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A Comparative Study of IT Integration in TU Programs: BICTE, BIM, and BCA in Nepal

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Abstract

This study presents a comparative analysis of three IT-integrated undergraduate programs offered by Tribhuvan University in Nepal: BICTE, BIM, and BCA. Each program serves different academic goals, BICTE prepares ICT educators, BIM blends IT with business, and BCA focuses on core computing. The research aims to help students make informed academic choices by analyzing the IT curriculum, practical components, and career relevance of each program. A mixed-methods approach was used, involving curriculum document review and surveys with students, lecturers, and alumni. Although each program is designed with a distinct purpose, the results indicate that for building a career in diverse IT fields, BCA provides the strongest technical foundation with extensive hands-on training, BIM offers a balanced approach suitable for IT-business careers, and BICTE, while focused on theory and education, requires improved practical exposure to broaden its career relevance. Stakeholders highlighted the need for updated content and real-world skill development, especially in BICTE. The findings support curriculum improvements and offer clear guidance for prospective students and educators.

Keywords: information technology (IT), Tribhuvan University, BICTE, BIM, BCA, curriculum comparison, IT education in Nepal, practical components, career relevance, program selection

1. Introduction

In today's rapidly evolving digital world, Information Technology (IT) plays a pivotal role across all sectors: education, management, and technical development (Fox, 2020). Recognizing

this trend, Tribhuvan University (TU), Nepal's oldest and largest university, has incorporated IT into several of its undergraduate programs. Notably, the Bachelor in Information Communication Technology in Education (BICTE), Bachelor in Information Management (BIM), and Bachelor in Computer Applications (BCA) stand out for their integration of IT within distinct disciplinary frameworks. BICTE is introduced for aspiring educators, BIM merges IT with business and management principles, and BCA focuses intensively on computing and software development. The integration of IT into higher education curricula is not merely a trend but a necessity, especially in developing countries like Nepal (Rana & Rana, 2020).

Studies have highlighted that effective IT integration can enhance teaching methodologies, promote student engagement, and bridge educational disparities. However, the practical implementation of IT in Nepalese higher education faces challenges, including inadequate infrastructure, limited access to digital resources, and a lack of trained personnel. In response to these challenges, the Nepalese government has initiated policies such as the Digital Nepal Framework and the ICT in Education Master Plan, aiming to strengthen IT infrastructure and digital literacy across educational institutions (Bhattarai, 2021). Despite these efforts, disparities persist, particularly between urban and rural areas, affecting the uniform adoption of IT in education. Within this context, TU's programs: BICTE, BIM, and BCA, offer varying degrees of IT integration, reflecting their unique objectives. BICTE combines pedagogical training with IT, preparing graduates for roles in educational technology. BIM offers a hybrid curriculum that integrates IT skills with business awareness, provision to the evolving demands of the corporate sector. BCA provides an in-depth focus on computing, equipping students with the technical expertise required in the software industry.

Given the diversity of these programs, prospective students often face challenges in selecting a course that aligns with their career aspirations and interests. A comprehensive understanding of how IT is embedded within each program is crucial for informed decision-making. This research aims to conduct a comparative analysis of the BICTE, BIM, and BCA programs at TU, focusing on their IT curricula, practical components, and alignment with academic and career goals. By examining course content and gathering feedback from students, lecturers, and alumni, the study seeks to provide insights that can guide students in their academic choices and inform curriculum development to better meet the demands of the digital age.

1.1 Literature Review

A paper by Pangeni (2016) examines the implementation of open and distance learning (ODL) in Nepal, highlighting its potential to expand access to higher education across diverse and remote populations. The study identifies several barriers to effective ODL delivery, including inadequate digital infrastructure, limited learner support services, and lack of trained educators. Despite these challenges, the author emphasizes the transformative role of technology in making education more inclusive and flexible. This perspective is valuable to our research as it underscores the importance of integrating IT effectively into higher education programs not only for curriculum relevance but also for expanding accessibility and modernizing instructional delivery.

A study by Pradhan (2018) explores the historical trajectory and ideological shifts in Nepal's national education policies, focusing on the tension between local values and global influences. The study critiques how education reforms have often been shaped by donor agendas rather than indigenous needs, leading to a mismatch between policy and implementation. This review is important to our research as it highlights how structural misalignments in national policy can influence curriculum design and the relevance of different programs to local career and technological demands.

The study by Rana and Rana (2020) examined ICT integration in Nepal's teacher education programs and identified key challenges such as insufficient infrastructure, lack of trained educators, and a gap between policy and practice. The study emphasizes the need for institutional readiness and professional development to effectively implement ICT in teaching.

Kunwar (2020) explored the influence of ICT in Nepal's higher education sector, particularly in the context of online education. The study notes that institutional commitment, technological infrastructure, and student digital literacy are critical factors that determine the success of ICT adoption.

Sherpa and Baraily (2022) conducted a qualitative study exploring faculty perceptions of the semester system in Tribhuvan University (TU)-affiliated colleges in Nepal. Utilizing an interpretive paradigm and narrative inquiry, they gathered insights from four faculty members outside the Kathmandu Valley. The study revealed diverse perceptions regarding the semester system, highlighting challenges such as student and faculty behaviors, and unpreparedness of teachers and administration. Despite these challenges, the semester system was seen as a potential avenue for pedagogical transformation and fostering self-empowerment through digital technology.

In a study by Khatiwada (2024), the integration of computer technologies in universities was found to be hindered by rigid academic structures and a lack of practical, application-based learning opportunities. The authors suggest that more flexible and hands-on approaches are needed for effective technology adoption in university settings.

According to Joshi and Khatiwada (2024), higher education institutions in Nepal face several obstacles in integrating ICT, including outdated curricula, limited access to modern technology, and a shortage of qualified instructors. The authors highlight the importance of revising academic content and enhancing faculty competence to meet the evolving demands of digital education.

1.2 Research Gap

While Information Technology (IT) is increasingly recognized as a core component across academic disciplines, limited research has been conducted in Nepal, particularly under Tribhuvan University, on how IT is integrated into undergraduate curricula across diverse program types. Existing literature often focuses on single programs or general digital literacy, leaving a gap in comparative analyses that evaluate structural, practical, and career-oriented IT integration across specialized programs like BICTE, BIM, and BCA. Moreover, stakeholder perspectives especially

those of students, alumni, and faculty, remain underexplored in assessing curriculum effectiveness and real-world relevance. This study addresses that gap by offering a holistic, comparative evaluation to inform curriculum development and student decision-making.

1.3 Research Objectives

To compare the BICTE, BIM, and BCA programs under Tribhuvan University by analyzing their IT curriculum, practical components, and relevance to academic and career goals, based on course content and feedback from students, lecturers, and alumni.

1.4 Research Questions

How is IT integrated into the BICTE, BIM, and BCA programs at Tribhuvan University, and how do students, lecturers, and alumni perceive its relevance to academic and career goals?

2. Methodology

This study employs a comparative mixed-methods approach to explore how Information Technology (IT) is integrated into BICTE, BIM, and BCA programs offered under Tribhuvan University. The primary goal is to evaluate both the structural integration of IT in these programs and the perceptions of key stakeholders including students, lecturers, and alumni, regarding its academic and career relevance.

2.1 Research Design

The research design consists of two primary components: curriculum document analysis and stakeholder survey analysis. Together, these components provide a comprehensive understanding of IT integration from both institutional and experiential perspectives.

2.1.1 Curriculum Document Analysis

Official curriculum documents, course structures, and institutional guidelines for the BICTE, BIM, and BCA programs were collected from authoritative sources. The document analysis focused on:

- Distribution of credit hours across different subject areas.
- Identification and frequency of core IT-related courses.
- Inclusion of practical components such as laboratory sessions, capstone projects, and internships.
- Emphasis on career preparation and technical skills development.

This component established a structural benchmark for evaluating IT content across the three academic programs.

2.1.2 Survey-Based Stakeholder Analysis

To understand how Information Technology (IT) is integrated into the BICTE, BIM, and BCA programs at Tribhuvan University, data was collected from three key stakeholder groups: students,

alumni, and IT faculty members**.** A purposive sampling method was used to select participants with direct and relevant experience in these programs. Collected sample were from:

- 15 current students (5 from each program)
- 9 alumni (3 from each program)
- 9 IT lecturers (3 from each program)

Data was gathered through structured digital questionnaires distributed to selected participants. The survey instrument included both closed-ended questions for quantitative analysis and open-ended questions for qualitative insights, ensuring a well-rounded understanding of IT curriculum effectiveness, practical exposure, and relevance to career preparation.

2.2 Quantitative Analysis

Descriptive statistics Kaur et al., (2018) were used to analyze and compare responses from respondents. The analysis focused on three core areas:

- Confidence in practical IT skills
- Satisfaction with IT-related course content
- Perceived alignment of the curriculum with job market requirements

To present the data effectively, results were visualized using charts, allowing for clear and comparative insights across the programs.

2.3 Qualitative Analysis

Qualitative responses from open-ended survey questions were analyzed using Python-based text processing tools. The analysis included the following steps:

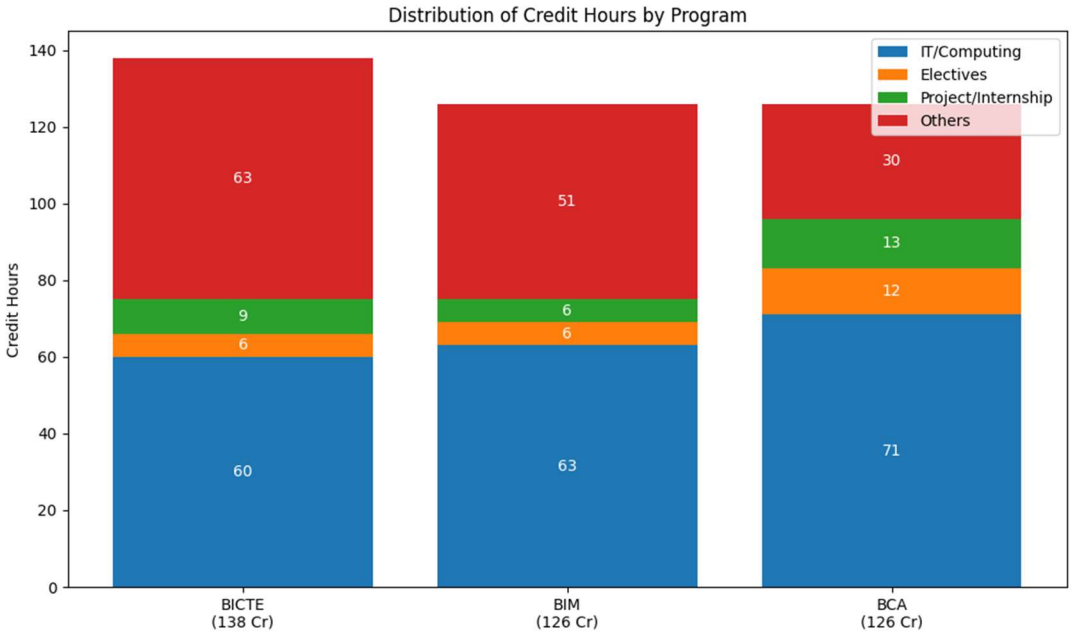
- CountVectorizer was used to extract frequently mentioned keywords across the responses.
- A Word Cloud was generated to visualize dominant terms and highlight key areas of emphasis.
- Thematic coding was performed to organize the feedback into major themes

This qualitative analysis provided deeper insight into stakeholder experiences and perceptions, complementing the quantitative findings.

3. Results and Discussion

3.1 Curriculum Document Analysis Results

Figure 1: Distribution of Credit Hours and Structural Orientation



BIM exhibits a balanced split between IT and Management. BICTE leans more toward education-focused courses, while BCA provides the highest weightage to core computing, emphasizing technical depth. BICTE has the highest total credit load, reflecting added educational and pedagogical requirements.

Table 1: *IT Subject Integration*

Aspect	**BICTE**	**BIM**	**BCA**
Foundational IT Courses	Programming in C/C++, Data Structures, Web Technology	Foundation of IT, C, Java, Python, Data Structure	C Programming, Java, Web Tech, Data Structure, OS
Advanced Topics	AI in Education, Network Security, Python, Cloud	AI, Data Mining, IT Security, BI, E-commerce, Ethics	Cloud, Distributed Systems, Advanced Java, Network Programming
Pedagogical Integration	Strong (ICT Teaching Methods, Digital Pedagogy)	None	Minimal (Cyber Law & Ethics)

BCA integrates the most extensive set of IT core and advanced subjects, tailored for technical computing careers. BIM blends IT with business intelligence and system applications,

while BICTE integrates IT with pedagogy, preparing graduates for education and school-level computing instruction.

Table 2: *Practical Components: Labs, Projects, and Internships*

Practical Elements	**BICTE**	**BIM**	**BCA**
Lab Work	Integrated throughout IT and pedagogy courses	Present in most IT-related subjects	Extensive lab emphasis across most IT courses
Capstone/Project Work	Capstone Project (7th semester)	Project work (6th semester)	Three separate projects (4th, 6th, 8th semesters)
Internship	1-semester Teaching Practicum (8th semester)	8-week industry internship (8th semester)	Internship (8th semester, 6 credit hours)
Elective Courses	2 electives in ICT and education integration (7th & 8th sem)	2 electives focused on IT domains (7th & 8th sem)	4 electives in advanced tech fields (7th & 8th sem)

While all three programs emphasize practical learning, BCA stands out with more frequent projects and broader elective options, enabling deeper technical specialization. BIM balances practical IT application with managerial relevance through targeted electives and a structured internship. BICTE focuses on educational ICT practices, combining a teaching practicum with electives that support instructional innovation in tech education.

Table 3: *Emphasis on Career Preparation and Technical Skills*

Dimension	**BICTE**	**BIM**	**BCA**
Career Orientation	ICT Educator, Digital Pedagogy	IT in Business & Management	Software Development, IT Services
Skill Development	Teaching ICT, Curriculum Design	Business Systems, Software Projects	Advanced Programming, Cloud, Networking
Soft Skills/Communication	Strong focus via pedagogy and research courses	Business Communication, Group Projects	Courses in English, Ethics, Applied Economics

BICTE prepares students for ICT teaching roles and educational system development. BIM emphasizes managerial application of IT in organizational contexts. BCA prioritizes high-level technical competence, preparing students for diverse roles in software development, networking, and emerging tech.

Table 4: *Sectoral Relevance and Vision Alignment*

Focus	BICTE	BIM	BCA
Vision Alignment	Digital education transformation in Nepal	Digitally enabled business leadership	Nation's ICT manpower development
Sectoral Target	Education (Colleges, Curriculum Dev.)	Business, Management, Public/Private Sector IT	ICT Industry, Startups, Software Firms
Postgraduate Pathway	MICTE	MBA IT, MIM	MCA, MSc CSIT, MIT

BICTE aligns with national needs for ICT-skilled educators. BIM addresses the demand for IT-integrated business managers. BCA aligns directly with Nepal's tech industry by producing hands-on computing professionals.

4. Survey Data Analysis Results

4.1 Alumni Perspective on IT Integration

Alumni responses indicate notable differences in how BICTE, BIM, and BCA programs integrate IT into their curricula. BCA alumni rated both the coverage of core IT concepts and the effectiveness of practical training highest, with BIM close behind, while BICTE lagged in both areas. In terms of practical training effectiveness, BCA again led with the highest average score, suggesting stronger integration of hands-on learning such as lab sessions and projects.

Interestingly, BIM alumni rated their program highest in job relevance, likely due to its hybrid focus on IT and management, highlighting its alignment with industry needs. BICTE, being more educationally focused, may not prepare graduates as directly for technical roles, reflected in slightly lower relevance scores.

These findings suggest that while all three programs incorporate IT, the depth and practical orientation vary significantly, impacting alumni perceptions of preparedness and real-world relevance. These findings emphasize the need for periodic curriculum review, particularly for BICTE, to enhance its technical depth and competitiveness.

4.2 Student Perspective on IT Integration

Table 5: *Student Perspective on IT Integration*

Program	Confidence in Practical Readiness	Satisfaction with IT Integration
BICTE	Low	Moderate–Low
BIM	Moderate–High	High
BCA	High	Very High

Survey data shows that BCA students have the highest confidence in practical readiness and are very satisfied with IT integration, reflecting the program's strong technical and project-based focus. BIM students reported moderate to high confidence and high satisfaction, highlighting its effective IT-business blend. In contrast, BICTE students showed low confidence and moderate–low satisfaction, suggesting a need for more hands-on technical exposure.

These results suggest that while all programs incorporate IT, the depth and delivery of practical training vary significantly. BCA appears best aligned with industry-ready IT skills, while BICTE may benefit from greater emphasis on applied technical learning to enhance student preparedness beyond educational contexts.

4.3 Teacher Perspective on IT Integration

Table 5: *Student Perspective on IT Integration*

Program	Strength	Concern / Suggestion
BICTE	Links pedagogy with IT	Lacks current tools and real-world project exposure
BIM	Balanced IT and management curriculum	Needs frequent updates to align with industry trends
BCA	Strong technical and coding foundation	Requires more focus on soft skills and emerging domains

Survey insights shows that BCA excels in technical readiness, BIM offers a balanced IT-business approach, and BICTE requires stronger practical integration to meet evolving IT demands.

Teachers highlighted the importance of aligning curriculum with current industry practices. While BCA is technically robust, it lacks soft skill development. BIM's adaptability depends on regular content updates, and BICTE requires modernization to ensure students are equipped for both educational and IT contexts.

4.4 Thematic Analysis

In response to the open-ended survey question, *"What are your views on how well IT subjects are integrated into your program's curriculum?"*, a thematic analysis was conducted. To begin, frequent keywords were extracted using CountVectorizer**,** and a Word Cloud was generated to visually highlight commonly emphasized terms.

Figure 2: *Perceptions of IT Integration in Undergraduate Programs*

The following themes emerged from the analysis:

1. Practical Exposure & Industry Relevance: BCA offers strong project and internship opportunities, while BICTE and BIM lack sufficient hands-on industry engagement.
2. Technical Skills & Modern Tools: BICTE and BIM lack modern technologies like cloud, cybersecurity, and Python; BCA is stronger but still needs updates.
3. Pedagogical Effectiveness: BICTE needs better integration of IT tools in teaching and more student-centered, interactive learning strategies.
4. Curriculum Gaps & Updates: All programs miss emerging topics (e.g., DevOps, data ethics) and soft skill development, affecting job readiness.
5. Business & Managerial Integration: BIM's IT-management blend is valued, but stronger technical content is needed to balance business orientation.

5. Conclusion

This study concludes that while BICTE, BIM, and BCA differ in their IT integration, each program is well-suited to its intended purpose: preparing educators, IT-enabled managers, and technical professionals, respectively. The differences in technical depth and practical training across the programs are clear, but they make sense when considering the different career paths each program is designed for. In today's global and changing IT landscape, it's important to keep

each program focused on its main goal, while also making room for students to explore broader opportunities if they choose.

6. Recommendation

For Tribhuvan University: Regularly revise curricula to include emerging IT fields like DevOps, cloud computing, and cybersecurity.

For BICTE/BIM/BCA Program Designers: Enhance technical depth while preserving the program's educational focus, with input from industry experts.

For Students: Select programs aligned with career goals, BCA for technical IT roles, BIM for IT-business careers, and BICTE for digital education.

For Future Research: Expand the study to more institutions and regions for broader and more generalizable findings.

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