SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	University of Botswana, Department of Computer Science																	
TITLE	Bachelor of Science in Information Technology														**NCQF LEVEL**		*7*	
FIELD	Information and Communication Technology		**SUB-FIELD**		Information Technology										**CREDIT VALUE**		*524*	
New Qualification		√	Review of Existing Qualification															
SUB-FRAMEWORK	General Education		TVET												Higher Education		√	
QUALIFICATION TYPE	Certificate	I		II		III		IV		V					Diploma		Bachelor	√
	Bachelor Honours				Post Graduate Certificate										Post Graduate Diploma			
	Masters								Doctorate/ PhD									

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

The BSc Information Technology (IT) qualification is a multidisciplinary degree that prepares students to effectively design, implement, maintain and manage IT infrastructure. It gives students a broad theoretical foundation on various core areas of IT such as databases, operating systems, and networking. The qualification emphasizes practical skills in the design, implementation, configuring, and analysis of IT systems. The qualification ensures that students develop the right attitude in the form of a range of personal skills such as decision making, self-discipline, adapting to change, working in a team, and effective communication. These skills are embedded into the curriculum throughout the qualification.

Many countries today are heavily investing in Information and Communication Technology (ICT) as one of the sectors that could improve their economies. The ICT sector offers better opportunities compared to other sectors

in terms of innovation and employment creation as it can be applied to many other sectors [1]. ICT today is seen as the main driver of economies as it is used to improve productivity by offering faster, more efficient, and in most cases cheaper delivery of services. Competitive economies have learned how to effectively use technology to develop their economies. The World Economic Forum 2012 Report [1] on Information Technology states that the ICT industry in the European Union contributes 25% growth in GDP and about 40% of its productivity growth. According to several studies in the literature, ICT could play a significant role in improving the economy and reducing poverty in Africa. However, the major challenges identified are insufficient infrastructure and low skills level [2, 3].

Botswana has developed strategies in Science, Technology, and Innovation in a bid to diversify its economy. Like many countries, the country has made several initiatives to extract the benefits of ICT. Among the initiatives includes Botswana Innovations Hub (BIH)[4], Botswana Institute of Technology Research and Innovation (BITRI) [5], and several ICT policies including the Maitlamo Policy[6]. These initiatives are in recognition of the potential benefits of IT and its impact on socio and economic development. BIH and BITRI have been established to encourage innovation and do research in key areas including ICT. The Maitlamo policy recognizes the need to improve ICT infrastructure, research, and development in the country.

Botswana was ranked in the top 6 in ICT readiness in Africa in 2012 by the World Economic Forum. Despite improvements in the ICT infrastructure and other initiatives the country has not fully realized its potential in ICT [1]. According to some studies and reports, the ICT sector is mainly constrained by a shortage of ICT skills [7]. This is despite the increase in the number of ICT graduates [8]. According to [8] 19% of IT graduates are unemployed using estimates from the Government Internship Program. There seems to be a skills gap regarding what is being taught in universities and what is required in the industry as pointed out in [9]. Core IT job openings are for those with the required skills. The use of systems and technology in organizations has developed into a business discipline. IT skills thus need to go hand-in-hand with some business skills. As a result, the business environment expects IT Professionals to analyze, develop and implement appropriate solutions [10, 11, 12, 13, 14, 15]. University students, therefore, require programs that are multi-disciplinary for them to cope well in today's business industry.

Business requires integration of computing technologies and systems to deliver better services and products. Effective and efficient application of these technologies and systems requires consideration of all issues related to a business enterprise. A typical Computer Science curriculum focuses on technical IT skills but lacks the

concepts of how IT skills are applied in a business environment beyond just providing e-mail, internet connectivity, and typical network services. As a result, most IT graduates are not as prepared to be immediately productive as they should be in todays' technology-reliant business environment. An Information Technology (IT) degree addresses this gap by providing students with skills for the application of IT in a business environment. The program covers theories and practices in the areas of information systems, business, and information technology which are intertwined and essential components of today's organizations. Today's organizations use IT to manage data, operations, data analysis, support operations, and decision making. This program is not a combined major of IT and a business degree but rather an integration of business concepts through the Information Technology curriculum in a seamless manner.

This country does not only need skilled IT practitioners, it is also in need of entrepreneurs and innovators. The country has many challenges in the application of IT in many sectors including education, indigenous knowledge, health, agriculture, and social inclusion. The country is looking at young and fresh graduates to tackle these problems and in the process create opportunities for themselves and others. IT graduates can fare better in this endeavor if they have some understanding of how businesses are managed and how products are developed and marketed. One of the mandates of the Human Resource Development Council (HRDC) [16] is to align curriculum with the industry expected competencies. This institution is also prepared to develop programs that are relevant and in line with the needs of the industry. The departmental national computing skills survey (CS Computing Skills Survey) [17] indicated that there is a need for graduates with multidisciplinary skills in IT, business, and management. As a result, a Bachelor of Science in Information Technology qualification is proposed to be the basis for the development of a relevant BSc in Information Technology program. The BSc in Information Technology qualification goes a long way in putting graduates in a better position to be potentially skilled IT professionals, entrepreneurs, innovators, and researchers ready to contribute to the economy.

Sustainability and Employability.

Information Technology is regarded as a major driving force behind the local and global economy. There is a great demand for IT professionals, especially with interdisciplinary skills. The IT qualification degree is designed to give students enough grounding to pursue postgraduate studies in related fields. Graduates are expected to work in a wide variety of sectors including health, consulting, financial services, government, information services, retail and transport, and logistics. Students graduating with this degree could venture into many

careers including IT infrastructure, database development and administration, web development, e-commerce, systems, IT Management, and business analysis.

PURPOSE:

The purpose of this qualification is to produce graduates with knowledge, skills and competencies to:

- Administer systems.
- Develop software applications.
- Design computer networks
- Manage computing resources and IT projects.
- Evaluate IT solutions for an organization.
- Troubleshoot systems operations and connections.

ENTRY REQUIREMENTS (including access and inclusion)

To be admitted into the Bachelor of Science in Information Technology qualification, the following entry requirements shall apply:

i. Certificate IV, NCQF level 4 (General Education or TVET)

ii. Candidates with Diploma in a related field may be considered through Recognition of Prior Learning in accordance with applicable policies.

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Demonstrate fundamental mathematical and statistical knowledge and understanding.	1.1 Solve mathematical problems requiring basic calculus, algebra, discrete mathematics, and statistical concepts. 1.2 Construct logical arguments and simple mathematical proofs. 1.3 Apply common probability distributions including binomial, normal, and exponential distributions. 1.4 Analyze research questions based on statistical data.
2. Apply computing techniques to solve IT problems.	2.1 Apply appropriate methods and techniques for representing, storing, and retrieving data. 2.2 Explain the functions of components of a computer network. 2.3 Implement a computer network. 2.4 Design a relational database. 2.5 Design effective and efficient queries to retrieve data from a database system. 2.6 Develop a basic software application using one of the programming languages including graphical interface and use of the object-oriented programming paradigm. 2.7 Implement basic integration of various applications using existing integration techniques. 2.8 Perform basic system administration functions including installation and configuration, writing scripts, creating

	accounts, setting permissions, performance, and backup. 2.9 Describe the major components of a web system. 2.10 Develop a website with database connectivity. 2.11 Provide solutions through troubleshooting and research techniques. 2.12 Evaluate the suitability of IT tools, techniques, and technologies for a given problem.
3. Demonstrate knowledge of Management and Business concepts.	3.1 Describe principles of organization structure and design, strategy, culture, and decision-making hierarchies in an organisation. 3.2 Explain organization theories to managers to enable them to understand, predict and influence organization design/structure development. 3.3 Apply economic principles, models, and reasoning to solving business problems. 3.4 Apply the basic economic theory and principles to macroeconomic and microeconomic issues. 3.5 Identify key factors needed to develop a successful business. 3.6 Explain financial and planning processes for the development of a business.
4. Apply IT, business, and management concepts and techniques to solve organizational problems.	4.1 Evaluate the appropriateness of techniques, tools, methods, and applications using metrics such as time, usability, cost, flexibility, compatibility, and security.

	4.2 Identify current and emerging technologies and their applicability in today's organizations. 4.3 Assess IT impact and its role in a given organization/domain. 4.4 Explain principles and concepts in the management of IT infrastructure including risk management and IT policies. 4.5 Apply fundamental IT concepts and strategies to real-world problems. 4.6 Explain how various IT components work together or complement each other in an organization to get desired results. 4.7 Develop a management plan for an IT Project.
5. Communicate clearly with a variety of audiences.	5.1 Create a presentation using available presentation applications/tools. 5.2 Apply best practices for presentations. 5.3 Write a report following standards and guidelines. 5.4 Write appropriate electronic communications using different means. 5.5 Write a critical review.
6. Demonstrate organizational skills	6.1 Organize team meetings. 6.2 Develop team strategy 6.3 Give feedback to team members or supervisors. 6.4 Collaborate with other teams 6.5 Exhibit the role of an IT professional (ethical, legal, and social)

7. Conduct basic research	7.1 Conduct basic research to gather information, critically review, conduct experiments, evaluate, interpret, and compare and present findings and recommendations. 7.2 Demonstrate ability to apply IT technologies to new environments and in a new way. 7.3 Show evidence of planning, implementing, and evaluating activities. 7.4 Show evidence of the ability to independently find and use technical information. 7.5 Demonstrate competency to engage in lifelong and independent learning through different mechanisms

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total*** ***(Per** Subject/ Course/ Module/ Units)*
		Level [6]	***Level [7]***	***Level [8]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	***Discrete Structures I***		√		***12***
	Discrete Structures II		√		***12***
	Introduction to Statistics	√			***16***
	Communication and Academic Literary Skills	√			***12***
	Academic and Professional Communication		√		***12***
	Introductory Mathematics I	√			***16***
	Introductory Mathematics II		√		***16***
	Introduction to Computing	√			***12***
CORE COMPONENT *Subjects/Courses/ Modules/Units*	***Programming Principles***	√			***12***
	Object-Oriented Programming		√		***16***
	Basic Micro Economics		√		***12***

	Data Structures		√		***12***
	Information Management		√		***12***
	Information Technology Fundamentals	√			***12***
	Principles of Management		√		***12***
	Database Concepts		√		***12***
	Computer Architecture		√		***12***
	Systems Programming		√		***12***
	Organizational Design and Development		√		***12***
	Operating Systems		√		***12***
	Computer Networks		√		***12***
	System Analysis and Design		√		***12***
	Organizational Behaviour		√		***12***
	Integrative Programming		√		***12***
	Web Technology and Applications		√		***12***
	Human-Computer Interaction		√		***12***
	Introduction to Software Engineering		√		***12***
	Industrial Attachment		√		***12***

	Database Systems		√		***12***
	Social Informatics		√		***12***
	Information Systems Engineering		√		***12***
	Systems Administration		√		***12***
	Project		√		***16***
	Web Computing		√		***12***
	Information Security Administration		√		***12***
	Information Systems Project Management		√		***12***
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	***Statistical Methods***		√		***12***
	Introduction to Knowledge Management		√		***12***
	Basic Macro Economics		√		***12***
	Marketing Management Strategy		√		***12***
	Entrepreneurship and Business Formation		√		***12***
	Management Information Systems		√		***12***
	Foundations of Business Law		√		***12***
	Business Finance		√		***12***

	Knowledge Management		√		***12***
	Information Systems Auditing		√		***12***

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
6	***80***
7	***444***
TOTAL CREDITS	***524***

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

This qualification is worth a total of 524 credits, and it comprises the fundamental, core, and elective components as follows:

The qualification requires108 credits of fundamental courses, 344 credits of core courses, and 72 credits of elective courses. The total credit a learner must achieve is a minimum of 524.

ASSESSMENT ARRANGEMENTS

Assessment will consist of both formative and summative assessments and should be aligned with learning outcomes and sub-outcomes. Assessment will be conducted by BQA registered and accredited assessors.

1. *Formative assessment*

The Formative assessment shall contribute 60% of the final grade.

2. *Summative assessment*

The summative assessment shall contribute 40% of the final grade.

MODERATION ARRANGEMENTS

1. *Internal moderation requirements*

Internal moderation is carried out by BQA registered and accredited moderators whose area of expertise is in the courses to be moderated.

2. *External moderation requirements*

External moderation is carried out by BQA accredited moderators from other institutions recruited for this purpose.

RECOGNITION OF PRIOR LEARNING

Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment for the award of credits towards the qualification in accordance with applicable university RPL policies and relevant national-level policy and legislative framework. Implementation of RPL shall also

be consistent with requirements, if any, prescribed for the field or sub-field of study by relevant national, regional, or international professional bodies.

CREDIT ACCUMULATION AND TRANSFER

Credit accumulation and transfer will be done according to the institution's policy on credit accumulation and transfer.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation

Learners in this qualification will have the following options for horizontal articulation:

- BIS Computer Information Systems
- BIS Business Information Systems
- BSc Computer Science

Vertical Articulation

Graduates of this qualification will have the following options for postgraduate education:

- MSc Information Technology
- MSc Computer Information Systems
- MSc Business Information Systems

EMPLOYMENT PATHWAYS

Graduates of this qualification will be able to take up the following jobs.

- Systems Analyst
- Systems Administrator
- Database Administrator

- Network Administrator
- Business Analyst
- Web Applications Developer
- IT Trainer
- Software Developer
- Information Security Analyst
- Sales and End User Technical Support
- IT Officer
- Technical Consultant

QUALIFICATION AWARD AND CERTIFICATION

1. Minimum standards of achievement for the award of the qualification

To be awarded Bachelor of Science in Information Technology qualification, a learner must meet the minimum requirement for credits from the fundamental, core, and elective courses.

The qualification requires candidates to pass 108 credits of fundamental courses, 344 credits of core courses, and 72 credits of elective courses. The total credits a learner must achieve is 524.

2. Certification

Candidates meeting prescribed requirements will be awarded the qualification Bachelor of Science in Information Technology in accordance with standards prescribed for the award of the qualification and applicable policies.

The qualification requires candidates to have passed 108 credits of fundamental courses, 344 credits of core courses, and 72 credits of elective courses. The total credit a learner must achieve is 524.

REGIONAL AND INTERNATIONAL COMPARABILITY

The BSc IT qualification is one of the ICT qualifications that are common throughout the world. There are two main approaches to the structure of the qualification: focused (with a specialization area) and broad-based. Some institutions offer fundamentals in the first two years and the last years focus on one or two areas such as security, databases, and information management or application domains such as the financial and health sectors. Other institutions choose a broader approach in which most areas of IT are covered. The proposed BSc

IT qualification is broad-based covering fundamental areas such as mathematics and statistics, core computing subjects such as networking, databases, operating systems, information management, and business courses. This qualification is comparable to other qualifications regionally and internationally in terms of structure and content (depth and breadth). This qualification also covers core IT areas as recommended by international professional bodies such as ACM and IEEE in the IT2017 Curriculum framework.

Regionally

University of Johannesburg

BSc Information Technology

Duration 3 years, 360 credits

This qualification is designed to produce well-rounded graduates with the knowledge, theory, and techniques of Information Technology. As a result, the qualification covers common computer science and IT areas which include programming, databases, networking, artificial intelligence, data structures and algorithms, software engineering, and project and computer architecture. The objective of the qualification is to produce graduates who can identify, evaluate, and solve IT problems.

Mulungushi University (Zambia – www.mu.ac.ac.zm)

BSc Information Technology

Duration 4 years

This qualification is aimed at producing graduates with a combined knowledge and practical skills in computing and business management. It has options to specialize in the areas of Networks and Security, Enterprise and Information Systems, and Web Systems and Technology. Offered courses include mathematics, principles of management, accounting principles, databases, programming, networking and computer security, software engineering, and knowledge management.

This qualification is also similar to the proposed qualification in terms of content, credits, and duration.

Similarities

- The proposed qualification is similar to the ones it was compared with in terms of content scope, the core areas of information technology covered, and the emphasis of the qualifications.
- The proposed qualification also aims to produce well-rounded IT professionals.

Differences

- The proposed qualification takes 4 years while others such as the one in South Africa take 3 years. This is so because, for the qualification in South Africa, the entry requirements are at level 6.
- The qualifications above offer learners specialized areas such as Networking and Informatics.

Internationally

Purdue University (Lafayette), USA – Purdue.edu

BSc Computer and Information Technology

Duration 4 Years

This qualification is similar to the proposed BSc IT qualification in terms of the courses offered. However, the Purdue University qualification offers more variety in terms of courses which include Cybersecurity and forensics, bioinformatics, cartography, game development, and parallel systems, among others.

Similarities

- The proposed qualification is similar to the one it was compared with in terms of core areas of Information technology.
- They have the same duration of 4 years.

Differences

- The University of Purdue qualification offers more variety of courses.
- The proposed qualification offers more organizational management and business management courses.

REVIEW PERIOD

5 years

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