	BQA NCQF QUALIFICATION TEMPLATE	Document No.	DNCQF.QIDD.GD02
BOTSWANA Qualifications Authority		Issue No.	01
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SECTION A:	QUALIFICATION DETAILS								

QUALIFICATION DEVELOPER (S)	University of Botswana							

TITLE	Doctor of Philosophy in Computer Science						NCQF LEVEL	10

FIELD	Information and Communications Technology	SUB-FIELD		Computer Science			CREDIT VALUE	360

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:

With the advent of the Internet and the consequence of worldwide connectivity, computing systems hold the keys to National Development and long-term sustenance. The area of application of computer science has seen exponential growth in practice in recent years. Indeed, the VISION 2036 document calls for Sustainable Economic Development and Human and Social Development (Human Resource Development Council, 2015). Further, the Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2022) also advocates for efforts to achieve a knowledge-based economy. The need to develop knowledge capital in computing systems compels the country to develop graduates with knowledge and skills in various types

of computing systems. Furthermore, the Human Resource Development Council (2016) categorically states that there is a critical shortage of skilled personnel in the areas of Database Designers, Data Centre Managers, Systems Analysts, Science and Technology Researchers, Cyber Security Experts, Web and Multimedia Developers, to name a few. The VISION 2036, National Development Plan (NDP 11), and long-term strategies of the different sectors of the economy (Human Resource Development Council, 2015) also confirm these findings.

There is a need, therefore, for strategic curriculum developments within Botswana to align with these developments to the rising need for technical expertise. This is endorsed in the country's vision 2036 pillar 1 and 2 which aims at achieving sustainable economic and human social development in the country. In addition, the country has seen the need to move towards a knowledge-based economy to realize economic growth that is globally competitive. This includes improvements in the quality of education, which should hasten the country's move from a natural resource driven as articulated in the National Development Plan (NDP 11). In addition, the Human Resource Development Council (HRDC, 2016) calls for the need to have advanced computing knowledge and skills required for the country's development and employability of human capital.

The departmental national computing skills survey (CS Computing Skills Survey 2017) and HRDC report on Top Occupations in Demand (December 2016) also indicated that there is a need for graduates who can apply broad knowledge of computing and ICT solutions. There is a strong and urgent demand for people with profound and vast knowledge in computer science to work at the frontiers of knowledge in both theoretical and applied specialties.

A Doctor of Philosophy degree in Computer Science is therefore required to produce those requisite advanced skills with the ability to specialize in and contribute to the body of knowledge in computer science.

PURPOSE:

The purpose of this qualification is to produce people with knowledge, skills and competences to:

- Conduct original scholarly research in emerging areas of Computer Science and publish articles in accredited journals and conferences.

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- Apply the most advanced knowledge of theory and practice of computer science to provide innovative computer-based solutions.

- Design and develop complex software systems to address technical problems.

- Demonstrate mastery of professional practice when addressing technical challenges through innovative integration and experimentation of methods, techniques, and tools.

ENTRY REQUIREMENTS (including access and inclusion)

For entry to a Doctor of Philosophy in Computer Science, the following entry requirements shall apply.

i) Master's Degree (NCQF level 9) in Computer Science or cognate field

ii) Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) will be considered according to institutional policies in line with national RPL and CAT policies

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SECTION B	QUALIFICATION SPECIFICATION

GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
1. Apply most advanced knowledge and skills in the design and development of software systems.	1.1 Apply advanced knowledge and skills in the specification and design of complex software systems. 1.2 Select appropriate methods and frameworks for the development and deployment of software systems. 1.3 Evaluate the effectiveness of a software system solution. 1.4 Apply ethical standards, protocols, and practices relevant to the discipline.
2. Conduct independent, original, and scholarly research of international standard in emerging areas of Computer Science.	2.1 Critique relevant theory and practice to articulate gaps in an area of interest in computer science. 2.2 Conduct in-depth literature review to select and justify methodological choices for achieving a particular research objective. 2.3 Explore various problem-solving techniques that effectively communicate strategic principles in the construction of computer-based solutions of varying complexity. 2.4 Develop a research proposal of an acceptable standard to address complex research problems. 2.5 Apply analytical, critical, and creative thinking skills to draw appropriate inferences and conclusions. 2.6 Develop proof of concept to demonstrate effectiveness of solution. 2.7 Publish articles in recognized journals or conferences.

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	2.8 Present research findings in conferences and seminars.
3. Demonstrate mastery of professional practice when innovating applications of computer science to address problems in various application domains.	3.1 Explore new ideas, techniques, and tools. 3.2 Identify, analyse, and synthesize suitable approaches to solve real-life problems. 3.3 Choose a theoretical framework appropriate to a problem in a given application domain. 3.4 Select appropriate research methods and associated research design. 3.5 Explore alternative solutions to a problem and identify the most appropriate option through trade-off analysis. 3.6 Formulate methods to test and confirm the viability of the proposed solution

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SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total (Per Subject/ Course/ Module/ Units)
				Level 10	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units					
CORE COMPONENT Subjects/Courses/ Modules/Units	Supervised Research and Thesis in Computer Science			360	360
ELECTIVE/ OPTIONAL COMPONENT Subjects/Courses/ Modules/Units					

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	*Credit Value*
10	*360*
TOTAL CREDITS	*360*

Rules of Combination:
(Please Indicate combinations for the different constituent components of the qualification)
This qualification has 360 core component credits all at NCQF Level 10. There are no fundamentals and electives. This is a research and thesis based qualification.

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ASSESSMENT ARRANGEMENTS

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

1. Formative assessment

Formative assessment or continuous assessment component of the thesis may include one or more of the following: seminar presentations, proposal defence, and research publications. Continuous assessment shall contribute 50% to the final grade of the thesis.

2. Summative assessment

Summative assessments are conducted in the form of viva oral examination (thesis defence). The viva oral examination is assessed by both external and internal examiners. Summative assessment shall contribute 50% to the final grade of the thesis.

MODERATION ARRANGEMENTS

In accordance with institutional policies and regulations, internal and external moderations are conducted by registered and accredited moderators.

1. Internal moderation requirements

Internal moderation is carried out by BQA accredited staff members in the department whose area of expertise is in line with the thesis topic to be moderated.

2. External moderation requirements

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

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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 institutional 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 in line with national RPL and CAT policies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)
Horizontal Articulation Learners in this qualification will have the following options for horizontal articulation: • Ph.D. in Information Systems • Ph. D. in Information Technology   *Vertical Articulation*   N/A **EMPLOYMENT PATHWAYS** Graduates of this qualification will be able to take up the following jobs: • Software Developer • Computer Science Researcher in industry and academia • Computer Scientist

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- Software Project Manager
- Software Systems Consultant
- Data Centre Managers
- Lecturer in Computer Science

QUALIFICATION AWARD AND CERTIFICATION

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

To be awarded Doctor of Philosophy in Computer Science qualification, a learner must satisfy appropriate provisions of the institution. A learner is expected to complete a minimum of 360 credits. A candidate should attain a pass grade in the oral examination to be considered for the award of the qualification.

2. Certification

Candidates meeting prescribed requirements will be awarded the qualification **Doctor of Philosophy in Computer Science** in accordance with standards prescribed for the award of the qualification and applicable policies of the institution.

REGIONAL AND INTERNATIONAL COMPARABILITY

A comparison was made for the proposed qualification both regionally and internationally. At regional level, we made a comparison with the PhD Computer Science offered by Stellenbosch University, South Africa and PhD Computer Science offered by the University of Nairobi, Kenya. Internationally, a comparison was made with the PhD Computer Science qualifications offered by University College London (UCL) and Arizona State University (ASU), USA.

Generally, the proposed qualification is similar to the regional and international qualifications studied for comparison in terms of the emphasis of the qualifications. While regional qualifications are similar in terms of

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duration and areas of research, international qualifications provide a variety of areas of research. However, the main objectives and learning outcomes are similar for all qualifications.

The proposed qualification generally compares well with the four qualifications studied in terms of aims and learning outcomes. The main difference is that the proposed qualification provides only a limited set of research areas in line with the available areas of specialization of academic staff who will be supervising PhD theses.

REVIEW PERIOD

5 years

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