research are clarified. After this clarification, the research methodology employed in this study is explained before the results are reported and analysed. Following a discussion of the results, the paper is concluded.

GROUNDED THEORY METHODOLOGY PRINCIPLES AND CODING PROCEDURES

The grounded theory research methodology was first put forward by Glaser and Strauss [3] in 1967. A methodology encompasses a set of principles, together with methods and

techniques to be employed in accordance with these principles [4, 5]. Three key principles that distinguish grounded theory methodology are the principle of emergence, constant comparative analysis and theoretical sampling.

The principle of emergence

The emergence principle of grounded theory methodology is manifested in the belief that both the outcome (grounded theory) and the research design process should be emergent [5]. Researchers should not start with some pre-conceived concepts, or guiding theoretical framework, as the concepts and theory must be allowed to emerge from data, i.e., researchers should allow the data to "speak for itself" [5, 6]. The emerging theory should be faithful to the persons being researched, faithful to context and be used to discover enduring frameworks [7].

Similarly a pre-defined well thought-out research design would inhibit the emergent nature of the grounded process [5].

Constant comparative analysis

Constant comparison is the major strategy used in discovering grounded theory. This technique is used as a means of (1) determining accuracy of data, (2) establishing limits of empirical generalization, (3) specifying a concept, (4) verifying theory, (5) generating theory [3].

To assess accuracy of evidence one incident (element of data) is compared with another. It is recognised that even if some evidence has inaccuracies, it is not too much of a problem, as in generating theory "it is not the fact upon which we stand, but the conceptual category (or a conceptual property) that was generated from it" [3]. Constant comparison, when used to establish limits of generalisation may assess an incident of data by comparing it against other data points in different organisations, for example, to see if it is still applicable, or to ascertain what variation exists [3]. To verify theory, constant comparative analysis can be used as a means of looking for other cases that confirm the existence of categories and propositions [3].

The major purpose of comparative analysis, however, is to generate theory [3]. In this process, data is broken down into incidents, and these compared for similarities and differences. While doing so the question of what concept or property of category they represent is asked [6]. The aim is to assign a common meaning to multiple data incidents, which become a category [8]. As concepts emerge and are named these are compared to other incidents in data, leading to the definition of properties of a category [6]. As such, there is a constant iteration between naming and comparing data incident to data incident, and data incident to concepts, in the light of a category [8].

In line with the principle of emergence, researchers should suspend any pre-conceived ideas and notions about the phenomenon under investigation, in order to allow the data 'to speak for itself' [3, 6]. It is recognized that it is impossible to ignore or pretend not to know what is already known, but in order to allow for creativity in naming and identifying concepts and categories, these should be held at bay [8].

Theoretical sampling

Theoretical sampling has been succinctly described as sampling directed by theory, as opposed to purely purposeful sampling, which is typically pre-determined before the start of the study [1]. With theoretical sampling, the decision as to where and when to sample, and the size of the sample should be determined by the emerging theory, and should continue until each category identified in the theory is saturated [6].

Coding Procedures

Coding represents "the analytic processes through which data are fractured, conceptualised, and integrated to form theory" [5]. Glaser & Strauss [3] and Glaser [6] make mention of open coding and selective coding, while Strauss & Corbin [5, 9] suggest three types of coding activities – open, axial and selective in sequence. Although presented as sequential processes, they are in practice performed iteratively, where the researcher moves between stages as demanded by the investigation.

Open Coding

Open coding is "the analytic process through which concepts and categories are identified and their properties and dimensions are discovered in data" [5]. Naming, comparing and the writing of memos are the key activities that take place in this phase [8]. Concepts are the basic building blocks of theory, and so the first task in developing it is seen as opening up the data to reveal and name these concepts [5]. The constant comparative method is the means used to achieve this, whereby comparing similarities and differences between data incidents yields discrete concepts, which are then given names [5]. Where the names given are sourced directly from the data, they are referred to as "in vivo" codes [5,9]. Glaser [6] suggests that naming of concepts be done using either "in vivo" words, or by using sociological constructs derived from an awareness and familiarity with the sociological literature.

Axial Coding

Axial coding is defined as "the process of relating categories to their sub-categories, termed "axial" because coding occurs around the axis of a category, linking categories at the level of properties and dimensions" [5]. A sub-category in this instance, is subordinate to a main category or phenomenon, in that it answers questions such as who, where, when, why and how about that category [5].

In axial coding, Strauss & Corbin [5, 9] suggest the use of a paradigm model to identify how a category relates to its sub-categories. Such a model helps to integrate structure (the conditional context in which a phenomenon is situated), with process (sequences of action/interaction pertaining to a phenomenon) [5]. The paradigm model advocated by Strauss & Corbin [5] has the following structure – concerning any one phenomenon (main category), routine or strategic actions/interactions give rise to certain consequences. Causal conditions are those categories that have an influence on the phenomenon, and thus on the actions/interaction of subjects, whilst intervening conditions limit the impact of causal conditions on the phenomenon. Glaser [6] defines a contextual condition simply as "a condition of overriding scope, under which a set of related categories and properties occur".

Usually coding proceeds until theoretical saturation is achieved, whereby gathering additional data, nothing substantially new emerges. The theory that is formed therefore represents the aggregate of data collected, rather than the view and perspective of only one data source [5].

Selective Coding

Glaser [6] elucidates the meaning of selective coding by noting that "to selectively code is to cease open coding and to delimit coding to only those variables that relate to the core variable, in sufficiently significant ways to be used in a parsimonious theory". Part of the process of selective coding according to Strauss & Corbin [5] is the identification of a central category. Such a category, they assert, must be central, in that all other major categories relate to it, and that with almost all cases there are indicators pointing to it. It should also be able to explain variation, and even contradicting evidence [5].

In refining the theory, Strauss & Corbin [5] suggest the following: Review the conceptual schema for internal validity and logic; fill in poorly developed categories; trim excess categories; and validate the schema, through, for example, a high level comparative analysis with the data. The final theory may be represented as a set of propositions or as a running theoretical discussion [3].

ALTERNATIVE GROUNDED THEORY APPROACHES

Glaserian versus Straussian Approaches

Grounded theory methodology has been a subject of great controversy since its creation by Glaser and Strauss [3] [10, 6, 7]. Numerous authors have written about the grounded theory methodology, with renewed interest spawned by the intense debate between its originators Glaser and Strauss about its canons [6, 7]. The key principles, procedures and techniques to be

applied in deriving grounded theory are articulated in Glaser & Strauss [3], Glaser [6] and Strauss & Corbin [5, 9] in addition to other monographs. Glaser [6] objected strongly to the rendition of the grounded theory method as described in Strauss & Corbin [9] leading to the development of what are termed the Glaserian and Straussian camps amongst grounded theorists [1]. Glaserian grounded theory methodology is widely believed to be faithful to the original formulation by Glaser and Strauss in 1967 [3]. The differences between the two are largely subtle, however, and not entirely apparent to the average reader of their monographs [6]. Nevertheless, it is possible to outline the key points of contention as follows:

Emergence versus Forcing

Glaser uses the "emergence" metaphor to characterise the claimed strict emergence of theory from data in the Glaserian approach [6]. Straussian grounded theory methodology is distinguished by its directive questioning of data for categories [9]. This has led to it being associated with "forcing" of categories from data. From the Strauss and Corbin [9] formulation emerged novel data analysis techniques which are widely used in qualitative research. The conflict between the methodologies is thus often referred to as the emergence versus forcing debate.

Use of the Paradigm Model

According to Kelle [10], one important point of divergence between the originators of grounded theory methodology is the use, by Strauss and Corbin [9], of the paradigm model in the discovery of theory. Strauss and Corbin [9] state that if the researcher does not use the model the "grounded theory analysis will lack density and precision". Glaser [6] asserts that this notion produces forced, pre-conceived, full 'conceptual description', rather than grounded theory that emerges from data. Thus, the central bone of contention is that the principle of emergence is violated by some of Strauss & Corbin's [9] suggestions. According to Glaser [11] these paradigm model codes form part of a wider family of codes to which no prescription to any research setting should be advocated. The rigid use of the paradigm model promotes deductive as compared to inductive research – what Glaser 6] refers to as forced rather than emergent theory. Strauss & Corbin [5], on the other hand, contend that the purpose of a paradigm model is to gain a better understanding of how a phenomenon relates to sub-categories. As such each category may serve as one or more of a causal condition, intervening condition, action/interaction or consequence, depending on the main category being investigated [5]. It is therefore not the intent that as a category emerges during open coding it be assigned the label of causal, intervening, consequence, etc. Furthermore, in accordance with the principle of emergence, any relationships identified should arise from the data, although actual linking takes place conceptually at the level of properties and dimensions of categories [5].

Asking of Questions

Another visible difference between the two approaches is that Glaserian grounded theory methodology requires one to enter the research setting without any research question [3]. Strauss & Corbin [9] suggest defining a research question prior to entering the field. A process of asking questions is also suggested by Strauss & Corbin [5] as a useful analytical technique. Glaser [6] argues that this leads to preconceived conceptual description, rather than grounded theory.

Coding Procedures

According to Locke [8] the essential difference between the Glaserian and Straussian approaches is that the Glaserian tends towards "more openness, flexibility, and more parsimony in the elaboration of necessary analytical steps". The Straussian, on the other hand, tends towards "increased prescription and formal elaboration of operational procedures" [8]. This is evident in the suggested use of detailed line-by-line microanalysis of data as one of the techniques prescribed by Strauss & Corbin [5]. As Glaser

[6] points out, going through such a procedure will result in over-conceptualisation of data incidents.

Straussian grounded theory methodology furthermore makes note of three major coding phases – open, axial and selective coding respectively [5, 9]. Glaserian grounded theory methodology on the other hand mentions only open and selective coding respectively [3, 6].

According to Strauss & Corbin [5], during open coding, categories are developed by grouping similar concepts together into more abstract explanatory terms. Discrete concepts may then become properties or characteristics of a category, or may provide suggestions for such characteristics. The rationale for this higher order grouping is that categories are easier to remember, think about, and develop in terms of properties and dimensions, and can be further differentiated by breaking them down into sub-categories if necessary [5]. Glaser [6] has a slightly different view on this process, arguing that firstly identifying discrete concepts and then grouping them into higher order categories is unnecessarily tedious and laborious. Rather, he suggests, through constant comparative analysis, broad-based categories should emerge, and then further comparative analysis will yield properties and dimensions of these [6].

Use of Grounded Theory Techniques for Analysis

Whilst the overshadowing debate concerning alternative grounded theory approaches has been between the Glaserian and Straussian camps, literature reveals a third strand of researchers who do not necessarily follow either. Rather, they choose to use only the grounded theory methodology techniques such as open, and/or axial and/or selective coding. Strict adherence to some or all of the principles is not deemed necessary. For instance, researchers may start with pre-conceived a priori theory, then go on to collect empirical data, and analyse it using grounded theory coding techniques. The intent may be to extend the initial theory inductively. Alternatively, the intent may be to use the initial theoretical framework solely as a guide or sensitizing device, before applying grounded theory techniques to analyse data and build theory. The final theory developed may or may not resemble the initial framework.

Mixed Methods

This study also reveals a fourth grounded theory approach which is consistent with the multi-method research approach in IS research [12]. Two particular formulations are the grounded action research [13] and the grounded case study approach [14]. Collectively, such approaches can be referred to as mixed grounded theory approaches.

Summary

Table 1 illustrates these four approaches and their differences.

Table 1 Four Grounded Theory Approaches.

Approach	Principles	Coding	A priori Theory	Paradigm model	Typical Refs
Glaserian	Required	Open, Selective	No	Viewed as family of codes	Glaser & Strauss (1967); Glaser (1992)
Straussian	Required (Glaser disputed adherence)	Open, Axial, Selective	No	Greater emphasis	Strauss & Corbin (1990, 1998)
Analytical	Not necessarily	Any or all used	Maybe used	Some times used	Variety
Mixed	Not necessarily	Any or all used	Maybe used	Some times used	Mingers (2001)

ADDITIONAL POINTS OF CONTENTION

The following section highlights some other key issues surrounding grounded theory methodology, which perhaps transcend those specific to the differences between the four approaches highlighted in the previous section, these being epistemological leanings, and the assertion that the grounded theory methodology is qualitative.

Epistemological Basis of Grounded Theory Methodology

There is no shortage of literature alleging the

epistemological position embedded within grounded theory methodology [1, 7, 15, 16]. Some researchers have alleged a positivist inclination in grounded theory methodology [7], while others have associated it with interpretivist thinking [16]. For instance, Glaser's [6] assertion that theory should emerge from data, without influence from the researcher, who must suspend all pre-conceived notions is decidedly positivist. The detailed descriptive and prescriptive feel of Strauss & Corbin's [5, 9], on the other hand, have a hard and positivist feel to them. Indeed, Bryant [2] argues that grounded theory methodology, whether Glaserian or Straussian is rooted in positivism. Hughes and Jones [16] argue that despite there being no explicit epistemological basis within the grounded theory methodology, some of its principles and techniques resonate with the interpretivist paradigm, e.g., inductive reasoning and theoretical sampling. Urquhart [17] argues that although many IS researchers who have applied the grounded theory methodology have adopted an interpretivist stance, the grounded theory approach is essentially a methodology, whose philosophical base is not specifically articulated. Fitzgerald and Howcroft [18] illustrate the separation between the epistemological, ontological, axiological and methodological aspects of any research. This distinction is particularly relevant to grounded theory methodology as it demonstrates that choice of methodology does not automatically imply adoption of any epistemological stance. With any application of grounded theory methodology, the researcher should explicitly state their epistemological stance, and then apply the grounded theory methodology in accordance with those tenets [17].

Methodological studies have demonstrated the dearth of IS research utilising the critical paradigm [28,29], hence its exclusion from this study. The epistemological comparison in this study is hence focused on positivist and interpretive approaches. Research was considered positivist if there was evidence of hypothesis testing, inference of results from sample to a general population, focus on quantitative data (though not strictly applied) and the existence of fixed relationships between constructs prior to the study [30]. Interpretive research was distinguished by the researchers' analysis of participants viewpoints, seeking context based understanding of phenomenon and a general absence of criteria expected from positivist studies.

Grounded Theory Methodology – Qualitative?

Grounded theory is perceived by some researchers to be a qualitative research approach [5]. This has in turn led to its data analysis techniques being closely linked to qualitative inquiry - particularly open, axial and selective coding. The widespread use of these techniques demonstrates their utility for qualitative analysis. The myth that grounded theory methodology is qualitative is widely disputed, especially by Glaser [19] who believes that this misconception erodes the methodology. This erosion has led to some researchers applying rigid and difficult rules for judging the credibility of grounded theory methodology studies [20]. Strauss & Corbin [5] too note that there should be close interplay between qualitative and quantitative data analysis in grounded theory methodology studies. Overall, as Glaser [6] asserts, in grounded theory methodology studies, "all is data", implying the methodology is neither qualitative nor quantitative.

RESEARCH METHODOLOGY

To conduct the study, articles which have employed grounded theory methodology in IS research were collected. Given the wide diversity of IS research outlets, it was beyond the scope of this study to identify all possible IS studies. It was decided to restrict the survey to journals, since most high-quality research is published in such outlets. The IS discipline is known to have more than 600 possible journal publication outlets [21]. Such a large list of journals to search was still beyond the scope of this study. Top researchers typically target the most prestigious outlets for their outputs. It is these outlets which might reveal "best practices" in IS research. Lewis et al. [22] conducted a scientometric study to establish validity of metrics used to ascertain journal

quality in information systems research. In this study, a list of top 50 IS-centric journals was produced. This list has since been used to investigate IS research trends [23], and hence was used as the sampling frame for this study.

Articles reporting on use of the grounded theory methodology were identified by using "grounded theory" as the search string and specifying that the search would be done within the body of the document by using "TX" for the EBSCOHost database. A typical search query would look as follows , (JN "International Journal of Electronic Commerce" and TX "grounded theory"). For publications not appearing in the EBSCOHost database the search was supplemented using Google© Scholar Advanced Search, ScienceDirect, Emerald Fulltext and JSTOR, with the same search keywords. Using the Interlibrary loan system, hard copies of articles were obtained where they were not available to the researchers electronically.

The time frame for articles was from 1985 to 2007. 1985 was chosen as it signifies the first relevant article using grounded theory methodology in IS research within the selected publications. The search yielded a total of 272 articles of which 146 where eliminated as they did not use grounded theory methodology or any of its canons to conduct research. For instance, the papers may have been conceptual pieces on grounded theory methodology, such as this one, rather than empirical research carried out using grounded theory methodology or its techniques. The remaining relevant articles for this study were 126.

RESULTS AND ANALYSIS

Journals Publishing Grounded Theory Methodology Research

Out of the top 50 IS-centric journals relevant articles were located in 30 journals. Table 2 shows the distribution of articles by journal. The highest incidence of grounded theory methodology research is found in the Information Technology and People Journal. The Information Technology and People journal credits itself as a pioneer in "new methods and theories for perceiving and understand[ing] [the] relationship" between IT and organisations [24]. It is hence no surprise to see that it is the leader in publishing grounded theory methodology research, a method that discovers new theory. The second highest incidence was in the Journal of Management Information Systems. MIS Quarterly, which is recognized as the most prestigious IS journal is among the top three publishers of grounded theory methodology studies. Other prestigious journals which contain a significant number of articles on grounded theory methodology are Information Research and the Information Systems Journal.

Table 2: IS-Centric Journals with Articles employing Grounded Theory Approaches (1985 – 2007)

Journal Title	**Articles**
ACM Transactions on Information Systems	1
Australian Journal of Information Systems	1
Communications of the ACM	7
Computer Supported Cooperative Work	3
Decision Support Systems	2
E-Service Journal	1
Electronic Markets	3
European Journal of Information Systems	9
Information & Management	4
Information and Organisation	1
Information Processing and Management	1
Information Research	**12**
Information Society	5
Information Systems Journal	**11**
Information Systems Management	2
Information Systems Research	2
Information Technology & People	**16**
Informing Science	1
International Journal of Human & Computer Studies	2
International Journal of Information Management	1
Journal of Computer Information Systems	1
Journal of Global Information Management	1
Journal of Information Systems Education	1
Journal of Information Technology Education	2
Journal of Management Information Systems	**14**
Journal of Organisational Computing & E-commerce	2
Journal of Strategic Information Systems	2
Journal of the Association of Information Systems	1
MIS Quarterly	**10**
Scandanavian Journal of Information Systems	7
TOTAL	**126**

Grounded Theory Approach Used in Articles

To establish the grounded theory approach used in each article, the criteria in Table 1 were applied. The results concerning the grounded theory approach used for articles in the period from 1985 to 2007 are shown in Figure 1 below. Overall, 62% of publications used the analysis techniques of grounded theory methodology without adopting a particular methodological stance, whether Glaserian or Straussian. The prevalence of this approach is perhaps not surprising, given the controversies associated with being either Glaserian or Straussian. It may also reflect the desire for flexibility when conducting IS research, with methods and techniques used where perceived as appropriate, and not necessarily in order to produce a grounded theory. It is also a reflection of the difficulty of following classical grounded theory methodology in traditional research contexts. Tradition often dictates that there be a priori conceptualisations of the research problem through extensive literature review, and well-designed research designs before data gathering. This is especially true for post-graduate students who are required to produce a detailed literature review before research commences as a course deliverable. These traditions are at odds with the emergent nature of grounded theory methodology. Many researchers wanting to employ grounded theory methodology are therefore forced to adopt only the grounded theory techniques in order to fit within the prevailing research traditions.

The next most popular approach was the use of the Straussian grounded theory methodology (17% of articles). The guidelines and prescriptions provided by Strauss & Corbin [5, 9] have been noted as useful, especially for novice researchers [16]. This may account, then, for the relative popularity of Straussian grounded theory methodology in IS research.

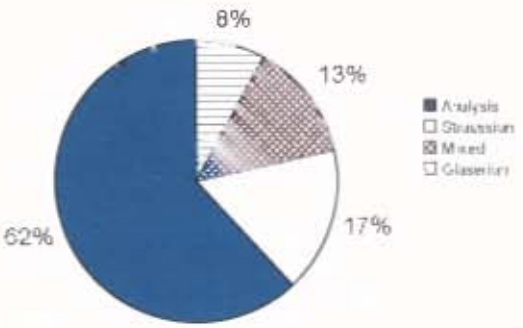

Figure 1. Grounded Theory Approaches used in IS

Glaserian grounded theory methodology was not widely used as reflected by the 8 percent incidence of articles. Monographs on the Glaserian approach offer limited guidelines, and prescriptions. Rather adherence to principles is emphasized. It is thus not as easy an approach to execute, especially for novice researchers, which possibly accounts for the less frequent use in IS research.

A low incidence was observed for the mixed methods approach, constituting 13% of the published research. Mixed methods research is not an easy approach to follow, especially where attempts are made to combine approaches at the paradigmatic level [12]. There are few guidelines for following this approach, which may account for its limited presence in IS research [12].

Longitudinal Trends in Grounded Theory Approach Publications

The distribution of articles for the years from 1985 to 2007 is shown in Figure 2 below. For analysis purposes, the publications are grouped into three time periods based on the relative increase of publications in the period. The first period of relatively slow publication of grounded theory methodology studies is from 1985 to 1994. The second period in which a steady increase is observed is from the years 1995 to 2000. The third and last period which shows a sharper increase is from 2001 to 2007. In the first decade, from 1985-1994, 40 % of articles in this period used the Glaserian

approach while 40 % used the grounded theory analysis techniques, with the remainder using the Straussian approach. No studies in this period utilised the mixed method approach. 60% of grounded theory methodology studies in the first decade were positivist while 40% adopted an interpretive epistemology.

In the next five years, from 1995-2000, there was a general increase in the use of grounded theory methodology in IS publications. In total, 26 articles were published during this period. That means in half the time, 5 years, IS journal articles reporting grounded theory methodology usage had more than trebled. This leap could be credited to the desire amongst researchers to change direction as scientific methods did not seem to yield the desired results. The work of Orlikowski in 1993 had demonstrated the usefulness of the methodology in "developing context-based, process-oriented descriptions and explanations of a phenomenon" [30]. Data shows that 46% of articles in this period used grounded theory methodology techniques for analysis purposes, without aligning themselves to any particular grounded theory approach. 23% of authors used the Straussian grounded theory approach as compared to only 12% the Glaserian. The remaining 19% adopted the mixed method approach, particularly Eisenhardt's [14] grounded case study approach. Epistemologically, the studies in this half decade had shifted from positivist to predominantly interpretive. 31% were positivist while more than double, 69% were interpretive.

From the years 2001 to 2007, a sharper increase in the use of grounded theory methodology was seen in IS research. 18 articles were published in 2007 alone, almost equaling the 25 published in the second period, between 1995 and 2000. This was the highest number of articles published in any single year since 1985. The total number of grounded theory methodology-based articles published between the years 2001 and 2007 was 95. Of the 95 articles, only 5% used the Glaserian grounded theory approach. A further 67% used only grounded theory analysis techniques, while 13% used grounded theory methods within a multi-method approach. The remaining 15% used the Straussian grounded theory approach.

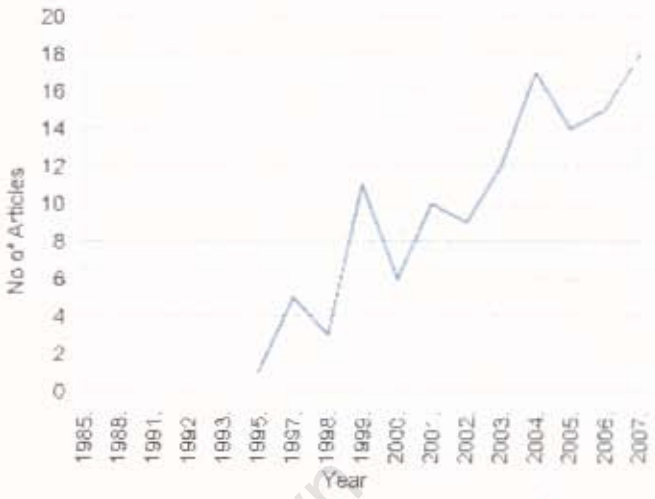

Figure 2. Grounded Theory Methodology Articles per year

Epistemology

Glaserian grounded theory methodology is often alleged to be positivist [2], while the Straussian approach is often associated with interpretivism [16]. It is important to assess how grounded theory methodology is used in IS research in order to understand whether these generalizations hold. Figure 3 below illustrates the differences.

For approaches employing just the grounded theory analysis techniques, 59% were interpretive while 41% were positivist studies. In studies following the Glaserian approach, 30% percent adopted a positivist epistemology while the remainder were interpretive. Mixed method studies were 47% positivist, compared to 53% interpretive. Finally studies following Straussian grounded theory methodology were 19% positivist and 81% interpretive. The findings debunk the myth that grounded theory methodology has any epistemological position embedded within its tenets.

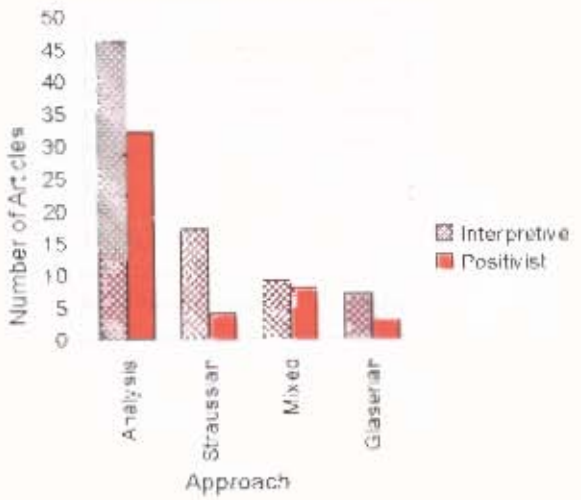

Figure 3. Epistemology in Grounded Theory Approaches

A Priori Theorising

Grounded theory methodology, whether Glaserian or Straussian advocates that no a priori theory, or review of related conceptual literature should be followed prior to data collection [3, 6, 5, 9]. It was found that for those articles following the Glaserian grounded theory methodology, no prior theorizing was evident, in accordance with the principle of emergence [6]. For research articles that claimed to be following the Straussian grounded theory methodology, however, 11% entered the research with a priori theory. These papers, it would seem, did not strictly adhere to the principle of emergence, and thus were perhaps mistaken in their articulation of having followed a grounded theory methodology. For researchers who used only grounded theory analysis techniques, 64% indicated prior theorising occurred. These studies are not bound to be inductive or emergent, and therefore correctly articulated their grounded theory approach. The mixed method approach was almost evenly matched with 55% approaching the research with a priori theory.

DISCUSSION AND IMPLICATIONS

Grounded theory methodology is increasingly being used in IS research. Its relevance is easily supported by acknowledging the nature of the discipline, which predominantly deals with IT in social contexts. Indeed, the IT artifact itself is inscribed with social and cultural rules, norms and procedures. Grounded theory methodology, which originated in sociology, is therefore an appropriate research methodology in IS. The opportunities presented for further inquiry are vast. Opportunities shall be discussed on the theoretical, methodological, human and researcher level in the sections that follow.

Theoretical Level

IS as a discipline has mainly relied on adapting theory from its cognate disciplines, such as social science and computer science [25]. This, although valid in some instances, faces a number of obstacles. Chief among these is that the problems that arise from the IS domain sometimes deviate sharply from known theorised areas in the cognate disciplines. Among these are topics such as the open source phenomenon and social networking [26]. Relying on social science-based theories in some cases not only diminishes the authority of IS as a strong discipline, but contributes to the theoretical erosion of those borrowed models [25]. The theoretical erosion comes about as a result of research which does not contribute in turn to the reference discipline [25].

Grounded theory methodology presents a possible alternative in building theory relevant to the IS discipline. Lyytinen and King [27] agree that building theory for the field would help strengthen it. In the IS discipline opportunities exist to build theory in both emerging fields and well researched ones. As Glaser [6] states, when generating theory through the grounded theory methodology, the theory will be faithful to the field being studied. The rise in grounded theory methodology use in IS research shows that concerns about the development of IS theory are relevant. However as shown by the paucity of grounded theory methodology literature, a great opportunity exists for more work on developing theory in IS.

Methodological Level

At the methodological level, opportunities exist in two areas. Firstly, the analysis has shown that there is minimal use of the full grounded

theory methodology in many IS studies. Many researchers opt to use just the analysis techniques of grounded theory methodology. The Glaserian approach especially has not been widely adopted. More IS research that employs the full set of principles and techniques, from either a Straussian or Glaserian stance, but particularly the Glaserian should be encouraged. Adopting these approaches, would allow for new understanding and contributions to emerge about both the research process and outcomes. This could be particularly relevant to developing country-based research, where the social context of developed nations, from where much research emanates, fails to capture all aspects of a phenomenon.

Secondly combining grounded theory methodology with other methodologies to create alternative approaches would be of great value in IS, given its multidisciplinary nature. Baskerville & Pries-Heje [13], for example, combined grounded theory methodology with action research to create a grounded action research approach. Plurality can increase the richness and validity of results and is to be encouraged in IS research [12].

Human Level

Grounded theory methodology seeks for theory to emerge from the data, and in essence seeks to build theory reflecting the major concerns of the studied group [6]. This type of theorising can be used to reflect the real concerns of a situation within a theoretical framework. The mixed method, grounded action research, for example, can reveal concerns in a group and at the same time work to rectify or correct the situation. This can serve to create theoretical frameworks that illuminate concerns and advise on corrective measures. There is potential for widespread application of such approaches in IS, where for instance IS projects are said to have failure rates approaching 50%. In these instances researchers agree that the social context plays a major role. By grounding theory to participants' understanding of the social context, improvements can be made [4]. There is no limit to the application of the methodology in the discovery of human concerns within the IS domain.

Researcher Level

As much as grounded theory methodology's usage is anticipated to grow in IS research, this could also present numerous challenges for the research community. Moving beyond debates on its epistemological basis, appropriate formulations of grounded theory methodology suited to either positivist, interpretivist or critical epistemologies are needed.

Criteria for judging the soundness of grounded theory methodology publications in IS would also need to be established. Misunderstandings and myths concerning the nature and underpinnings of grounded theory methodology are still widespread. Some of these myths are centered around themes of using quantitative data in a grounded theory methodology study, the role of literature and a prior theory. Hence an opportunity for IS researchers exists in the rationalisation of the debates that surround the methodology. Without IS researchers engaging in the debates of grounded theory methodology and contributing to its building, the quality of grounded theory methodology-based IS research will not improve.

CONCLUSION

Different approaches to grounded theory methodology are being used in IS research. Four distinct approaches were identified in this study – the Glaserian grounded theory approach, the Straussian approach, application of grounded theory analysis techniques, and mixed methods. The predominant mode of usage in IS research has been the application of grounded theory analysis techniques, followed by the Straussian grounded theory approach, then Glaserian and finally mixed methods. The growth in grounded theory methodology use has been shown to be a positive development, capable of contributing to the theoretical core of IS, hence strengthening the discipline.

The predominant epistemological stance used with grounded theory approaches is interpretive. However positivist studies are also quite common. This debunks the myth that grounded theory methodology is either positivist or interpretivist. It confirms also the assertion that it is the stance of the researcher utilizing grounded theory methodology that

determines the epistemology rather than the methodology itself.

The paper has made a contribution to IS research by highlighting the alternative approaches and clarifying the nature of grounded theory approaches in IS research. Further work can be done to build better understanding of the process and outcomes of following a Glaserian grounded theory approach, and of mixing methods in IS research.

AKNOWLEDGEMENTS

We wish to acknowledge the financial assistance of the National Research Foundation in South Africa for making this study possible. Opinions expressed in this publication are those of the authors and not necessarily NRF's.

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APPENDIX 2: PAPERS ANALYSED IN LITERATURE REVIEW

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APPENDIX 3: INTERVIEW QUESTION SHEET

This is a guide and the questions posed in the interview may vary depending on the information being received and other new ideas that may arise.

General Opening Questions:

1. Tell me about how you came to be an open source contributor?
2. When did you start contributing to the community?
3. What did you think about the field then?
4. Have your initial perceptions about the field changed since then, if so how?
5. Who would you say influenced your decision to engage in the open source community? Please tell me how they influenced you?
6. Could you explain the events that led to your current position within the community?
7. How would you describe the person you were then?
8. How would you describe the person you are now?
9. What would you say has been the highlight of the time you have been an active member of the community.
10. Any disappointments within that same time frame, if any could you explain?

Intermediate Questions:

1. What do you know about the South African Open Source Policy?
2. What are your thoughts on this particular initiative?
3. What role do you think governments play in the open source software community?
4. What notable positive developments have you observed in the open source community?
5. Are you involved in any open source advocacy activities and how?
6. What challenges do you think are faced by the open source community today?
7. What would you recommend as possible solutions?
8. What do you consider as the lesson that you have learn't because of your participation in the open source initiatives.
9. In terms of the future, what would you perceive as your future role in the community?
10. Could you please describe a typical day that you would be involved in any open source activities.
11. How do you manage the everyday challenges posed because of your role in the community?
12. What do you think is the role of industry in the community?
13. Could you explain how you would come to be involved in any particular open source

project? What are the issues that you consider before participating?

14. How would you describe the projects you have been involved in to date?
15. Reflecting on your participation, what experiences stand out?

Concluding Questions:

1. What are your views regarding proprietary software?
2. If you were speaking to someone considering joining an open source initiative, what would your advice to them be?
3. Did this interview make you think of something that you had not considered before, if so please explain?
4. Any recommendations on what can improve my understanding of open source software?
5. Do you have any questions for me?

APPENDIX 4: COVER LETTER

Department of Information Systems
Leslie Commerce Building
Engineering Mall. Upper Campus
OR Private Bag. Rondebosch 77001
Tel: 650-2261
Add: ALUMNI, Cape Town
Fax No: (021) 650-2280

Masters Dissertation: Participant Consent Form

Dear Sir/Madam,

As an Information Systems Masters student at the University of Cape Town, I am completing a short study of Free and Open Source Software (F/OSS) in South Africa.

As part of the research process I will be conducting interviews to gain qualitative insights from community stakeholders. Further data will be obtained through observation of the regular meetings hosted by the community. Your participation in this research will be greatly appreciated.

The interview and interview questions have been approved by the UCT Ethics committee. Participation is voluntary and all data collected will be stored electronically and will be kept strictly confidential. The results will be kept anonymous and will only be published as part of the research. However, if you are willing to receive a copy of the final results of the research, you are welcome to give us your email address and the final results will be sent to you.

If you have any further queries, please feel free to contact either the researcher or Professor Irwin Brown. Contact details are provided below.

Thank you for your time and cooperation.

Sincerely,
Masters Student (Information Systems):

Research Student: Rangarirai Matavire mtvran001@uct.ac.za .....

Supervisor: Prof Irwin Brown Irwin.Brown.uct.ac.za .....

Department of Information Systems
University of Cape Town

PARTICIPANT CONSENT FORM

By signing this participant consent form, you are agreeing to participate in the research project entitled "Towards an Understanding of Open Source Communities: A Substantive Classic Grounded Theory of Participation in Free and Open Source Communities in South Africa "

Signature: _____

Date: _____

APPENDIX 5: TOP INFORMATION SYSTEMS JOURNALS (Lewis, et al., 2007)

Journal	Number of Schools Classifying the Journal in:		
	The Top Category	The Top Two Categories	Any Category
ACM Special Interest Group Pubs	0	1	6
ACM Transactions on IS	7	12	13
Australian Journal of IS	0	0	6
Behavior & IT	0	2	9
Communications of the ACM	24	31	31
Communications of the AIS	0	5	12
Computer Supported Cooperative Work	1	1	2
Data Base	2	13	21
Decision Support Systems	4	25	27
E Commerce Research & Applications	0	2	3
e Service Journal	0	0	2
European Journal of IS	3	21	25
Electronic Markets	1	2	7
Information & Management	5	22	29
Information and Organization	6	14	15
Information Processing and Mgt	1	2	6
Information Research	0	0	1
Information Systems	5	8	13
Info Systems Frontiers	0	3	10
Information Technology and Mgt	0	4	7
Information Technology and People	2	7	12
Informing Science	0	0	1
International J of Human Comp Studies	1	7	13
International Journal of E Commerce	2	9	15
International Journal of Info Mgt	0	2	8
Information Resource Management J	0	4	11
Information Systems Journal	2	15	18
Information Systems Management	1	4	8
Information Systems Research	34	34	34
Journal of the ACM	3	7	8
Journal of the AIS	3	18	18
Journal of Computer Info Systems	0	5	9
Journal of Database Management	1	5	9
Journal of Organizational and EUC	0	3	12
Journal of Global Information Mgt	0	3	8
Journal of Global Info Technology Mgt	0	3	6
Journal of Info Systems Management	0	0	3
Journal of Information Technology	2	8	14
Journal of IS Education	0	0	6
Journal of IT Cases & Applications	0	1	5
Journal of IT Education	0	0	3
Journal of Info Tech Theory & App	0	0	3
Journal of MIS	27	33	34
Journal of Strategic Information Systems	2	16	22
MIS Quarterly	35	35	35
MISQ Discovery	0	0	1
Organizational Computing & Ecommerce	1	5	13
Scandavian Journal of IS	0	1	6
The Information Society	2	9	13
Wirtschaftsinformatik	0	0	1