**Chapter One**

**Utilization of Information Communication Technologies by Students with Disabilities**

**1.0 Introduction**

It is undisputable that Persons with disabilities, in their diverse constituency groups, are among the historically most marginalised groups. The recognition of barriers encountered by persons with disabilities has led to the development of international, regional and national instruments to promote and protect their human rights. Persons with disabilities in Zimbabwe remain in the periphery of the development trajectory due to difficulties in accessing public spaces, goods and services, information communication and technologies owing to attitudinal, environmental and institutional barriers. Hence there are inclusive policies which will provide an all-inclusive environment that provides equal opportunities persons with special needs. Similarly, affordability of ICT services for consumers and ensuring that smart devices are available and affordable to consumers will be promoted. Therefore, study is going to assess the utilization of information communication by persons with disabilities focusing on those with visual impairment (students).

The use of assistive technology by learners with visual impairment in their academic work and information seeking has been studied by several authors who found that technology plays an important role in the information behaviour of such learners (Corn and Wall, 2002). At the dawn of the 21st century, the prevalence of ICT in all aspects of life and the need for the establishment of a knowledge society led many countries such as the United Kingdom (Livingstone, 2012), Malaysia (Kannan, Sharma and Abdullah, 2012), Turkey (Cavas, Cavas, Karaoglan and Kisla, 2009) and the Republic of Korea (Yeo, Kim and Bae, 2014) to introduce and expand the use of ICTs in their education systems to transform education and to establish knowledge societies. ICT integration in the curriculum is the apparent goal of an extensive array of educational initiatives (Proctor, Burnett, Finger and Watson, 2006). Seesurrun (2015) studied the development of a self-help skills education for learners with visual impairment in Mauritius. Seesurrun (2015) established that there is necessity for a curriculum that can be specifically designed to meet the needs of learners with visual impairment. In addition, Zelelew (2016) studied the inclusion of students with visual impairment at Addis Ababa University and established that resource constraints and attitudes inhibit inclusion. In South Africa, the provision of tablets is consistent with the Gauteng government‟s vision and mission of building a smart, knowledge-based and innovation-driven economy in the province (Makhura, Collins and Segabutla, 2021).

In Kenya, Nyagah, Wachiuri and Imonje (2017) established that there are relative advantages of ICT integration in the teaching and learning of English among learners with visual impairment in special secondary schools. In a study in Namibia, Kithuka (2008) revealed factors affecting the integration of ICT in the learning and teaching of learners with visual impairment. However, it should be noted that these studies have been carried out in other countries which have conditions which are not like those in Zimbabwe. Furthermore, the above reviewed studies did not focus on ICT integration in the education of learners with visual impairment as pursued in this study. Zimbabwe recognises ICT as the building block of its society and the critical role of ICTs in enhancing the schooling system (Tarisayi and Manhibi, 2017). As a result, the Zimbabwe ICT policy stresses the importance of integrating ICTs in teaching and learning in general and in teaching learners with special needs in particular. Various initiatives have been initiated by the Zimbabwean government to enhance the availability and use of ICTs in schools in Zimbabwe (Chitanana, 2014). It is not certain what strategies have been utilized in ICT integration in educating learners with visual impairment in Zimbabwe.

Most visually impaired students are now attracted to the inclusive education. The concept was implemented in western countries in the 1980s (UNICEF, 2020; UN, 2020), and has become an issue on the global agenda. Article 24 of the United Nations Convention on the Rights of Persons with Disability (UNCRPD) adopted in 2006, protects the right to education of persons with visual impairment. It compels all state parties to take appropriate measures to ensure such individuals access and participate in inclusive education as equals through various support services.

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**1.1 Background of the study**

The 1980s, witnessed a huge expansion of higher education in Zimbabwe premised, among other reasons, on a rapid increase in the number of students enrolments including those with disabilities. Most enrolled in the higher education institutions, acerbated by the establishment of new universities and colleges following the country’s independence from colonial rule (Altabach, Reisberg & Rumbley, 2009). In this regard, the World Bank (2016: 58) reported that: …many higher education institutions operate with overcrowded and deteriorating physical facilities, limited and obsolete library resources, insufficient equipment and instructional materials, outdated curricula, unqualified teaching staff and an absence of academic rigor and systematic evaluation of performance.

Gebrehiwot (2015) reports that Africa has had the highest average regional growth rate that reached 10% in the years 2000-2005. However, these developments have serious implications for the quality of education in general, and the provisions for students living with disabilities in particular. As a result of such huge expansion of student enrolment, the resources available to support learning, and teaching, considerably decreased in the last quarter century. In addition, the average qualification levels of instructors also declined. According to Crosling (2009), the quality of students’ learning experiences, student retention and success are becoming increasingly challenging issues with increase in the diversity of the population. These claims, contain the argument that, traditional modes of teaching and learning may not be as effective now as they were in previous times when the student population was more homogenous. In light of this viewpoint, in order to address the students’ diversity, “the methods of teaching and learning should be designed to be more relevant to students’ needs, interests, and previous experiences” (Gebrehiwot, 2015 p.27). Accordingly, the use of more active learning strategies is recommended as a successful approach to address diversity. What is required is the awareness, and commitment of the developing institutions and their staff.

Furthermore, infrastructural adaptations in most teacher training institutions are a cause of concern to visually impaired pre-service trainee teachers. Chapter 10.1.1 of the Nziramasanga Report (1999) highlights that, students living with disabilities` drop outs is caused by the institutions’ systems. The American Foundation for the Blind (2020) opines that inclusive education is widely practiced in developing countries with few resources to support it. The National Blind Council Society (NBCS) (2018) found that the scenario in Zimbabwe was that, visually impaired students in teacher training were not provided with necessary support services. Most administrators and lecturers in most inclusive teacher training institutions in Zimbabwe are not well versed with orthopedagogics and orthodidactics and the mechanics to handle visual impaired trainee students (NBCS, 2008). Orthopedagogics and orthodidactics are regarded as the art and science of teaching a specific group of individuals according to their needs and interest (International Bureau of Education, 2017). Similarly, Mahanya, (2019) establishes that lecturers lack adequate knowledge, skills and training for effective implementation of inclusive tertiary education. This implies that visual impaired trainee students in inclusive training institutions are taught using the ‘one-pedagogy-catering-for-all-strategy,’ basically the lecture-method, which may be a challenge to such students where resources are inadequate. Technology has great potential in providing access for all learners and the ability to access the general curriculum.

The challenges visually impaired students face in their learning environment due to their condition can be minimised with the help of assistive technologies (United Nations International Children’s Emergency Fund [UNICEF], 2020). Assistive technology (AT) should not be viewed by educators within a ‘rehabilitative’ or ‘remediative’ context, but as a tool for accessing the curriculum and exploring out means to help students with disabilities achieve positive outcomes (Podzo & Chipika, 2019). Additionally, Podzo and Chipika (2019) express that assistive technology has the potential to augment abilities and bypass or compensate for barriers that disabilities create. Consideration of AT is, therefore, required for the visually impaired students so that they have the necessary tools to fully access and participate in the curriculum with the greatest possible level of independence (WHO, 2020). Thus, it is essential that, as far as capacity and resources allow, institutions should provide necessary assistive technologies to students with visual impairments just as they do for other students. The most traditional technology most visually impaired students use for learning purposes is Braille.

The use of Braille has been met with some challenges such as lack of or little material in Braille; lack of Braille skills to both some students who may acquire the impairment at a later stage in life and instructors (Gebrehiwot, 2015). A computer is one of the AT which is of great importance to both the physically challenged, and the rest of the students. However, studies carried out reveal that students with visual impairment face the following challenges; disproportionate number of computers with the relevant software like JAWS (Kendall, 2016), Limited internet access (UNESCO, 2020), malpractice by non-disabled students who sometimes delete JAWS since all students share the same computers at times due to lack of facilities and unavailability of specialist to fix the computers when they develop a problem or they were attacked by a virus (Podzo & Dzviti, 2017; Gebrehiwot, 2015). Poverty is a major contributory factor that leads to disability, while disability traps people into poverty (UNICEF, 2020). It is worth pointing out that assistive technologies are very expensive and are out of reach for many learners living with disabilities (Podzo & Dzviti, 2017). All these challenges can be minimised by enacting, and enforcing relevant legislation and policies, government subsidies as well as removing import duty on assistive technology (Disabled Persons International, 2020). Students with disabilities should be equipped with the relevant skills through training as well.

Technological support needed by students with visual impairment in tertiary institutions Tugli (2013) suggests the following new technologies and software options that Higher Education Institutions (HEIs) can acquire to enhance access to learning and assessment by sudents with disabilities (SwDs) are text –to-speech devices/ Voice input, Digital white board, print enlargers and document converters, scribe pen, visual/ graphic outliners, visual tracking and phonetic spell checkers.

**1.2 Statement of the problem**

The use of ICTs by person with visual impairments has been costly and one can barely use the new technologies and assistive technologies that are being developed. Especially with computers be it hardware and software as well as software. The problem is the lack of resources to access information communication technologies by persons with low vision or visual impairments. Are they able to use technologies as they supposed to. This also includes accessibility, affordability, availability and literacy when using the technologies. Accessibility entails the having new technologies in an understandable manner by persons with visual impairments and affordability involves the cost of ICTs used by persons with disabilities that is reasonable. Most importantly is the availability of information communication technologies and if the areas of location are suitable for the new technologies. Note that not all persons with know how to use braille, tactile and software such as JAWS among others. Some may even fail to use smart phone so it is important to take into consideration the literacy part of PWDs.

More students are enrolling in tertiary and college institutions but the challenges of the un availability of resources still remains for persons with disabilities. Statistics are not clear not clear due to the lack of database for Person with disabilities here in Zimbabwe.

Through Zimbabwe’s education system, the visually impaired (VI) people like an ybody else, need to understand and apply ICT as tool to aid their learning, professional development, and as means of socialising. What is questionable is whether the education system of Zimbabwe from pre-school to tertiary level, prepares VI people to be effective users of ICT as STEM objectives suggest. The purpose of study is to gain insight on inclusivity of Communication and Information Communication in the education of Zimbabwe, with reference to visually impaired learners (VILs) in ICT use for learning.

**1.3 Research aim**

Through Zimbabwe’s education system, the visually impaired (VI) people like anybody else, need to understand and apply ICT as tool to aid their learning, professional development, and as means of socialising. What is questionable is whether the education system of Zimbabwe from pre-school to tertiary level, prepares VI people to be effective users of ICT as STEM objectives suggest. The purpose of study is to gain insight on inclusivity of Communication and Information Communication in the education of Zimbabwe, with reference to visually impaired learners (VILs) in ICT use for learning.

**1.3.1 Objectives of the proposal**

The main objective of the study was to examine the relationship of ICT utilisation and the availability of resources by students with visual impairment in universities near Harare. Specifically the study sought to:

* + 1. To identify cost of ICT tools used by students with visual impairment in University around Harare.
    2. To determine the of ICT resources required by students with visual impairment in selected schools and universities in Harare.
    3. To assess the relationship between ICT and availability as well as accessibility for students with visual impairment

1.4 **Research questions**

1.6.1. What is the cost of ICT tools used by students with visual impairment?

1.6.2. What are the resources needed to develop ICTs for students with visual impairment?

1.6.3. How accessible are the technologies used by persons with disabilities?

**1.5 Justification of the study**

The rationale for this study is firmly grounded in the principles of inclusivity and accessibility within the digital landscape. In today's society, the widespread dependence on digital platforms underscores the importance of comprehending how individuals with visual impairments navigate and utilize information and communication technologies (ICTs). Through research, we can identify the challenges faced by this demographic and pave the way for the creation of more inclusive and accessible technologies. Additionally, the significant role that ICTs play in empowering individuals with visual impairments cannot be overstated. These technologies act as catalysts for improving communication, education, employment opportunities, and daily living activities, ultimately fostering increased levels of empowerment and independence. By conducting thorough research, our goal is to gain a deeper understanding of the diverse needs of users with varying degrees of visual impairment in order to tailor ICT solutions that cater to a broader audience. Furthermore, by examining how individuals with visual impairments currently interact with ICTs, researchers can identify areas for enhancement and drive innovations in assistive technologies, thus improving their efficacy and user experience.

The importance of research findings cannot be overstated in their role of informing policymakers and stakeholders about the challenges and needs faced by individuals with visual impairments. By shedding light on these issues, research helps in the development of policies that promote equal access to information and communication technologies (ICTs) and ensure adherence to accessibility standards. Moreover, research serves as a valuable tool for raising awareness among developers and businesses about the specific requirements for creating accessible technologies that cater to the needs of individuals with visual impairments.  
In addition, research delves into the impact of ICTs on the social participation of individuals with visual impairments, highlighting how technology can foster connections, community engagement, and civic participation. Through exploring how persons with visual impairments utilize ICTs, research contributes to a better understanding of the digital divide and aids in addressing disparities in access and usage to achieve digital equity.  
Ultimately, conducting research on the utilization of ICTs by individuals with visual impairments is crucial for ensuring that technological advancements benefit all members of society and contribute to promoting social justice and fostering an inclusive environment where everyone can thrive.

**1.6 Assumption of the study**

In the field of technology accessibility for individuals with disabilities, there are foundational assumptions that shape our understanding. Firstly, it is assumed that individuals with disabilities have some form of access to information and communication technologies (ICT), whether through personal devices or community resources, including internet connectivity, computers, smartphones, and assistive technologies. Secondly, there is the assumption that individuals with disabilities are willing and prepared to use ICT, despite potential obstacles such as past negative experiences, lack of training, or uncertainty about the value of technology. Moreover, it is recognized that there is a diverse range of experiences and preferences among individuals with disabilities when it comes to ICT usage, encompassing various types of disabilities, age groups, socioeconomic backgrounds, and levels of technological proficiency. Taking into account environmental factors such as social support, physical environments, and cultural beliefs about disability and technology, it is understood that external influences can significantly impact the utilization of ICT by individuals with disabilities. Lastly, it is acknowledged that tailored training programs and support services are essential to meet the individualized skills and technology needs of individuals with disabilities in order to effectively utilize ICT.

1**.7 Delimitation of the study**

**This study is focusing on all types of visual impairments which means that other type of disabilities will not be covered hence they will not be able to benefit from this research. More so those from primary and secondary institutions are not going to be part of the research because of the formalities of obtaining parents’s consent to participate. Time may also not allow for those under eighteen to participate as well. Most importantly this research will done be in the areas sorounding Harare province in the near by institution such as Midlands State University, University of Zimbabwe, Zimbabwe Open University and Women’s University in Africa among others.**

**Furthermore, this study limited to one type of ICT tools, it will consist of screen readers, Braille displays and mobile applications. Note that the research will be focusing the use and the resources which might be available in order to increase ICT utilisation. Participation list will comprises of educators and students from the above mentioned Institutions. This clarity will also aid in both data collection and analysis, while making sure that the findings can be interpreted meaningfully within the area of interest.**

**1.8 Limitation of the study**

The level of technological literacy plays a significant role in determining the extent to which visually impaired individuals can effectively utilize Information and Communication Technology (ICT). Discrepancies in digital literacy levels can have a substantial impact on how technology is accessed and used among this demographic. Some individuals may possess advanced skills and familiarity with technology, while others may struggle due to limited proficiency. These differences in technological expertise can lead to inconsistencies in data analysis and interpretation. Moreover, the rapid rate of technological advancements further complicates the assessment of ICT utilization among visually impaired individuals. Researchers must adapt to the continuous development and adoption of new tools and applications to ensure the accuracy and relevance of their findings.  
Environmental factors, such as socioeconomic status and educational background, further contribute to the complexity of understanding ICT access and usage within this population. Addressing these challenges necessitates a comprehensive approach that considers both quantitative and qualitative aspects of ICT utilization, taking into account personal experiences, motivations, and barriers faced by visually impaired individuals.

One significant challenge researcher’s may encounter when studying the experiences of individuals with disabilities, particularly in tertiary institutions, is the potential stigmatization that participants may face. This stigma can lead to a reluctance to fully share their experiences, hindering open communication during interviews or surveys. Furthermore, in some regions like Zimbabwe, where the number of students with visual impairments may be limited, the research findings may not be as conclusive. Additionally, logistical barriers such as transportation costs for researchers can further impede the collection of comprehensive information for the study. These factors underscore the importance of considering contextual nuances, such as technology limitations, when proposing solutions in such settings.

**1.9 Theoretical framework**

From a theoretical background perspective, the study mostly relies on the results of a comprehensive literature review, including previous projects’ outcomes. The literature unequivocally attests to the power and potential of ICT-AT for improvement of learning, communication, and daily living of PwD. Nevertheless, the considerations regarding the challenges and barriers in education, employment, daily life and access to resources are also evident in a number of studies. Several studies [17–22] highlight the positive effects of the use of ICT and ICT-AT in the education of various groups of learners with disabilities, and the ways in which digital competences can develop though an inter-disciplinary approach in the curriculum. However, the presence of ICT and ICT-AT in different educational settings (e.g. primary, secondary, tertiary education and formal, informal and non-formal settings) holds different opportunities as well as different challenges for learners with disabilities. For example, in higher and postsecondary education, digital competences are considered very essential for the academic success of learners with disabilities [23–25]. By contrast, not all stakeholders in primary and secondary formal education [26,27] consider digital literacy of learners with disabilities as a priority. Hence, the development of digital competences and the successful use of ICT-AT is influenced by educators’ views, stances [19,28,29] and own benefits [22,30,31]. Access to ICT-AT also has an important role in making provisions for the educational needs of PwD, and in securing their fuller participation in modern, knowledge-based society. Technology acts as an enabler in the lives of learners with disabilities of all ages through the provision of compensatory technological tools that motivate learners, build on their strengths, and allow the completion of academic tasks independently, resulting in autonomy, and in higher social and economic aspirations [32]. Thus, enhancing understanding and proficiency with technology of learners with disabilities, allows them to improve their quality of life and to enjoy the benefits of e-inclusion [33]. In addition, it provides access to communication in all aspects (e.g. Augmentative and Alternative Communication, mobile technology [33,34] and the internet [35]). In employment, technological developments have had both positive and negative consequences [36]. On the positive side, they have increased the accommodation options for workers with disabilities, but on the negative side, they have created a dilemma in the identification of a specific technology for use in a particular employment setting. Notwithstanding the considerations, a number of studies support the beneficial effects of AT [37] for employees with disabilities, but also for health care workers, employment office workers, and co-workers [36]. Albeit the acknowledgment of the positive impact of the use of ICT and ICT-AT as well as the development of digital skills in modern society, the literature indicates some difficulties and barriers. These include physical and functional factors that may impede: (a) extent of usage and under-utilization or abandonment of AT [38], (b) lack of even basic training in the use of ICT [5,7], (c) failure in policy and decision making to effectively cover essential aspects of ICTAT [26,39,40], (d) financial constraints resulting in limited resources and technology availability [41,42], (e) problematic and inadequate ICT-AT service delivery systems [42,43] and (f) issues related to accessibility and design of technology (such as in-accessible mainstream technology, complex and challenging interfaces, (in)compatibility of technologies [40]). Digital competence is further fundamental for participation in education, social, cultural and political life [44]. Thus, a society that expects its members to be “informed citizens” cannot ignore problems related to access and unequal opportunities. To that end, based on the theoretical background briefly described in this section, a conceptual framework was developed to facilitate the collection, description and assessment of experiences in ICT and ICT-AT education and skills development for PwD of all ages. This framework focussed on the learning perspective of ICT-AT, and Engeström’s activity theory model [45] has been borrowed and adapted accordingly. As a result, the framework map (Fig. 1) takes as a starting and central point the person’s (end-user’s) learning experiences, his/her wish to self-determination and fulfilment and the related needs (needs and aspirations). It includes a map of different groups functioning in a person’s surrounding “ecosystem”, and it helps to understand roles, expectations and barriers. Thus, it can provide assistance in devising solutions in order to tackle the digital divide, and consequently promote quality of life (i.e. human life goals) and access to human rights and equal opportunities through use of ICT-AT. More specifically, the conceptual framework takes into consideration the following constituents, as these are considered elements of the ICT-AT learning experiences for PwD of all ages, and they synthesize the theoretical basis of the research work of ENTELIS:

1.11 The Theoretical Framework Unified Theory of Acceptance and Use of Technology (UTAUT) was used as a basis for this study (Venkatesh Viswanath , Michael G. Morris & Gordon B. Davis, 2003). The theory lays out four constructs that influence the use of an information technology or system such as a digital library by an individual. The four constructs are performance expectancy, effort expectancy, social influence and facilitating conditions. The theory also points out four factors that moderate the effect of the key constructs, that is age, experience, gender, and voluntariness of use (Venkatesh et al, 2003). Theproponentsofthetheoryhighlightfourmainconstructsofthetheoryasfollows: Performance expectancy is the belief by an individual that the information system will help him or her to achieve their intended task. Effort expectancy is the degree of ease that is associated with the system. Social influence refers to the degree to which an individual perceives that there are other important persons who believe that he or she should use the system. Facilitating conditions are defined as the belief by an individual that both organisational and technical infrastructure exist to support the use of the system (Venkatesh et al, 2003). Application of the Theory to the Study This study evaluates user perspectives of persons with visual impairment on friendliness, efficiency, satisfaction, learnability, and accessibility (independent variables) of digital libraries (system) to the process of accessing information (Dependent variable). On the other hand, the Unified Theory of Acceptance and use of Technology (UTAUT) explains the relationship that exists between performance expectancy, effort expectancy, social influence and facilitating conditions (Independent variable) to the usage (dependent variable) of an information system or a technology (system) in the presence of moderating factors. The application of the theory constructs in the study is as follows: The theory explains performance expectancy as the degree to which an individual believes that the system will help him or her to achieve their intended task. Likewise, persons with visual impairment may consider that using technology will help them to satisfy their information need. It is on this basis that the study assumed that digital libraries are useful to persons with visual impairment. Effort expectancy is explained in the theory as the degree of ease that is associated with the system. Ease of use is considered in this study as the overall usability construct that the study sought to check of the digital library. This was done through an evaluation of whether the digital library was friendly, efficient, satisfying, easy to learn and accessible to persons with visual impairment in the process of information retrieval. Social influence is described in the theory as the degree in which an individual perceives that there are other important persons who believe that he or she should use the digital system. In this study, there were various bodies described in the significance of this study that support digital information access and retrieval by persons with visual impairment. These include the universities seeking to provide digital information resources to persons with visual impairment as well as other governmental, non-governmental and international agencies that encourage persons with visual impairment to use digital platforms to access and retrieve information as a way of promoting their independence. Facilitating conditions are explained in the theory as the belief by an individual that both organisational and technical infrastructure exist to support the use of the system. It is necessary for persons with visual impairment to acquire assistive technology skills such as use of screen readers and screen magnifiers for those who are blind and low vision respectively. In addition, they need to be provided with the required assistive technologies (both hardware and software) such as screen magnifiers and screen readers to facilitate utilization of digital library and subsequent retrieval of the required information resources to meet an information need. The UTAUT theory therefore forms a basis of this study and explains the findings achieved from the study.

The study on ICT integration methods in educating learners with visual

impairment was guided by the Diffusion of Innovations (DOI).

According to Rogers (1995), DOI is a theory that seeks to explain how,

why and at what rate new ideas and technology spread through social

systems. Rogers‟ earlier work was in the field of rural sociology, inspired

by farmers who were slow to adopt various biological-chemical farming

innovations (Riesenberg and Gor, 1989). According to Korpelainen

(2011), the Diffusion of Innovations (DOI), “is a general theory of how

new ideas are spread and adopted in a community, and it seeks to explain

how communication channels and opinion leaders shape adoption”.

Rogers (1995) defines diffusion as the process by which an innovation is

communicated through certain channels over time among the members

of a social system and it refers to the accumulated level of users of an

innovation; whilst he views an innovation as an idea or practice that is

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**1.10 Definition of terms**

Information and Communication Technology (ICT) is a general term which refers to all kinds of technologies that enable users to access and manipulate information. ICT in this study will be taken to mean the computer, computer hardware and software and internet connections used to manage and communicate information for learning, business or social purpose (Mikre, 2011). Information and Communication Technology (ICT) is a broad term that encompasses various communication devices and applications, including radio, television, mobile phones, computer hardware and software, satellite systems, and the associated services such as videoconferencing and distance learning

Persons with disabilities include those who have temporary long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.

Visual impairment refers to a reduction in the individual’s vision. It involves limited vision or the complete absence of vision as a result of impairment in the eye structure. The total inability to see is referred to as blindness whereas the individual with low vision possesses some residual vision which can be utilised to the person’s benefit

**1.11 Outline of the dissertation**

**1.12 Chapter summary**

**References list**

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